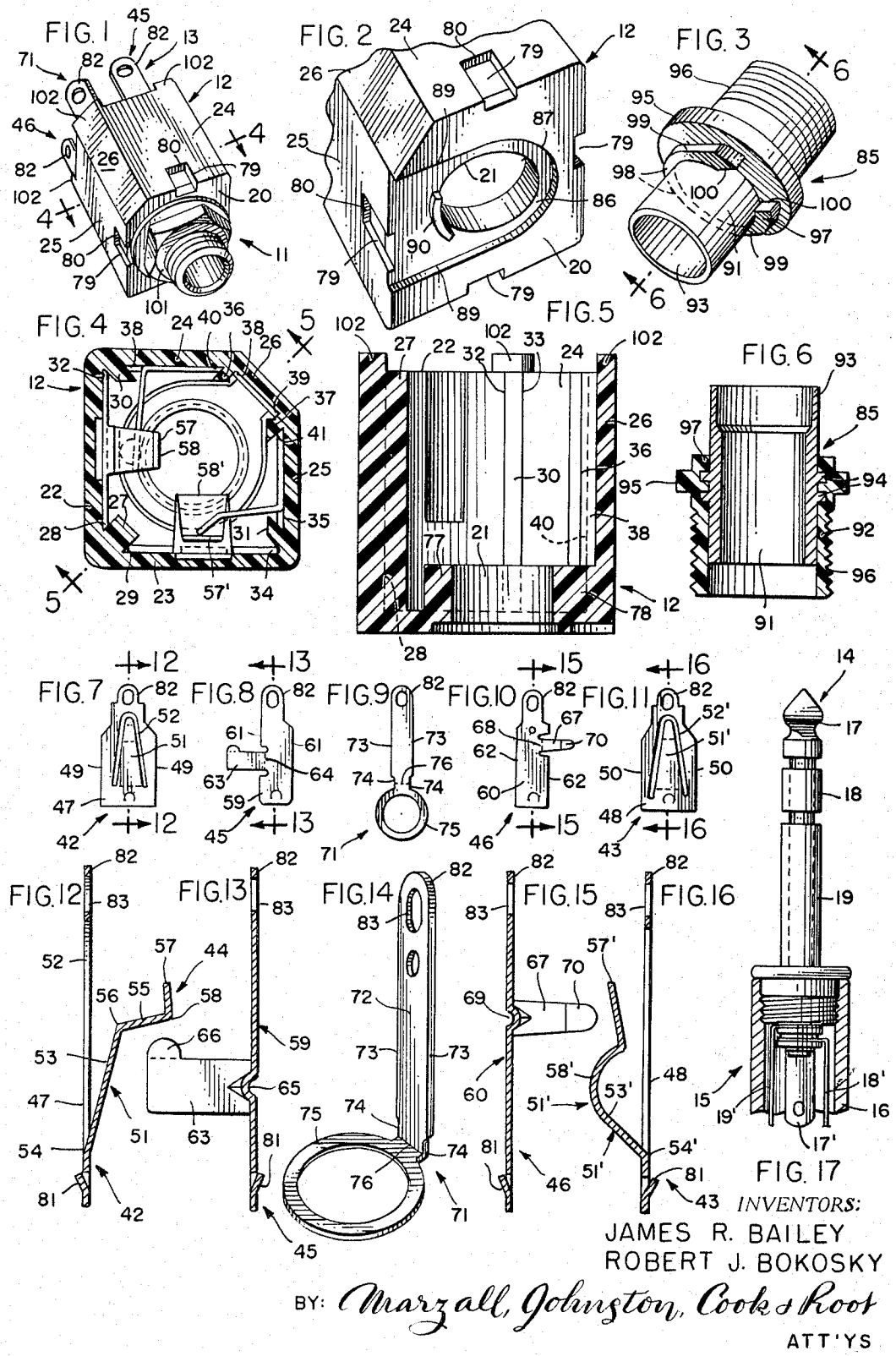
May 14, 1968 J. R. BAILEY ETAL 3,383,481

ELECTRICAL JACK WITH AXIALLY MOUNTABLE CONTACT ELEMENTS

Filed Jan. 29, 1965 2 Sheets-Sheet 1



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ELECTRICAL JACK WITH AXIALLY MOUNTABLE CONTACT ELEMENTS

Filed Jan. 29, 1965 2 Sheets-Sheet 2

FIG. 20

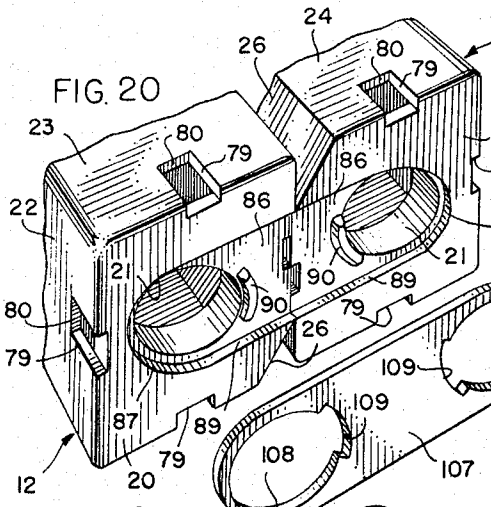


FIG. 21

FIG. 18

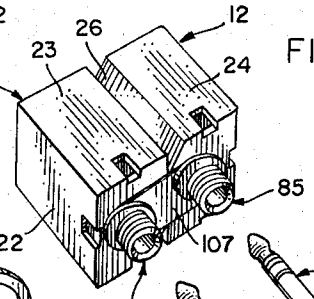
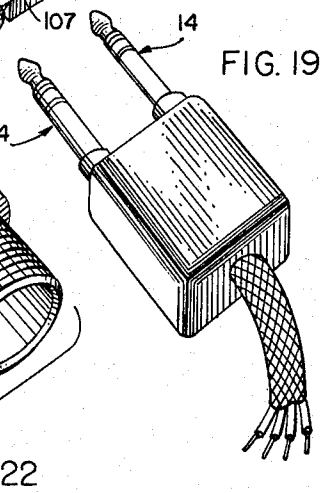


