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B. J. JOHANSON ETAL

3,170,749

PLUG ASSEMBLY

Filed June 21, 1962

2 Sheets-Sheet 1

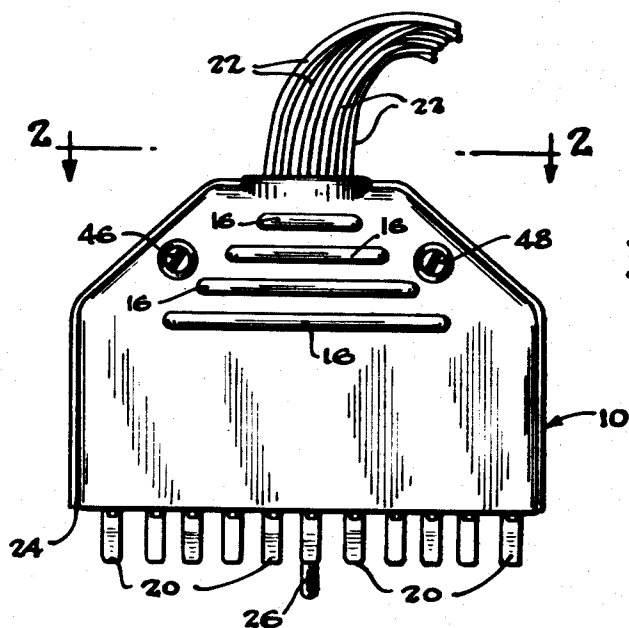


Fig. 1

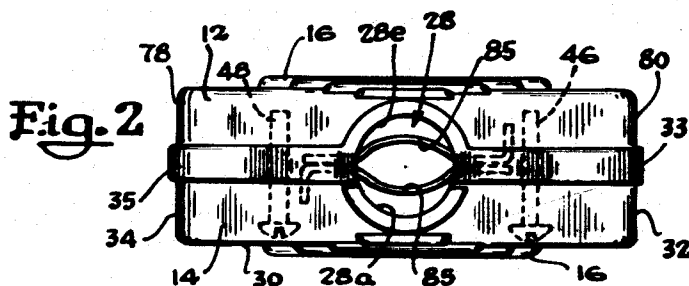


Fig. 2

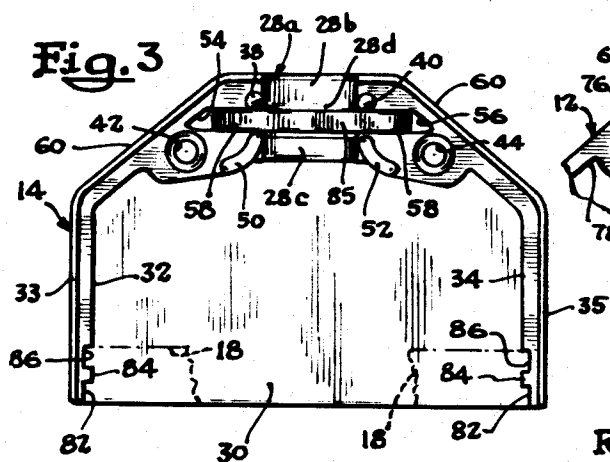


Fig. 3

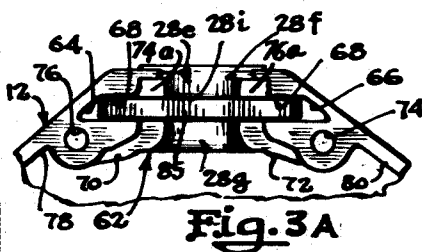


Fig. 3A

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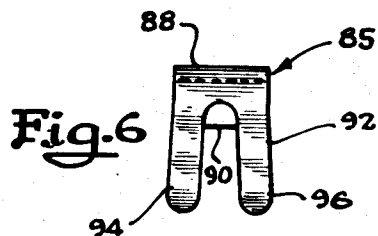
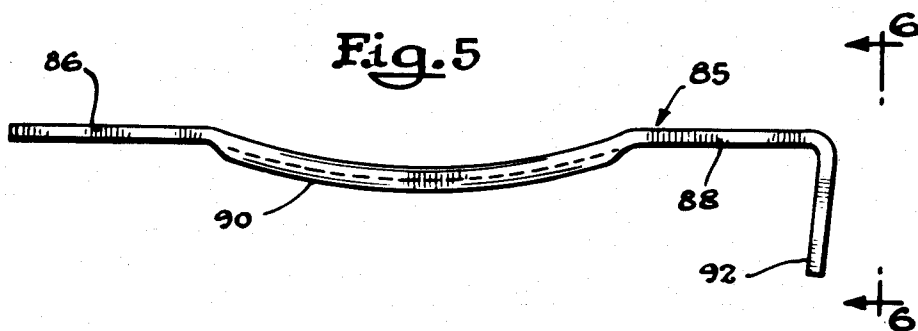
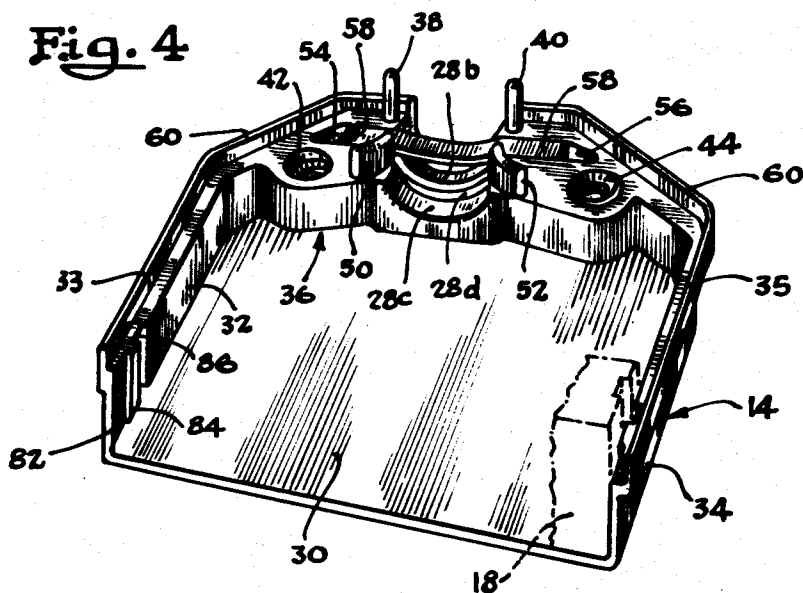
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PLUG ASSEMBLY

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2 Claims. (Cl. 339-107)

The present invention relates to an electrical connecting device and more particularly it relates to an improved plug assembly.

In the electronic components manufactured today it can readily be appreciated that many sub-assemblies are combined into one complex to define a functional unit. Such units ordinarily do not function of themselves but are interrelated with other auxiliary equipment to further define an operational unit. Each of the sub-assemblies or components, comprised of many parts themselves, must be electrically interconnected to the other components of the assembly of the operational unit to define the composite electrical structure. In order to provide for convenience in assembly of the sub-units the individual electrical leads are led to a common plug unit and electrically connected to the contact elements provided therein. The sub-unit then may be electrically interconnected with any other unit by means of a suitable electrical plug connector of predetermined specifications.

Many of the plug assemblies in current use employ metallic housing in order to provide a connector that is suitable for rough usage. Such connectors must, of course, be provided with a separate insulating housing on the inner face thereof in order to shield the metal housing from the electrical contact elements and electrical leads contained therein. Further, the electrical leads emanating from the plug housing must be brought together by a clamping assembly in order to group the leads in a convenient manner for handling. It can readily be seen that if the leads were not grouped into a compact bundle they would be subject to greater damage through tangling and the like, they would occupy considerably more space and thereby reduce the assembling efficiency of the unit, and they would lead to confusion if many such units were assembled in close relation. Clamps associated with the present plug assemblies are provided externally of the plug housing and conventionally are C-clamps, U-clamps, hose clamps or the like. This type of clamp is rather bulky and requires that the installer screw the separated end sections of the clamp together in order to bring the clamp and thereby the electrical leads confined therein into closed relation whereby the leads will be compactly grouped.

