Dec. 24, 1940. W. T. WEIDENMAN, SR 2,225,728

SEPARABLE ELECTRICAL CONNECTOR

Filed Jan. 3, 1939

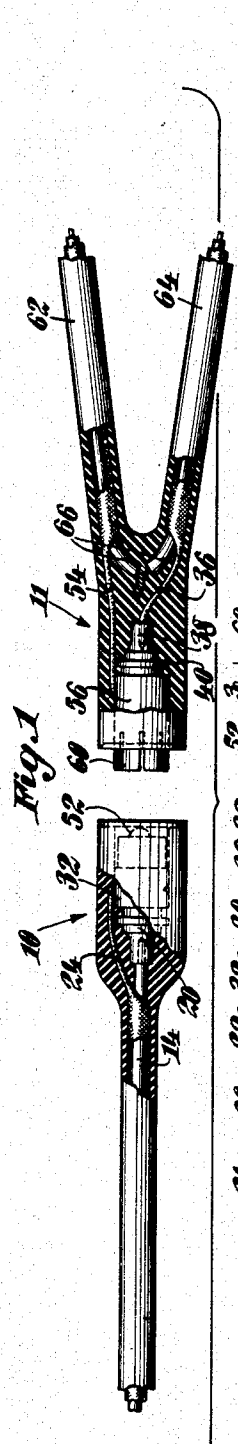


Fig. 1

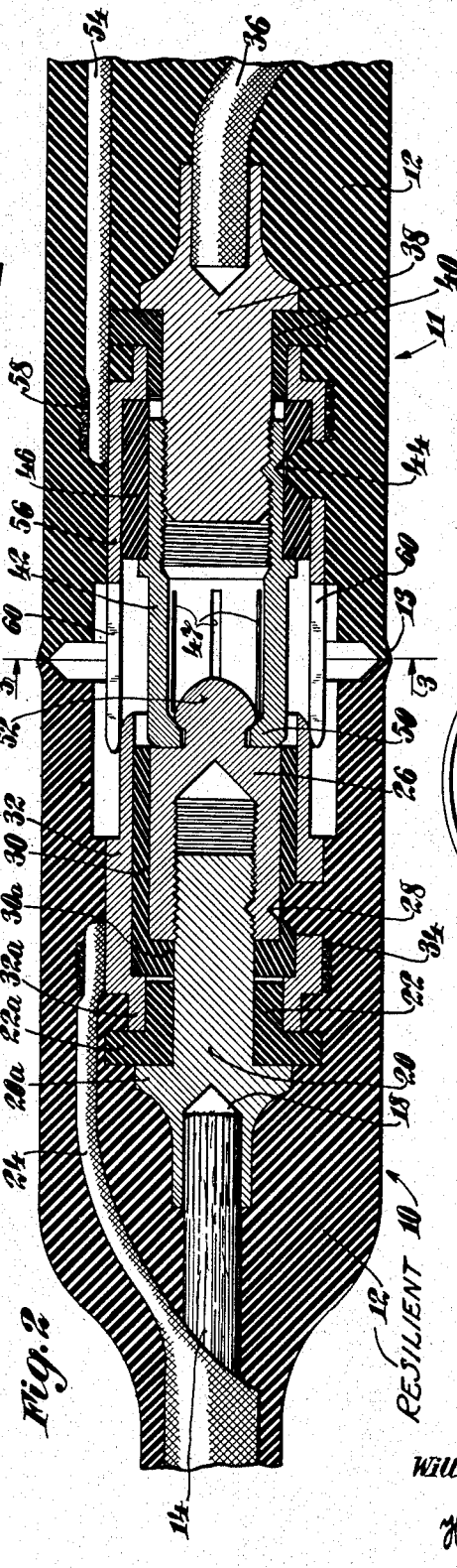


Fig. 2

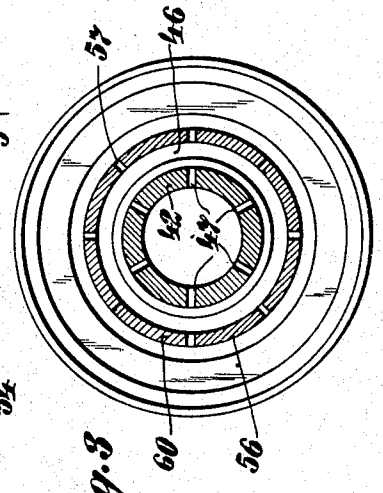


Fig. 3

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Patented Dec. 24, 1940 2,225,728

UNITED STATES PATENT OFFICE

2,225,728

SEPARABLE ELECTRICAL CONNECTOR

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Application January 3, 1939, Serial No. 248,971

1 Claim. (Cl. 173—328)

This invention relates to separable electrical connectors, and has particular reference to connectors comprising two interlocking elements adapted to electrically connect a plurality of electrical conductors, regardless of the relatively angular positions of the contacting portions of each element when joined.