FIG. 19



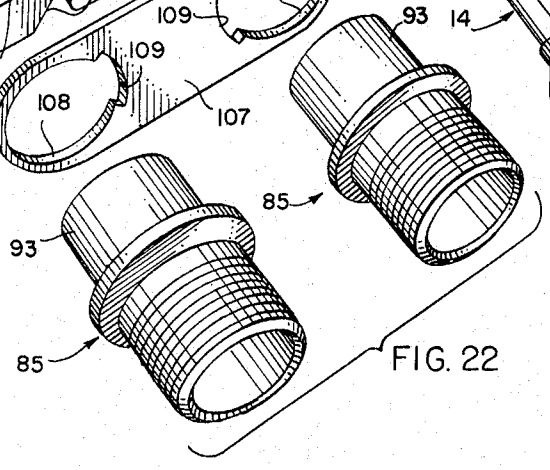


FIG. 22

FIG. 23

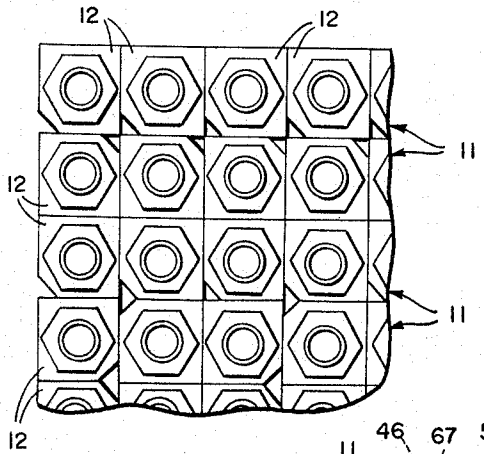
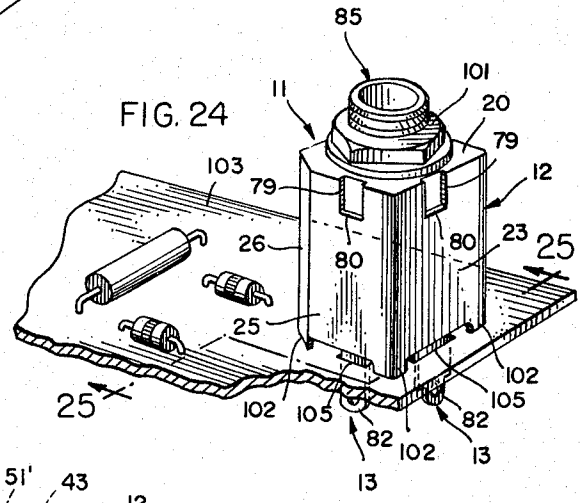


FIG. 24



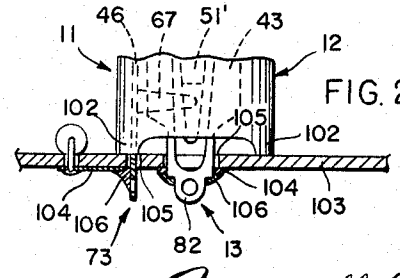


FIG. 25

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ELECTRICAL JACK WITH AXIALLY MOUNTABLE CONTACT ELEMENTS

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Filed Jan. 29, 1965, Ser. No. 429,023
13 Claims. (Cl. 200—51.1)

ABSTRACT OF THE DISCLOSURE

An electrical jack embodying a hollow housing open at one end and having a collar at the opposite end for the guidance of a plug stem therethrough into the housing, the housing having flat lateral walls and spaced pocket forming grooves on the inner faces of said walls in position to receive the opposite edges of flat contact making elements in said pockets in position overlying the inner faces of the housing walls, at least some of the contact elements having portions in position for engagement with a plug stem in the jack.

The present invention relates in general to electrical jacks, and has more particular reference to phone jacks having improved structural features facilitating manufacturing and assembly operations, thereby minimizing costs and providing jacks having improved performance characteristics, the invention pertaining more specifically to the provision of jacks having neat, compact configuration adapted for close together assembly on printed circuit panels and other mounting panels.

The high density packaging of circuitry, in recent years, has become a major consideration in the design of electronic equipment. Improvements have been made in miniaturizing circuit components, as in microcircuits, and in reducing the size of control panel components, such as switches and panel lights. There has, however, been little if any reduction in size of conventional phone jacks; and it is an important object of the present invention to provide improved structures wherein novel features and expedients are employed to effect substantial reduction in the cross-sectional size of jacks embodying the present invention.

Another object is to provide a jack having relatively flat plug engaging electrodes assembled in position extending longitudinally and alongside of the axis of the jack, whereby jack dimensions transversely of said axis are greatly minimized; a further object being to provide longitudinally extending electrodes of novel yet exceedingly simple configuration for the accomplishment of their plug engaging and circuit controlling functions; a still further object being to form electrodes by pressing contact making portions thereof outwardly of the plane of relatively flat mounting portions of the electrode.

Another important object of the invention is to provide an improved jack comprising an electrode support frame preferably of molded electrical insulating material adapted to receive the stem of a jack plug therein, and formed with integral seats adapted to interlockingly receive and retain a relatively flat, longitudinally extending electrode in position therein to make electrical contact with a jack plug when applied in the frame; a further object being to provide novel, inexpensive and exceedingly simple interlocking means on the electrode and the electrode supporting frame of the jack for securing the electrode in mounted position on the frame in response to sliding assembly movement thereof into latchingly anchored position on the frame.

