

May 10, 1949.

M. E. MEZEK

2,469,397

ELECTRICAL CONNECTOR

Filed Nov. 14, 1945

2 Sheets-Sheet 1

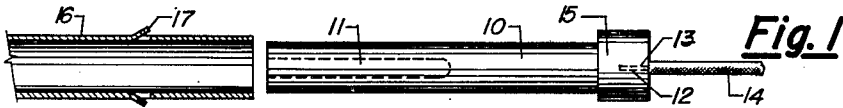


Fig. 1

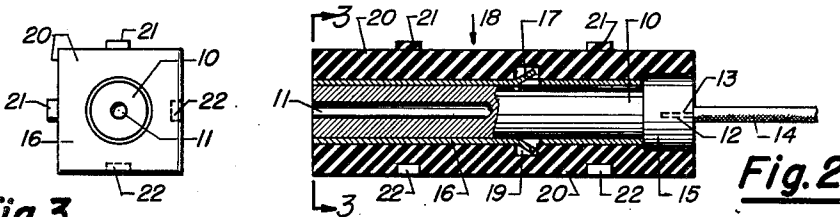


Fig. 2

Fig. 3

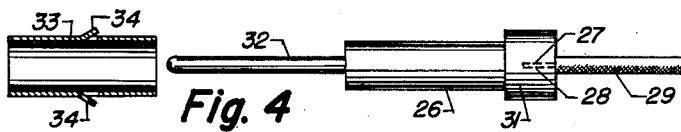


Fig. 4

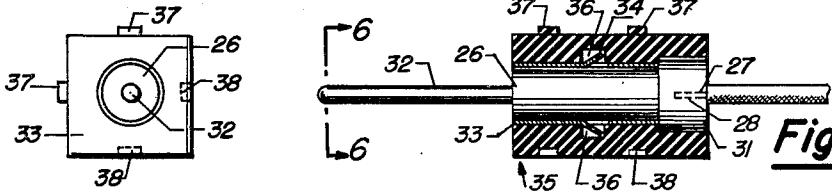


Fig. 5

Fig. 6

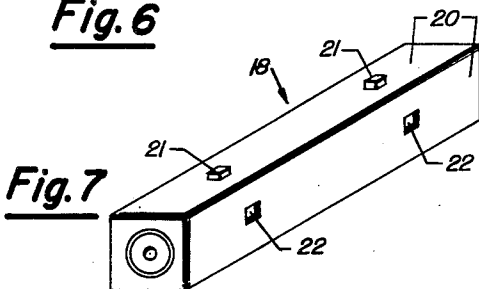


Fig. 7

Fig. 8

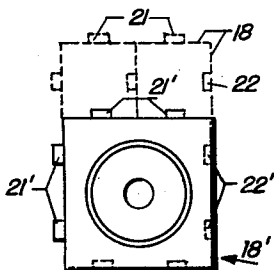
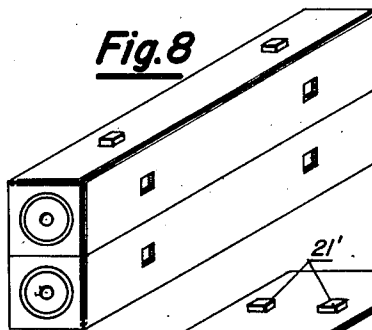
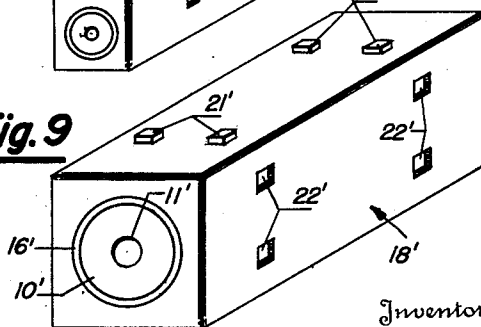