Separable electrical connectors are commonly used in aeroplane telephony, particularly as quickly detachable connections for use with radio appliances such as head phones and microphones. These connectors are subjected to varying weather conditions, high and low temperatures and are used in restricted spaces and associated with many other instruments so that little space and poor visibility are provided for manipulating such connections.

Because of the field of use of such devices a desirable type of device, therefore, should be weatherproof and provide a connection of reasonable strength yet easily detachable by a jerk or pull in emergency. For this and other uses, the elements should be readily connected under all adverse conditions and to that end eliminate the necessity of fitting parts to a number of particular receiving means or contacting projections, thus avoiding the possibilities of jamming or reversing the parts or forming an incomplete circuit.

Accordingly, devices embodying the present invention including cooperating, releasably connected plugs and sockets forming one set of electrical connections and concentrically arranged contact portions that are capable of completing circuits when the plugs and sockets are connected, the elements of the device being provided with waterproof sheaths that coact to render the entire connection moistureproof.

The concentric arrangement of the contacts of the separable elements assures completion of the connections between the several electrical conductors regardless of relative rotation of the parts, thus overcoming the difficulties encountered in inserting multiple prong plugs in connectors having multiple sockets.

For a more complete understanding of the invention, reference may be had to the accompanying drawing, wherein:

Figure 1 is a plan view of a connector constructed in accordance with the present invention, with parts of the device broken away, a Y cord being appended to one end of the connector;

Figure 2 is an enlarged sectional view of the device with the adjacent portions thereof in contacting position completing the circuits; and

Figure 3 is a cross-sectional view of the connector shown in Figure 2 taken on the plane indicated by the line 3—3 of Figure 2.

Connectors of the type embodying the present invention consist of two separable connecting elements 10 and 11 as shown in Figure 1, which may be joined as shown in Figure 2.

The connecting members 10 and 11 include soft rubber sheaths 12, preferably molded, of proportions suitable to the particular use. The ends of the sheaths are cupped, feather-edged and slightly overlength so that the edges deform each other upon abutment, thus sealing the joint and forming a moistureproof connection 13 when members 10 and 11 are joined, as illustrated in Figure 2.

A suitably insulated electrical lead wire 14 is molded in the end of the sheath 12 of element 10, and secured in a recess 18 in the end of a threaded stud 20 having a flange 20a thereon, the end of wire 14 being serrated to insure suitable anchorage within the stud 20.

The stud 20 extends through an insulating bushing 22 formed of "Bakelite," hard rubber or other insulating material, and is threaded into or otherwise secured in terminal connecting piece or plug member 26. The bushing 22 includes a flange 22a which abuts the flange 20a on the stud 20. The plug member 26 may be permanently secured to the stud 20 by punching in or deforming the plug at point 28 before enclosure within the rubber sheath 12. An insulating bushing 30 formed of "Bakelite" or other hard insulating material encloses the major portion of the plug member 26 and has an inwardly directed flange 30a disposed between the plug member 26 and the end of the bushing 22.

The wire or cable is illustrated as the shielded type, the shield 24 forming its second conductor and encircling and being insulated from the wire 14, as is usual. The shield 24 is electrically connected and bound by wire 34 to a metallic sleeve 32, which is supported on the bushings 22 and 30 concentrically with respect to said plug member 26 and insulated therefrom by the bushings 22 and 30. The sleeve 32 includes a reduced portion 32a which is disposed between the flange 22a on the bushing 22 and the end 30a of the bushing 30, thereby retaining all of these elements in fixed relationship.