Another important object is to provide a jack comprising a frame formed with a pair of opposed electrode

mounting grooves for slidingly receiving the opposite side edges of a relatively flat, preferably sheet metal electrode, whereby the same may be assembled in the frame merely by sliding it edgewise into assembled position between the grooves; a further object being to form an electrode receiving pocket in the frame defined by a pair of opposing electrode edge receiving grooves between which a relatively flat electrode forming plate may be slidingly assembled and latched in mounted position through the interengagement of a locking shoulder, formed on the frame at the bottom of the electrode receiving pocket, and a latching lug formed adjacent the inner or bottom end of the electrode forming plate, in position to latchingly engage such shoulder when the electrode has been moved to mounted position in the pocket.

Another important object is to provide a jack comprising a hollow box-like frame forming a housing having an end wall formed with an opening for the removable reception of the stem of a jack plug applied axially therethrough and into the box-like frame, said frame also having lateral walls extending normally of the front wall and enclosing the space occupied by the stem of a jack plug when mounted in the housing, and electrode retaining grooves formed along the opposite edges of the inner face of a said lateral wall, so that a plug engaging electrode having a generally flat mounting portion may be assembled and secured upon the inner face of a said lateral wall, with the opposite edges of the mounting portion received in said grooves; a further object being to form the electrode with an inwardly pressed resilient portion in position to be engaged and depressed outwardly by the stem of a jack plug when applied in said box-like frame; a further object being to provide a cooperating electrode having a flat mounting portion sized for assembly with its opposite edges in electrode retaining grooves formed along the edges of the inner face of a lateral wall of the housing adjacent the wall on which the plug engaging electrode is mounted, said cooperating electrode having a contact finger disposed in position normally engaging and making electrical contact with the inwardly pressed resilient portion of the plug engaging electrode, whereby to provide a normally closed switch adapted to open in response to the depression of said inwardly pressed portion of the plug engaging electrode, when the same is engaged by the stem of a plug.

The foregoing and numerous other important objects, advantages, and inherent functions of the invention will become apparent as the same is more fully understood from the following description, which, taken in connection with the accompanying drawings, discloses preferred embodiments of the invention.

Referring to the drawings:

FIG. 1 is a perspective view of a jack assembly embodying the present invention and comprising a formed housing in and upon which jack components are assembled and mounted in accordance with the teachings of the present invention;

FIG. 2 is an enlarged perspective view of the front end of the housing shown in FIG. 1;

FIG. 3 is an enlarged perspective view of a component of the jack illustrated in FIG. 1, said component being formed and adapted for assembly on the housing at its forward end;

FIG. 4 is an enlarged sectional view taken substantially along the line 4—4 in FIG. 1;

FIG. 5 and 6 are sectional views taken substantially along the lines 5—5 in FIG. 4, and 6—6 in FIG. 3, respectively;

FIGS. 7 through 11 are plan views of preferably sheet metal blanks from which jack components may be formed, in accordance with the present invention, for assembly in the housing of the jack shown in FIG. 1;

FIGS. 12 and 13 are enlarged sectional views taken substantially along the lines 12—12 and 13—13 in FIGS. 7 and 8, respectively, to illustrate jack components which may be formed from the blanks shown in FIGS. 7 and 8;

FIG. 14 is an enlarged perspective view of a jack component which may be formed from the blank shown in FIG. 9;

FIGS. 15 and 16 are enlarged sectional views taken substantially along the lines 15—15 and 16—16 in FIGS. 10 and 11, respectively, to illustrate jack components which may be formed from the blanks shown in FIGS. 10 and 11;

FIG. 17 is a perspective view, partially sectionalized, illustrating a form of plug that may be applied in the jack shown in FIG. 1, for circuit making purposes therein;

FIG. 18 is a perspective view showing a pair of jacks of the sort illustrated in FIG. 1, arranged in side-by-side contiguous relationship and secured together to form a twin jack unit adapted to receive the spaced apart stems of a twin jack plug;

FIG. 19 is a perspective view of a twin jack plug embodying a pair of spaced stems positioned for insertion in the twin jack unit shown in FIG. 18;

FIG. 20 is an enlarged perspective view showing the front ends of the housing of the jacks forming the unit shown in FIG. 18;

FIG. 21 is an enlarged perspective view of the fastening strap which secures a pair of jacks together in forming the twin jack unit shown in FIG. 18;

FIG. 22 shows enlarged perspective views of the plug stem receiving and guiding components of the unit shown in FIG. 18, said components being shown in position for assembly through the openings of the strap shown in FIG. 21 and into mounted position in the ends of the housings shown in FIG. 20 during the assembly of a twin jack unit of the sort shown in FIG. 18;

FIG. 23 is a plan view of the ends of a number of jacks of the sort shown in FIG. 1, to illustrate how the same may be arranged compactly as a bank of jacks;

FIG. 24 is a perspective view illustrating the manner in which the rear end of a jack of the sort shown in FIG. 1 may be mounted upon a support panel; and

FIG. 25 is a sectional view taken substantially along the line 25—25 in FIG. 24, showing how the terminals of the jack components may be electrically connected in printed circuits formed on the jack supporting panel.