Fig. 10

Fig. 9



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2 Sheets-Sheet 2

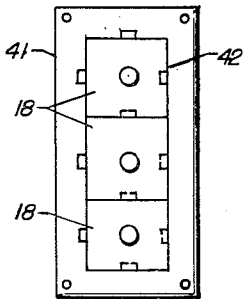
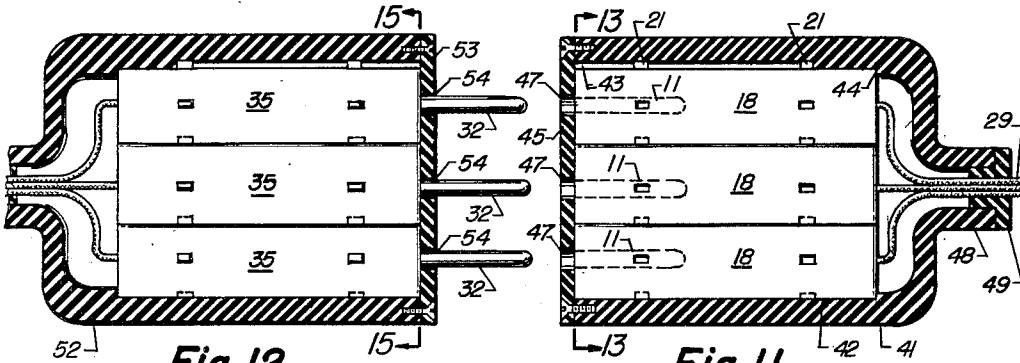


Fig. 13

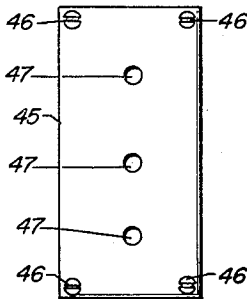


Fig. 14

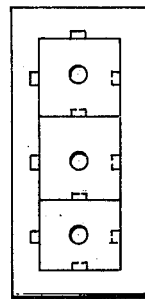


Fig. 15

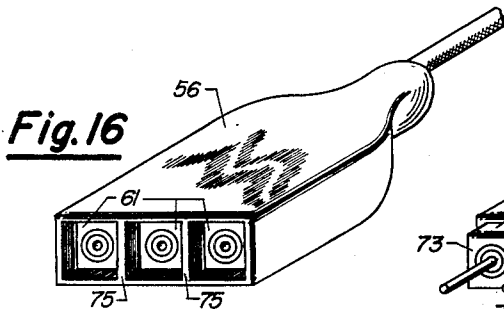


Fig. 16

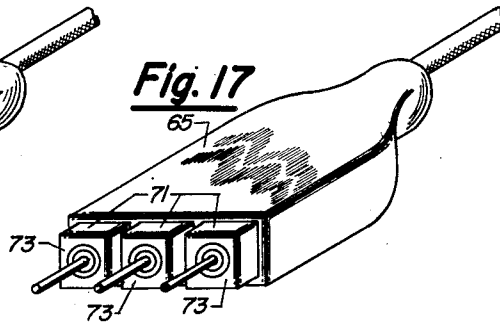


Fig. 17

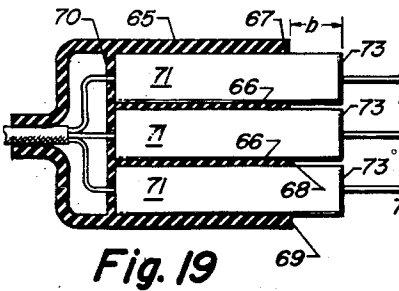


Fig. 19

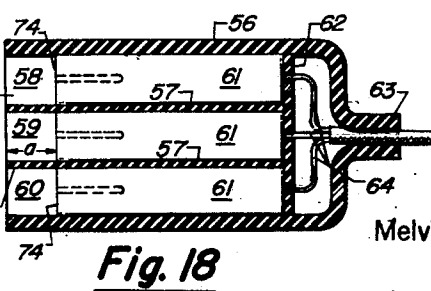


Fig. 18

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ELECTRICAL CONNECTOR

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Application November 14, 1945, Serial No. 628,627

1 Claim. (Cl. 173—328)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

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This invention relates in general to electrical connectors and in particular to connectors of the plug and socket type.