The connecting or socket member 11 similarly consists of a protecting rubber sheath 12 enclosing a threaded and flanged stud 38 having a socket in which an electrical conductor 36 is inserted and electrically connected as by solder. The stud 38 is encircled by an insulating bushing

40 throughout a portion of its length and is threaded into a metallic sleeve 42. The sleeve 42 and stud 38 are permanently connected by prick-punching the assembly at 44. An insulating sleeve 46 encircles flanged sleeve 42 and together with bushing 40 supports and insulates the concentric contact sleeve 56 from the contact sleeve 42. These elements are assembled and retained in fixed relationship similarly to the corresponding portions of plug member 10.

The outer end of the sleeve 42 is longitudinally slotted, permitting spreading of its flanged ends 50 to allow insertion of coaxial connecting plug 52 on the end of the plug member 26, said plug 52 being undercut to allow the ends 50 to grip and retain the plug 52 after its insertion. Any number of slots 47 such as, for example, six, may be provided to render the sleeve 42 sufficiently resilient to allow the flanged ends 50 to spread to receive plug 52.

Inasmuch as the sleeve 42 and the sheaths 12 are resilient, the connector elements 10 and 11 need not be in alignment when they are snapped together. Moreover, they can be disconnected by pulling them apart axially or by bending them at an angle relatively to each other.

A conductor 54 is attached to the contact sleeve by a binding 58, a portion of the sleeve 56 extending outwardly beyond the bushing 46 and being slotted longitudinally to provide resilient fingers 60. The diameters and lengths of the sleeves 32 and 56 are so related that the fingers 60 are flexed outwardly in passing over the end of sleeve 32 when the plug 52 is received within the flanged ends 50 of the sleeve 42, and the ends of the fingers 60 and sleeve 32 are chamfered to allow them to engage easily.

The conductors 36 and 54 may be of any pliable material with high electrical conductivity, such as tinsel, said conductors extending through separate flexible insulated elements 62 and 64 that diverge from the connecting member 11, thus forming a Y cord as shown in Figure 1. Suitably insulated supporting wires 66 form a framework for the super-imposed soft rubber housing of the Y cord, increasing its strength and also providing a carrying member for conductors 36 and 54. Any other types of conductors may be used instead of Y cord construction, as the particular purpose may demand.

The connecting elements may be easily produced. In assembling for example the connector element 10, the bushing 22 is slipped onto the stud 20 against the flange 20*a*, the sleeve contact 32 then being telescoped on the bushing 22 and the bushing 30 slipped between the sleeve contact 32 and the stud 20. The plug member 26 is then threaded onto the stud, locking the sleeve contact 32 and bushings 22 and 30 in place and the assembly punched at 28 to secure it in permanent relationship. The conductors 14 and 24 are then connected to the contact elements, and the rubber sheath 12 molded thereon. The completed connector thus forms a unitary member, in which all of the parts are permanently associated in accurate relationship.

Inasmuch as the electrical contacts are concentrically disposed it is unnecessary to connect them in any predetermined rotated relationship. Connectors embodying the invention, therefore, are particularly suitable for use under conditions such that they must be connected and disconnected quickly and without being visable, and thus fulfull the requirements of radio appliances in the aviation field since they eliminate the formation of reversed connections and the necessity of observing the relationship of the parts before connecting. Additionally, the moisture-proof coverings of the devices allow them to be used under adverse weather conditions and the soft rubber sheaths reduce the tendency of the plugs to break under shock and vibration.

While the invention has been described with reference to the specific structures shown in the accompanying drawing, it is not to be limited save as defined by the appended claim.

I claim:

A separable electrical connector comprising a pair of connector elements, each having a stud member, a contact carried by the stud member, a pair of insulating elements concentric with said member, a contact sleeve supported on said insulating members concentric with the said stud member and contact and having an inwardly directed flange interposed between said insulating elements, and a resilient moisture-proof sheath having a free outer edge portion of reduced thickness surrounding said stud, insulating elements and sleeve, the contact of one of said connector elements including an undercut plug disposed inwardly of the free edge of its sheath and the contact of the other connector element including a plurality of annularly disposed flanged fingers extending beyond the free edge of its sheath adapted to detachably receive and grip said undercut plug and retain said contact sleeves in engagement and free edge portions of said sheaths in resilient engagement to form a moisture-proof seal, whereby the connector elements may be connected and disconnected when in axial alignment or out of axial alignment.

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