To illustrate the invention the drawings show a phone jack **11** comprising a housing **12**, which may be made of any preferred or convenient insulating material, such as the reaction product of phenol and formaldehyde, or similar moldable material, and one or more contact making electrodes **13** mounted within the housing, in position to make electrical contact with the stem **14** of a conventional jack plug **15**, when the same is applied in the jack. As shown in FIG. 17, the stem **14** of a conventional jack plug may be mounted on a handle **16** to facilitate manipulation of the same when inserting the stem into and withdrawing the same from the jack. The stem **14** may have a tip **17**, a ring **18** and a sleeve **19** of electrical conducting material relatively insulated the one from the other and respectively connected electrically with corresponding terminals **17'**, **18'** and **19'** for connection in external circuitry. Another form of plug may comprise a tip and a sleeve only, the ring **18** and its connection terminal **18'** being omitted.

As shown more particularly in FIGS. 1, 2, 4 and 5 of the drawings, the housing **12** may comprise a generally rectangular box-like structure having a front end wall **20** formed centrally with a preferably circular opening **21**, and lateral side walls **22**, **23**, **24**, **25** and **26** extending rearwardly of the front wall **20**, the housing being open at its rear end. The lateral walls **22**, **23**, **24** and **25** are preferably disposed each at right angles with respect to the adjoining wall so that the housing is of generally square sectional configuration, except that the wall **26** which interconnects the adjacent sides of the walls **24** and **25** is inclined at an angle of 135° with respect to each of said walls, whereby one corner of the otherwise square section of the housing is truncated to form the inclined wall **26**.

The housing is also formed with preferably integral inwardly extending ribs at and along each of the corners provided at the junction of the lateral walls, a rib **27** being formed at the junction of the lateral walls **22** and **23**, the opposite faces of said rib extending at angles of the order of 45° with respect to the inner faces of said walls **22** and **23**, in order to form slide receiving grooves **28**, **29**, between the adjacent faces of said walls and said rib. A pair of diagonally opposite, inwardly extending ribs **30** and **31** are formed respectively at the junctions of the walls **22** and **23** with the walls **24** and **25**, to provide slide grooves **32**, **33**, between the adjacent faces of the rib **30** and the walls **22** and **24**, and slide grooves **34**, **35**, between the adjacent faces of the walls **23** and **25** and the rib **31**. A pair of parallel spaced apart and inwardly extending ribs **36** and **37** are formed respectively at and along the corners formed at the junction of the inclined wall **26** with the walls **24** and **25**, the mutually facing sides of the ribs **36** and **37** being undercut to form facing slide grooves **38**, **39**, while the outwardly facing surfaces of the ribs **36** and **37** are inclined at angles of the order of 45° with respect to the inner faces of the walls **24** and **25** to form slide grooves **40**, **41** respectively between the adjacent faces of the wall **24** and the rib **36** and of the wall **26** and the rib **37**.

It will be seen from the foregoing that the facing pairs of slide grooves **28–32**, **29–34**, **33–40**, **35–41**, and **38–39** may form electrode mounting pockets for receiving and supporting the electrodes **13** within the housing. To this end, the electrodes **13** may conveniently comprise sheet metal pressings or stampings formed from blanks of the sort shown in FIGS. 7 through 11. The same, in each case, provides opposite side edges adapted for sliding reception in the electrode mounting pockets formed by and between the slide grooves.

As shown more particularly in FIGS. 7 through 16, the electrodes **13** may include one or more electrodes **42**, **43**, having stem engaging portions **44**, adapted for disposal in position to electrically connect with the stem **14** of a jack plug **15** when it is introduced into and positioned within the housing **12** as through the end opening **21** thereof. The electrodes may also include circuit-forming electrodes **45**, **46**, respectively adapted to cooperate with the electrodes **42** and **43**, in order to make electrical contact therewith, whenever and so long as the stem engaging portions **44** of the electrodes **42**, **43**, are not in electrical contact with the stem **14** of the jack plug, said stem engaging portions **44**, when in engagement with the jack plug stem, being thereby shifted to positions electrically disconnected from the electrodes **45**, **46**.

To these ends, the electrodes **42**, **43**, **45** and **46** may be formed as stampings or pressings from relatively thin gauge sheet metal stock, FIGS. 12, 13, 15 and 16 being sectional views illustrating said electrodes, while FIGS. 7, 8, 10 and 11 show the electrodes in flattened condition.

The electrodes **42** and **43** each comprise a relatively flat body portion or frame **47**, **48**, having preferably parallel opposite side edges **49**, **50**, spaced for reception respectively in the groove pairs **28–32** and **29–34**, the electrodes **42**, **43** being each respectively formed with an integral, preferably triangular tongue **51**, **51'** connected to the frame **47**, **48** along the base of the triangular tongue which extends in a correspondingly shaped opening **52**, **52'** in the frame. The tongue **51** of the electrode **42** has a base portion **53** connected with the electrode frame **47** and bent from the plane thereof, at a desired inclination, as along a bend line **54**, said tongue having an offset portion **55** bent therefrom at a desired angle, in a direction inclined away from the plane of the frame **47**, as along a bend line **56**; and the tip portion **57** of the tongue is bent

upwardly from the offset portion 55 into a plane substantially parallel with and spaced forwardly of the frame 47, as along a bend line, to form a jack plug stem engaging shoulder 58.

The tongue 51' of the electrode 43 also has a base portion 53' which is connected with the electrode frame 48 and bent forwardly and outwardly of the plane of the frame at a desired inclination, as along the line of bend 54', the upper portions of said base portion, remote from the line of bend 54', being curvingly rebent toward the plane of the frame 48 to form an outwardly projecting jack plug stem engaging shoulder 58'. The tip 57' of the tongue 51' may be bent forwardly and outwardly of the frame 48, at the upper edge of the tongue portion 51', as along a bend line 56'.

The width of the electrode 42, between its spaced apart side edges 49, is such that the frame 47 of the electrode may extend across the inner face of the housing wall 22 between the slide grooves 28 and 32. Accordingly, the electrode 42 may be mounted in the housing with its side edges 49 slidingly received and retained in said grooves. When so mounted, the projecting portions of the tongue 51 at the stem engaging shoulder 58 will be depressibly supported, through the inherent resilience of the tongue 51, in position to make electrical contact with the stem 14 of a jack plug 15 when the same is introduced into the housing through the opening 21.