The general object of the invention is to provide a novel and improved plug and socket connector unit of such construction that any desired number of such units may be assembled or nested together in a secure and compact manner to thereby constitute a multiple contact connector.

Another specific object of the invention is to provide a novel connector unit, the longitudinal surface of which is constituted entirely by intersecting plane faces in order that a plurality of such units may be assembled in a compact manner to thereby constitute a multi-contact connector.

Another object is to provide a multiple element plug and socket connector in which any defective contact element may be easily and quickly replaced.

Another object is to provide a novel multiple contact element plug and socket connector in which adjacent elements in the connector are shielded from each other by a barrier.

These and other objects of my invention will become apparent from the detailed description to follow and from the accompanying drawings which illustrate preferred embodiments of the invention.

With reference to the drawings, Fig. 1 is a detail view of components included in the socket half of the connector;

Fig. 2 is a longitudinal view, partly in section, of a complete assembly for the socket half of the connector;

Fig. 3 is an end view on lines 3—3 of Fig. 2;

Fig. 4 is a detail view of components included in the plug half of the connector;

Fig. 5 is a longitudinal view, partly in section, of a complete assembly for the plug half of the connector;

Fig. 6 is an end view on lines 6—6 of Fig. 5;

Fig. 7 is an isometric view of the socket connector half shown in Fig. 3;

Fig. 8 is an isometric view of a pair of the connector halves shown in Fig. 7 stacked vertically;

Fig. 9 is an isometric view of a socket half of a connector of double the size of the unit shown in Fig. 7;

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Fig. 10 is an end view of the connector half illustrated in Fig. 9;

Fig. 11 is a longitudinal view, partly in section, of the socket half of an encased assembly of three connector units of the type shown in Figs. 2 and 7;

Fig. 12 is a longitudinal view similar to Fig. 11, but showing the plug half of the assembled connector;

Fig. 13 is an end elevation taken on lines 13—13 of Fig. 11;

Fig. 14 is an end elevation of an end plate which serves to hold the connector units within the casings shown in Figs. 11 and 12;

Fig. 15 is a view similar to Fig. 13 taken on lines 15—15 of Fig. 12;

Fig. 16 is an isometric view of a modified form of the invention showing the socket half of an encased stack of three connector units, each unit being of a construction similar to that shown in Fig. 7, and which provides a barrier element between the exposed metallic parts of adjacent connector units;

Fig. 17 is also an isometric view similar to Fig. 16 which shows the plug half of this modified form of connector assembly;

Fig. 18 is a longitudinal view, partly in section, of the assembly shown in Fig. 16; and

Fig. 19 is also a longitudinal view, partly in section, of the assembly shown in Fig. 17.

Referring now to Fig. 1, the female or socket half of my novel connector unit is comprised of cylindrical core 10 made from a good conductive material such as copper. In one end of this core there is drilled an axially extending recess 11 which is adapted to receive the plug portion of the male connector half; in the other end of core 10 there is drilled a recess 12 of a diameter just large enough to admit the conductor portion 13 of an insulated lead 14. A barrel 15 is slipped over the right hand end of core 10. This barrel is preferably made of hard copper and, when subjected to pressure, squeezes the core 10 so that it clamps the conductor 13 in the recess 12. It is to be understood however that other well known means may be utilized to secure the conductor 13 to or within core 10.

A sleeve 16 of metal is adapted to be pressed onto core 10 in a force fit. This sleeve is pro-

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vided with one or more ears 17 which are struck out from the sleeve body.

Referring now to Fig. 2, it is seen that core 10 with barrel 15 and sleeve 16 fit within a tubular casing 18 made of any suitable insulating material such as Bakelite. Casing 18 is provided with internal recesses 19 so that as the core 10 with sleeve 16 thereon is slipped into the casing from the right hand end, the ears 17 will spring outwardly into recesses 19 and so lock the core 10 within the casing.