In accordance with the present invention an improved plug connector is provided wherein the plug housing is of a rigid dielectric material to thereby obviate the need for an additional insulating housing and whereby the plug assembly is provided with internal contact element receiving and positioning means and internal clamp means for the plurality of electrical leads emanating therefrom.

It, accordingly, is a general object of the present invention to provide an improved plug assembly having a molded electrical lead receiving opening and an internal electrical lead clamp member.

A further object of the present invention resides in the provision of an improved plug assembly having an insulating housing and means integrally associated therewith to receive and position the contact element carrying insulating body.

An additional object of the present invention resides in the provision of an improved plug assembly having a resiliently deflectable internal lead clamp.

The novel features which we believe to be characteristic

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of our invention are set forth with particularity in the appended claims. Our invention itself, however, together with further objects and advantages thereof, will best be understood by reference to the following descriptions taken in connection with the accompanying drawings, in which:

FIGURE 1 is a plan view of the assembled plug assembly of the present invention;

FIGURE 2 is an end view of the plug assembly viewed from the electrical lead opening of the assembly;

FIGURE 3 is a plan view of one of the bodies of the housing showing the inner detail;

FIGURE 3A is an enlarged fragmentary view of the electrical lead receiving recess and clamp member portion of one of the housing bodies;

FIGURE 4 is a perspective view of the mating body to that illustrated in FIGURE 3 illustrating the inner details of the housing body construction;

FIGURE 5 is a side elevation of the clamp member of the present invention; and

FIGURE 6 is an end view of the clamp member of FIGURE 5 viewed from the bifurcated prong end thereof.

Referring more particularly now to FIGURE 1, there is shown the plug assembly, indicated generally at 10. The housing of the plug assembly 10 is defined by body portions 12 and 14, as indicated in FIGURE 2. Each of the body portions 12 and 14 are provided with transverse ribs 16 thereon. The ribs 16 provide gripping surfaces to facilitate withdrawal of the plug assembly 10 from a socket. The raised rib surfaces provide a corrugated area that is readily grasped firmly by the fingers in insertion and withdrawal of the plug assembly 10 from a mating socket.

The body portions 12 and 14, in assembled relation, define an insulating body receiving portion at one end thereof and an electrical lead receiving opening at the other end thereof. The insulating body, schematically represented fragmentarily in FIGURE 3 at 18, receives a plurality of contact elements 20 therein. An electrical lead 22 extends from each of the contact elements 20.

As indicated in FIGURE 1, the contact elements 20 extend outwardly from the face 24 of the housing of the plug assembly 10 when in assembled relation. Said contact elements 20 are adapted to be received in a mating female-type socket member to define an electrical interconnection therebetween and between the unit interconnected with said members. A polarizing stud 26 projects outwardly from the face 24 of the housing of the plug assembly 10 and defines a means for locating the plug assembly with respect to the socket within which it will be inserted.

The electrical lead receiving opening 28 as illustrated in FIGURE 2 and, as shown, is defined at one end of the plug assembly.

The body portion 14, FIGURES 2 and 3, includes a base portion 30. Upstanding wall portions 32 and 34 are integrally joined to the base portion 30 and extend along opposite sides thereof to enclose said base portion along said sides. The wall portions 32 and 34 extend outwardly from said base and terminate in relatively thinner wall sections 33 and 35, respectively, integral with the outer face of said wall sections. A boss, indicated generally at 36, extends along one end of the base portion 30 and substantially encloses same. The boss 36 defines a recess 28a substantially centrally therein which recess 28a defines a portion of the electrical lead opening 28 of the assembled housing. The recess 28a of the body 14 has a pair of spaced arcuate portions 28b and 28c. A third arcuate portion 28d of larger radius than either of the recesses 28b and 28c is interposed between said latter arcuate portions.

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A pair of projections 38 and 40 are provided on the boss 36 adjacent the recess 28a, said projections extending upwardly from the top face of the boss 36. A pair of openings 42 and 44 extend completely through the boss 36 and are adapted to receive the threaded bolts 46 and 48 which hold the body portions 12 and 14 in assembled relation. Arcuate projections 50 and 52 flare evenly from the main open body portion of the body 14 into the recess 28a to define guide means to facilitate insertion of the electrical leads into the recess 28a and the electrical lead openings 28 defined by the mating body portions when in assembled relation. A pair of recesses 54 and 56 extend from the upper face of the boss 36 to the floor of the base portion 30 of the body 14. A shallow groove 58 extends from each of the recesses and opens into the upper portions of the recess 28a of the boss 36.