The distance between the opposite side edges 50 of the frame of the electrode 43 is such that said electrode may be disposed in the housing 12 in position overlying the inner face of the housing wall 23, with the opposite edges 50 of the electrode frame in engagement in the grooves 29 and 34, so that the electrode may be held in position presenting the plug stem engaging shoulder 58' of the electrode tongue 51' in position to electrically engage the stem of a jack plug when the same is mounted in the housing 12 through the opening 21.

It will be noted that the plug stem engaging portions 58, 58' of the electrodes 42 and 43 are relatively offset axially in the housing 12, when said electrodes are in mounted position therein. The relative position of said stem engaging portions 58 and 58' is such as to allow them to electrically connect respectively with the tip 17 and the ring 18 of a jack plug, when the same is mounted in the jack.

As shown in FIGS. 8, 10, 13 and 15, the auxiliary electrodes 45 and 56 may comprise sheet metal strips 59, 60, respectively, having opposite side edges 61 and 62 spaced apart for snug sliding engagement, respectively in the slide grooves 33, 40 and 35, 41 of the housing 12, so that the electrodes 45 and 46 may be slidingly mounted in the pockets, defined between said grooves, and retained thereby in position overlying the inner faces of the walls 24 and 25.

The electrode 45 is formed with a preferably integral contact finger 63 extending outwardly of the strip 59 at a side edge 61 thereof, said finger being bent, as along a bend line 64, to lie in a plane making an angle of the order of ninety degrees with the plane of the strip 59. The material of the strip and finger may be and preferably is indented, as at 65, across the line of bend 64 to brace and rigidify the finger 63 in position extending substantially normal to the strip 59. The strip remote end of the finger 63 may be formed with an outwardly bent contact terminal portion 66 in position to make electrical contact with the outwardly bent portion 53 of the tongue 51 of the electrode 42, when both electrodes 42 and 45 are in mounted position, in the housing 12, as shown clearly in FIG. 4 of the drawings.

The electrode 46 is formed with a preferably integral contact finger 67 extending outwardly of the strip 60, at a side edge 62 thereof, said finger being bent, as along a bend line 63, to line a plane making an angle of the order of ninety degrees with the plane of the strip 60. The material of the strip and finger may be and preferably is indented, as at 69, across the line of bend 68, to brace and rigidify the finger 63 in position extending substantially normal to the strip 60. The strip remote end of the finger 67 may be formed with an outwardly bent contact terminal portion 70 in position to make electrical contact with the outwardly bent portion 57' of the tongue 51' of the electrode 43, when both electrodes 43 and 46 are in mounted position, in the housing 12, as shown clearly in FIG. 4 of the drawings.

A jack 11 embodying the present invention may be provided with all of the electrodes 42, 43, 45, and 46, if desired, but either or both of the electrodes 45, 46 may be omitted in the event that it is not desired to incorporate one or other or both of the normally closed switches provided by the electrodes 45 and 46, respectively, in cooperation with the electrodes 42 and 43. In like fashion, either one of the electrodes 42, 43 may be omitted in order to provide a jack having only one plug engaging contact. It is desirable, however, although not essential, that jacks embodying the present invention include a grounding electrode 71, of the sort shown in FIGS. 9 and 14, said electrode conveniently comprising a sheet metal strip 72 having opposite side edges 73 spaced apart sufficiently to provide for snug sliding engagement in the facing grooves 38 and 39 of the housing. At the lower end of the electrode, its side edges may be recessed to form a neck which connects with a ring portion 75 preferably integral with the strip 72, at an end thereof, said ring portion being bent from the strip 72, as along a bend line 76, to extend in a plane substantially normal to the plane of the strip.

As shown more particularly in FIG. 5 of the drawings, the housing 12, at its forward end, may be formed with an inwardly extending boss 77 defining the opening 21 and integrally connected on one side, as at 78, with the housing wall 26, at the bottom of the pocket formed by and between the facing grooves 38 and 39. Accordingly, the electrode 71 may be slidingly assembled in the housing with its opposite edges 73 extending in the facing grooves 38 and 39, and with the ring portion 75 of the electrode overlying the inner end of the embossment 77, the inner circular edge of the ring portion 75 being the same size as the housing opening 21 and being disposed in coaxial alinement therewith.

In order to secure the electrodes 42, 43, 45 and 46 in the housing 12, when slidingly assembled therein from the rear open end thereof, the forward end of the housing, adjacent its front wall 20, may be provided with openings 79 forming latching shoulders 80 at the lower ends of the electrode mounting pockets formed by and between the grooves 28–32, 29–34, 33–40 and 35–41, at the inner or forward ends of the walls 22, 23, 24 and 25, such shoulders 80 facing toward the forward end of the housing. Each of the electrodes 42, 43, 45 and 46, at its bottom end, may be formed with an outwardly struck latching lug 81 in position to snap behind and latchingly engage with a shoulder 80, as and when the electrode reaches mounted position in the housing, the electrodes 42, 43, 45 and 46 being thereby firmly and permanently anchored in mounted position.

It will be seen that the upper ends of the electrodes 42, 43, 45 and 46, remote from the latching lugs 81, preferably extend outwardly of the open rear end of the housing, and form connection lugs 82 preferably having perforations 83 to facilitate the electrical connection of the electrodes, as by soldering, in external electrical circuitry in which it may be desired to electrically connect said electrodes.