The longitudinal surface area of the casing 18 is constituted by a plurality of intersecting plane faces 20. It is of the same thickness throughout its length. That is, the lines formed by the intersection of the plane faces 20 run parallel to the longitudinal axis of the casing. Further, since all of the longitudinal surface area of the casing 18 is constituted by plane faces, a transverse cross-section of the casing is a polygon in configuration.

In the illustrated embodiment, casing 18 has four faces, of like width, and the transverse cross-section is accordingly a square. That is, all sides of the polygon are of equal length and all internal angles are 90 degrees. It is to be understood, however, that both the number of faces on casing 18 as well as the width of the faces may be varied without departing from the spirit and scope of my invention. Thus, for example, if the surface area of the casing 18 were to be made up of three intersecting plane faces, all of which were of the same width, the transverse cross-section of the casing would be an equilateral triangle. If the faces numbered three, two of them being of equal width and including an angle of 90 degrees between them, the transverse cross-section would be a right triangle. If the casing were to have five sides, all of equal width, a cross-sectional area would be a pentagon; if six sides, all of equal width, the cross-sectional area would be a hexagon, etc.

It will now be evident that a casing of such unique configuration, any number of them may be stacked together in any desired arrangement to provide a multiple contact connector. The stacked connectors may be secured together by any suitable clamping or strap means but these have not been shown. Alternatively, the stacked connectors may be placed in a housing. The latter type of assembly is described hereinafter in further detail.

Further, it will be evident that should any one of the units become defective, it may be easily removed from the group and replaced. Thus my arrangement is far more economical than present constructions where all contact elements constitute an integral whole and are therefore inseparable for purposes of replacing any particular unit.

If desired, casing 18 can be provided with pairs of projections 21 on the top and left faces respectively. Pairs of recesses 22 having a configuration complementary to projections 21 are provided in the bottom and right faces respectively. This construction is shown clearly in Figs 2 and 3. The projections 21 and recesses 22 help to retain each contactor element in position when it is assembled in any desired combination. Fig. 8 shows two of such units stacked vertically. Fig. 9 shows a unit of the same construction as shown in Fig. 2 but double the size and with much larger current conducting parts for service where connectors of high current rating are required. The casing 18' in Fig. 9

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has double sets of projections 21' and recesses 22'. Thus a plurality of connectors as shown in Fig. 9 may be stacked as in Fig. 8, or may be combined with smaller units as shown in Fig. 10.

Figs. 4, 5 and 6 shows details of construction of the plug or male half of my novel connector unit. In this view, numeral 26 designates a cylindrical core, preferably of copper. In the right end of core 26 there is drilled a recess 27 of a diameter just large enough to admit conductor portion 28 of insulated lead 29. A barrel 31 of hard copper is slipped over the right end of core 26. Pressure applied to barrel 31 will then squeeze the metal in core 26 to clamp in the conductor 28. The left end of core 26 terminates in a plug 32 which is of such a size as to fit snugly within recess 11 in the socket or female half of the connector previously described.

A sleeve 33 of metal is adapted to be pressed onto core 26 in a force fit. The sleeve is provided with one or more ears 34 struck from the sleeve material. Fig. 5 shows that core 26, barrel 31 and sleeve 33 fit snugly into a tubular casing 35 which may be of the same insulating material as casing 18. Casing 35 is also provided with internal recesses 36 so that as the core 26 with sleeve 33 is slipped into the casing from the right end as viewed in Fig. 5, ears 34 will spring outwardly into recesses 36 and so lock core 26 within casing 35.

As shown in Fig. 6, casing 35, like casing 18, is provided with a pair of projections 37 on the top face and another pair on the left face. Also like casing 18 of the female connector half, the bottom and right faces are provided with recesses 38 of a configuration complementary to projections 37.

As previously explained with reference to the socket half of the connector unit, projections 37 and recesses 38 aid in securing any desired multiple arrangement of individual connector elements together in a compact assembly. The connector elements constituting the plug half of the connector would be assembled to match the assembly of the socket connector half.