An upstanding wall portion 60 is defined along the outer periphery of the boss 36, said wall having an interrupted portion in mating relation with the recess 28a of the boss portion to define a continuation of said recess. The wall 60 presents a continuous wall portion in combination with the wall members 32 and 34 along the sides of the base 30.

The mating body portion 12 of the housing of the plug member 10 is adapted to be received in inter-engaging relation with the body portion 14. The body portion 12 is much the same as that described hereinabove for the body portion 14. The chief differences reside in the construction of the boss, indicated generally at 62, of the body 12. The boss 62 defines a recess, indicated generally at 28e, substantially centrally disposed therein. The recess 28e has a pair of spaced arcuate portions 28f and 28g. Intermediate the spaced arcuate portions 28f and 28g is a third arcuate portion 28i of slightly greater radial dimension than either of the arcuate portions 28f or 28g. Recesses 64 and 66 extend into the boss 62 from the upper face thereof and are adapted to receive the resilient clamp member as described in detail hereinbelow. The inboard portion of each of the recesses 64 and 66 is connected to the recess 28e by a shallow channel 68. Depressions 70 and 72 are defined in the inner wall of the recess 28e at the area where said recess opens into the inner chamber of the body 12, said depressions adapted to receive the arcuate projections 50 and 52 of the body portion 14 when in assembled relation therewith. Openings 74 and 76 extend through the boss 62 and the base of the body portion 12. Said openings 74 and 76 are adapted to be in coaxial relation with the openings 42 and 44 of the body portion 14 when in assembled relation therewith and are further adapted to receive bolts 46 and 48 to hold the mating body portions in assembled relation. The boss 62 has openings 74a and 76a disposed laterally of the arcuate portion 28f for reception of the projections 38 and 40 of the boss 36 when the body portions are in assembly. When the body portions 12 and 14 are in assembled relation, the wall sections 33 and 35 of the wall portions 32 and 34, respectively, are adapted to be received in telescoped relation over the outer face of the wall sections 78 and 80 of the body 12 to overlap the same.

The outer or open terminals of the body portions 12 and 14 are each provided with a vertically extending grooved section along the opposite wall portions thereof, as shown in FIGURE 3 in connection with the body portion 14. As indicated, a recess 82 opens onto the outer open face of the body portion and terminates inboard thereof at a raised vertically defined ridge 84. The opposite face of the ridge 84 is defined by a second recess 86 initiating at the ridge 84 and extending inwardly thereof a short distance, the total lateral dimension defined by the recesses 82 and 86 and the ridge 84 being substantially equal to the lateral dimension of the contact element bearing insulating body 18 to be received therein.

A resilient clamp member 85 is adapted to be received by each of the bosses 36 and 62 of the body portions 14

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and 12, respectively. As indicated more clearly in FIGURE 4, the top face of the clamp member is adapted to be substantially flush with the top face of the boss portion 36 in view of the fact that said clamp is received within the recesses 58 of the boss 36.

The construction of the clamp 85 is shown in FIGURES 5 and 6. As indicated, the clamp 85 is defined by a flat terminal portion 86 and 88 interconnected by an arcuate section 90. A portion of the terminal 88 is bent downwardly to form the leg portion 92 of the clamp 85. The leg portion 92 defines a pair of projections 94 and 96 in relative spaced relation, said projections in relaxed position, extending to a total lateral dimension at the base of the projections that is slightly greater than the lateral dimension of the terminal portions 86 and 88 and that is slightly greater than the lateral dimension of the recesses 54 and 56 of the body portion 14.