In order to provide snug guidance for and alinement of the stem 14 of a jack plug in the jack, as the plug is applied through the opening 21 into mounted position in the housing 12, and also to provide for the electrical connection of the jack plug sleeve 19 with the grounding electrode 71, a plug stem guiding sleeve member 85 may be mounted on the housing 12, in position extending in

the opening 21 and outwardly thereof. The sleeve member 85 may be secured in the housing in any suitable, preferred or convenient manner. As shown, the front wall 20 of the housing may be formed with a recess 86 providing a seat around the openings 21, said recess, at one end, having a semi-circular wall portion 87 concentric with the opening 21. The recess also has spaced apart preferably parallel side wall portions 89 connected with the opposite ends of the semi-circular portion 87 and extending to the edge of the front wall 20, at the side of the opening 21 opposite from the circular portion 87. An arcuate rib 90 may be formed medially between the spaced side edges 89 of the seat 86, at the edge of the opening 21 remote from the circular wall portion 87.

As shown, the sleeve member 85 may comprise an inner core 91 of metal, such as steel, encased in a preferably molded sheath 92 of insulating material, although the sleeve member, if desired, may be made entirely of metal. As shown, the core 91 may comprise a cylindrical sleeve having an inner end sized to snugly yet slidingly fit in the opening 21. The interior of said inner end is preferably cut away, as shown more particularly in FIG. 6, to form terminal end portions 93 of relatively thin section. The cylindrical core 91 may also be formed, medially between its ends, with a pair of spaced apart, circumferentially extending ribs 94 adapted to interlockingly engage with and anchor the molded sheath 92 upon the core, said sheath extending from above the ribs 94 to and beyond the end of the core remote from the thin section end portions 93 thereof. The molded sheath may provide a circular outstanding flange 95, opposite and outwardly of the ribs 94 of the core, said flange 95 being adapted to engage with and overlie the front surface of the wall 20, as well as the forward edge of the rib 90. The molded sheath 92 also may be formed exteriorly with screw threads 96. On the side of the flange 95 remote from said screw threads 96, the sheath 92 may form a spline embossment 97 for engagement in the seat 86 to hold the sleeve member 85 against relative turning movement in the housing opening 21.

To this end, the embossment 97 may have a semi-circular side 98 shaped to fit the semi-circular side 87 of the seat 86, and a pair of spaced apart flat surfaces 99 connected with the opposite ends of the curved side 98 and adapted to engage the straight sides 89 of the seat 86. On its side remote from the curved surface 98, the spline embossment is cut away to form a pair of parallel facing surfaces 100 spaced apart to receive snugly therebetween the curved rib 90. As a consequence, the sleeve member 85 may be mounted on the front wall 20 of the housing, with the inner thin section 93 end of the core 91 snugly seated in the opening 21, the spline embossment extending in the seat 86 with the opposite ends of the rib 90 engaging the facing shoulders 100 of the embossment. When so mounted, the flange 95 will be disposed in overlying engagement with the outer surface of the front wall 20, with the threaded portion 96 of the sleeve member 85 projecting forwardly of the front end of the housing.

The inner thin section end 93 of the sleeve member, when the same is in mounted position on the housing, will project through and inwardly of the ring portion 75 of the electrode 71 which rests upon the seat provided by the inner end of the embossment 77, to secure said electrode 71 and the sleeve member 85 in mounted position in and on the housing 12. The inner thin section end of the sleeve member may be peened or otherwise rolled outwardly over the upper surface of the ring portion 75 of the electrode, thereby forming an electrical contact connection between the electrode 71 and the metal portions of the sleeve member.

When the jack plug is in mounted position in the housing with its tip in electrical contact with the plug engaging portion 58 of the electrode 42 and the ring 18, if included on the plug, in electrical contact with the ring engaging shoulder 58' of the electrode 43, the resilient reaction of said tip and ring engaging portions of the electrodes 42 and 43 will tilt the plug within the channel of the sleeve member sufficiently to bring the sleeve portion 19 of the plug into electrical contact with the sleeve member, to thereby ground the plug sleeve 19 with the ground electrodes 71.

Where the sleeve member 85 embodies a sheath 92 of molded insulation material, the jack may be mounted on a metal support panel without electrically connecting and thereby grounding the core 91 of the sleeve member on said support panel, by inserting the threaded portion 96 of the sheath through an opening formed in the panel and then clamping the panel by and between the flange 95 and a clamping nut 101 and associated washer secured on the threaded portion 96 of the sleeve member. Such an arrangement is especially useful where it is desired to maintain in one grounded condition the panel on which the jack is mounted. Where it is desired to electrically connect the metal portions of the sleeve member with the panel on which the jack is mounted, the sleeve member 85 may be formed as an integral metal element.

As shown more particularly in FIGS. 24 and 25, jacks embodying the present invention are especially well suited for use in conjunction with circuitry formed on support panels by circuit printing procedures. To this end, the housing 12 may be formed with stanchions or feet 102 at the rear or open end of the housing, said stanchions being formed at the rear end of the inclined wall 26 and at the corners formed at the junction of the walls 22–23, 22–24 and 23–25. These stanchions may serve to support the jack upon a printed circuit panel 103 containing printed circuit forming elements 104 on the side thereof remote from the jack. The panel may be formed with slots 105 therethrough to receive the circuit connecting portions 82 of the electrodes 13, permitting the same to project on the side of the panel 103 opposite from the side upon which the frame of the jack is supported. The circuit connecting ends of the electrodes may project from the panel adjacent the printed circuit elements 104 with which it may be desired to electrically connect the electrodes; and said electrode ends may be electrically connected with the circuit forming elements 104 merely by applying blobs of solder 105 thereto, in the manner indicated in FIG. 25.