As an alternative arrangement, the individual contact units as shown in Fig. 7 may be stacked together, and the whole then placed in a housing. Such a construction is shown in Figs. 11-14. Referring now to Fig. 11, it is seen that a three-high stack of socket contact units of the type shown in Fig. 7 are inserted in a housing 41 of insulating material and which contains a rectangular recess 42. The dimensions of this recess are substantially the same as those of the three-high stack of contactor units so that the latter will fit snugly into the recess. The top and side walls of recess 42 would be slotted as at 43 in the event that casing 18 is provided with projections 21. An internal shoulder 44 formed in recess 42 serves as a stop for the stack of contact units. To hold the latter in place, there is provided a cover plate 45 which is attached by screws 46 after the stack of contact units has been inserted. The plate 45 has openings 47 which are aligned with recesses 11. The right end of housing 41 terminates in a neck portion 48 through which the leads 29 may be passed. If desired, these leads may be sealed in by a bushing 49 where they pass through the neck portion 48.

Fig. 12 shows the complementary three-high stack of male contact units inserted in a housing 52 of the same construction as casing 41 and secured therein by a plate 53, the latter being similar to plate 45 and containing apertures 54 aligned with the plugs 32.

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In applications where the connector units are to be used in high voltage circuits, or at high altitude, or where moisture may cause an electrical breakdown, the plug and socket units may be assembled in housings which when coupled together provide a barrier of insulation material between adjacent contact elements in the multi-element connector. Such an arrangement is shown in Figs. 16-19.

Referring to Figs. 16 and 18 which show the socket half of this type of assembly, it is seen that there is provided a housing 56 of insulating material. This housing includes partitions 57 which divide the interior into three compartments 58, 59 and 60. Into each of these compartments there is inserted a socket connector unit 61 of the type generally shown in Fig. 7. In the illustrated embodiment, connector units 61 do not however include projections or recesses. The relative dimensions of the contactor units 61 and the compartments 58-60 are such that the former will fit tightly into the latter. In Fig. 18, it is seen that housing 56 includes a transverse partition 62 which acts as a stop for the units 61. Housing 56 also terminates in a neck portion 63 through which leads 64 are passed.

In Figs. 17 and 19, the plug half of the connector is seen to include a housing 65 of insulating material, longitudinally extending partitions 66, compartments 67-69, a transverse partition 70 and plug contact units 71. The latter are similar in construction to those shown in Figs. 4-6 except that their exterior surfaces are not broken by the projections 37 and recesses 38. Units 71 each have substantially the same dimensions as compartments 67-69 to the end that the former will be held snugly in the latter.

It will be seen from Figs. 17 and 19 that the front face 73 of each of the plug connector units 71 extends beyond the front edge of housing 65 by a distance b indicated in Fig. 19. Correspondingly, the front face of housing 56 of the socket connector half seen in Figs. 16 and 18, extends beyond the front face 74 of each of the socket contactor units 61 by a distance a , equal to distance b . Now when the plug and socket connector halves are brought together, the end faces 73 and 74 of the plug and socket connector units 61 and 71 will abut. Thus the forward portions 75 of the partitions 57 provide a barrier element between adjacent contact elements.

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The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claim rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claim are therefore intended to be embraced therein.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

What is claimed is:

A connector for electrical conductors comprising a pair of male and female connector elements, each of said elements comprising a cylindrical conducting core, a conductor receiving aperture extending into one end thereof, a hard barrel squeezed about said end compressing said end to hold the conductor received within said apertured end, the other ends of said cores having, respectively, an axially aligned extending male plug and an axially aligned cooperating female socket, a sleeve tightly fitting each core from its cooperating end as far as said barrel at the other end, a plurality of angularly outwardly extending ears on said sleeve and a tubular insulating casing embracing said sleeve, said casing being provided with internal recesses corresponding in location with said ears of said sleeve to receive said ears therein and hold said casing on said sleeve.

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