The clamp is held in the body portion 14 by insertion of the leg 92 into one of the recesses 54 or 56. Upon insertion of the leg 92 into said recess the projections 94 and 96 will be resiliently urged into intimate confining relation with the walls of the recess to thereby secure the clamp member 85 to the boss 36. The terminal portions 86 and 88 are adapted to be snugly received within the recesses 58 extending from 54 and 56 to the recess 28a of the boss 36. The arcuate portion 90 of the clamp 85 is adapted to span the opening defined by the recess 28a and to be in spaced relation with the base of the recess. The larger recess portion 28d of the recess 28a is adapted to receive the arcuate portion 90 of the clamp member 85 in snug relation therein when a large number of electrical leads is present in the recess. It can readily be seen that upon bolting the two body sections together the resilient clamp member will be urged outwardly until it reaches its maximum outward travel defined by contact with the base of the recess portion 28d. Thus, the assembled plug member may be adapted to receive a very few leads within the arcuate portions 90 of the assembled plug or a large number of electrical leads, the maximum number being defined by the maximum opening provided between the base portions of the smaller recesses 28b and c and 28f and g.

It is readily seen that the plug assembly of the present invention can be adapted to receive any number of leads without modification and without the provision of a different clamp member for the varying number of electrical leads to be received therein. The clamp member 85 can be provided such that it extends in a flat resilient member across the entire recess wherein one lead could be restrained therein in confined relation or any number of leads up to the maximum defined by the maximum recess opening. The resilient internal clamp member will deflect to receive any number of leads within the limits defined. An additional component is not required to facilitate clamping of the leads into convenient grouping. The only assembly required is that in fastening the separate body sections together. This assembly is required in the present plug assemblies and thus the plug of the present invention results in an assembly that is convenient, inexpensive, time saving, and that results in a saving of components and extra operations in installation.

While we have shown and described a specific embodiment of the present invention it will, of course, be understood that other modifications and alternative constructions may be used without departing from the true spirit and scope of the invention. We therefore intend by the appended claims to cover all such modifications and alternative constructions as fall within their true spirit and scope.

What we claim as new and desire to secure by Letters Patent of the United States, is:

1. A connector assembly including a connector insulating body having a plurality of electrical contact elements therein, and a plurality of electrical leads extend-

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ing from said contact elements, said connector assembly comprising:

First and second insulating bodies positioned in inter-engaging mating relation and defining a housing, said housing having said connector insulating body assembled at one end thereof and an electrical lead receiving opening at the other end thereof, said first and second insulating bodies of said housing each having a base portion which has upstanding walls integrally affixed thereto and extending along opposite sides of said base portion, said opposed upstanding walls of each of said first and second insulating bodies having means in engagement with said connector insulating body for holding said connector insulating body in assembly with said housing, one end of the base portion of each of said first and second said bodies having an upstanding boss integrally attached thereto, each of said bosses having an arcuate recess therein defining said electrical lead receiving opening of said housing when said first and second bodies are in inter-engaging mating relation, and a resilient clamp member in direct fastened engagement with each of said bosses and extending across said respective arcuate recess thereof, said clamp members cooperating to embrace said electrical leads, and means to hold said first and second insulating bodies in inter-engaged mating relation.

2. A connector assembly including a connector insulating body having a plurality of electrical contact elements therein, and a plurality of electrical leads extending from said contact elements, said connector assembly comprising:

First and second insulating bodies positioned in inter-engaging mating relation and defining a housing, said housing having said connector insulating body assembled at one end thereof and an electrical lead

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receiving opening at the other end thereof, said first second insulating bodies of said housing each having a base portion which has upstanding walls integrally affixed thereto and extending along opposite sides of said base portion, said opposed upstanding walls of each of said first and second insulating bodies having means in engagement with said connector insulating body for holding said connector insulating body in assembly with said housing, one end of the base portion of each of said first and second said bodies having an upstanding boss integrally attached thereto, each of said bosses having an arcuate recess therein defining said electrical lead receiving opening of said housing when said first and second bodies are in inter-engaging mating relation, each of said bosses having a fastener-receiving opening disposed laterally of said arcuate recess, and a resilient clamp member in fastened engagement with each of said bosses, each of said clamp members having resilient attaching projections in fastener engagement with the walls of said fastener-receiving opening and each of said clamp members extending across said arcuate recess of said respective boss, said clamp members cooperating to embrace said electrical leads, and means to hold said first and second insulating bodies in inter-engaged mating relation.

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