As shown in FIGS. 18–22, jack structures embodying the present invention are especially well adapted for assembly together in pairs in order to provide twin jack units of the sort shown in FIG. 18, the same being adapted to accommodate the spaced parallel stems of a dual stem plug of the sort shown in FIG. 19. The twin jack arrangement shown in FIG. 18 is made possible because the jack dimension, from the center axis of the housing 12 vertically to each of the walls 22, 23, 24 and 25, may be and preferably is precisely one-half of the spacement of the stems in conventional dual stem plugs. To this end, the housings 12 of jacks embodying the present invention may be conveniently sized so that the dimension between the outer faces of the opposite walls 22, 25 and 23, 24 is precisely 5/8 of an inch, whereby juxtaposed jacks in side-by-side engagement will accommodate a dual plug having stems spaced 5/8 of an inch, on centers. Accordingly, it is merely necessary to fasten a pair of jacks together in side-by-side relation in order to produce a jack unit, thereby avoiding the expense of providing special twin jack structures in a common housing.

The provision of the seat 86 and arcuate rib 90 on the forward end of the jack housings 12, however, greatly facilitates the interconnection of a pair of jacks in providing twin jack units. To this end, as shown more especially in FIG. 20 of the drawings, a pair of jack housings may be assembled side by side with their front walls 20 in co-planar relationship and their lateral walls 25 in facing engagement, and with the open ends of the seats 86 in facing registration. Thereupon, a connection link 107, preferably although not necessarily of metal, may be mounted in the alined seats 86 of the juxtaposed

housings. Accordingly, the opposite ends of the link **107** may have semi-circular configuration to fit the correspondingly shaped semi-circular portions **87** of the seats **86**, the opposite side edges of the link being parallel and spaced for snug engagement with the straight parallel sides **89** of the seats. At its opposite ends, the link **107** is formed with a pair of circular openings **108** in position to register with the openings **21** of the jack housings, the adjacent sides of said openings **108** having segmental extensions **109** for the accommodation of the arcuate ribs **90**.

After the connection link **107** has been applied in the alined seats **86**, the upper or inner ends **93** of a pair of sleeve members **85** may be applied through the openings **108** of the link and the openings **21** of the interconnected housings **12**, and peened over upon the inner faces of the ring portions **75** of the grounding electrodes **71** in mounted position within the housings. Where used in assembling twin jack units, it is preferable, though not essential, that the sleeve members **85** be made entirely of metal and that the embossments **97** shown in FIG. 3 be omitted, since such embossments are provided for engagement in the seats **86** which, in the twin jack arrangement, are occupied by the connection link **107**.

It is, of course, within the purview of the present invention to provide twin rack units having centers of any desired spacement in excess of 5/8 of an inch, such desired spacement being attained merely by employing a spacing link **107** having the desired spacing distance between the centers of the openings **108**.

Another valuable attribute realized by the compactness of the 5/8 inch sectional size of the jack housings **12** is illustrated in FIG. 23, which shows how a number of jacks may be mounted together in a bank in fashion presenting all of the jacks on 5/8 inch centers both horizontally and vertirally, the spacement of centers diagonally being almost exactly $2\frac{9}{32}$ of an inch.

The novel features of the present invention permitting such close spacement of centers in adjacent jack structures, of course, include the formation of the electrodes **13** of flat sheet metal stock and the endwise assembly of the electrodes in pockets at the inner faces of the housing walls, together with the formation of such electrode pockets by and between elertrode edge receiving grooves formed in the housing.

It is thought that the invention and its numerous attendant advantages will be fully understood from the foregoing description, and it is obvious that numerous changes may be made in the form, construction and arrangement of the several parts without departing from the spirit or scope of the invention, or sacrificing any of its attendant advantages, the forms herein disclosed being preferred embodiments for the purpose of illustrating the invention.

The invention is hereby claimed as follows:

1. An electrical jack comprising a housing of insulating material having a wall formed with an opening, at the proximal end of the housing, and side walls enclosing an axial chamber into which the stem of a jack plug may be removably mounted by insertion and retraction thereof through said opening, said housing having a pair of pocket defining grooves formed on and extending longitudinally of each of a plurality of said side walls, each pair of grooves providing a pocket extending between the opposite ends of the housing and opening at its distal end, an electrode forming strip of sheet material inserted in each of said pockets, through its open end, a said strip having opposed edges interfittingly received in a pair of said facing grooves, and a contact resiliently supported on a said strip in position to electrically connect with the stem of a jack plug in the housing.

2. An electrical jack comprising a housing of insulating material having a wall formed with an opening, at the proximal end of the housing, and side walls enclosing an axial chamber into which the stem of a jack plug may be removably mounted by insertion and retraction thereof through said opening, said housing having a pair of spaced facing grooves formed on and extending longitudinally of each of a pair of said side walls, each pair of grooves providing a pocket extending between the opposite ends of the housing and opening at its distal end, an electrode strip of sheet material insertable in each of said pockets, through its open end, said strips having opposed edges interfittingly received in corresponding pairs of said facing grooves, a plug stem engaging contact resiliently supported on one of the electrode stripes in position to electrically connect with the stem of a jack plug in the housing, and a switching contactor on the other strip in position making electrical connection with said contact, when the jack is in normal plug free condition.

3. An electrical jack comprising a housing of insulating material having a wall formed with an opening, at the proximal end of the housing, and side walls enclosing an axial chamber into which the stem of a jack plug may be removably mounted by insertion and retraction thereof through said opening, said housing having a pair of spaced facing grooves formed on and extending longitudinally of each of a pair of said side walls, said pair of side walls being vertically spaced equally from the axis of said chamber, each pair of grooves providing a pocket extending between the opposite ends of the housing and opening at its distal end, an electrode strip of sheet material insertable in each of said pockets, through its open end, said strips having opposed edges interfittingly received in corresponding pairs of said facing grooves, said electrode forming strips each carrying a resiliently supported contact in position to electrically connect the stem of a plug when mounted in the jack, said contacts being disposed in axially spaced position in the chamber.

4. An electrical jack comprising a housing of insulating material having side walls enclosing an axial chamber into which the stem of a jack plug may be removably mounted by insertion and retraction thereof through an opening at the proximal end of the housing, including a pair of mutually normal walls joined to form an angular corner of the housing, a pair of associated walls each extending at right angles to the other and joined, respectively, at right angles, to a corresponding one of said mutually normal walls, and an inclined wall extending between and interconnecting the edges of said associated walls to form a truncated housing corner diagonally opposite its said angular corner, a sleeve of electrical conducting material secured in said opening at the proximal end of said housing and sized to slidingly receive and support the stem of a plug in the housing, said housing being internally formed with a pair of mutually facing grooves extending at and along the opposite sides of each of said walls, each pair of grooves forming a pocket opening at the distal end of the housing a strip of sheet material having opposed edges interfittingly received in the pocket formed at one of said mutually normal walls by a said pair of facing grooves, a contact resiliently supported on said strip in position to electrically connect with the stem of a plug jack when mounted in the housing, and a grounding strip of electrical conducting material having opposed edges secured in the facing groove at the opposite sides of said inclined wall, said grounding strip being electrically connected with said sleeve.

5. An electrical jack, as set forth in claim **4**, wherein said housing has an internal embossment defining said opening and forming a circular seat facing into said chamber, and a ring of electrical conducting material connected with said grounding strip and supported on said seat, said sleeve having an inner end in electrical contact with said ring.

6. An electrical jack comprising a housing of insulating material having a front wall formed with an opening, at the proximal end of the housing, and side walls enclosing an axial chamber into which the stem of a jack plug may be removably mounted by insertion and retraction thereof through said opening, a sleeve of electrical conducting material extending in said opening and sized to

slidingly engage and support the stem of a plug in the housing, said sleeve having an outwardly extending flange formed thereon, medially of its ends, in position to overlie said front wall at the edge of said opening, interfitting shoulders formed on said outwardly extending flange and on said front wall to prevent relative turning of the sleeve in the opening, a contact element resiliently supported on a said side wall, in a said pocket, within the housing, in position to electrically connect with the stem of a plug jack when mounted in the housing, and a grounding conductor mounted in another of said pockets and electrically connected with said sleeve, at its inner end, within the housing, said grounding conductor extending to and outwardly of the housing, at its distal end.

7. An electrical jack comprising a pair of units each embodying a housing of insulating material having a front wall formed with an opening and side walls enclosing an axial chamber into which the stem of a jack plug may be removably mounted by insertion and retraction thereof through said opening, a sleeve secured in said opening and sized to slidingly engage and support the stem of a plug in the housing, said sleeve having an outwardly extending portion overlaying the front wall of the housing at the edge of said opening, a contact element supported on said side walls in position to electrically connect with the stem of a plug jack when mounted in the housing, said housing being formed with a depressed seat in its front wall around said opening and extending thence between spaced parallel seat defining shoulders to and having an open end disposed at a side edge of said front wall, said units being disposed in parallel adjacency with the front walls thereof in co-planar alinement, with the open ends of their depressed seats in facing alignment, and a link interconnecting said units, said link comprising a strip of material extending, at its opposite ends, in said depressed seats and having opposed side edges in snug abutting engagement with the seat defining shoulders of both units, said link having perforations in coaxial alinement with the openings of said units, whereby the sleeves of said units may be applied through said perforations and openings and fastened to said housings to thereby secure the link to both housings.

8. An electrical jack, as set forth in claim 1, including interengaging latch means, formed on said housing and on a said electrode strip, to secure the strip in mounted position in its pocket.

9. An electrical jack, as set forth in claim 1, including means forming a latch engaging shoulder in a said pocket, adjacent the proximal end of the housing and a latching lug on a said electrode strip in position to engage said shoulder to secure the strip in the housing, when mounted in the pocket.

10. An electrical jack, as set forth in claim 1, wherein the housing comprises a pair of flat, mutually normal walls and a pair of flat walls each extending at right angles to the other and, respectively, at right angles to a corresponding and contiguous one of said mutually normal walls, to provide a housing having generally rectangular sectional configuration, with a pair of spaced facing groove extending at and along the opposite sides of each of said flat walls.

11. An electrical jack comprising a housing of insulating material having a wall formed with an opening, at the proximal end of the housing, and side walls enclosing an axial chamber into which the stem of a jack plug may be removably mounted by insertion and retraction thereof through said opening, said housing having a pair of spaced facing grooves formed on and extending longitudinally of each of a plurality of said side walls, each pair of grooves providing a pocket extending between the opposite ends of the housing and opening at its distal end, an electrode strip of sheet material insertable in each of said pockets, through its open end, said strips having opposed edges interfittingly received in corresponding pairs of said facing grooves, a contact resiliently supported on one of said strips in position to electrically connect with the stem of a jack plug in the housing, a sleeve of electrical conducting material secured on said housing, in said opening, and sized to slidingly engage and support the stem of a plug in the housing, and means to electrically connect said sleeve with another of said electrode strips.

12. An electrical jack, as set forth in claim 2, wherein the pockets containing the strips, which respectively carry the resiliently supported contact and the contractor, extend at contiguous mutually normal walls.

13. An electrical jack as set forth in claim 4, wherein the housing is formed with an internal circular embossment defining said opening at the proximal end of the housing, said grounding strip having a ring portion overlying the inner face of said embossment, said sleeve having an inner end peened over upon and electrically connected with said ring portion, thereby securing said ring portion on the embossment.

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