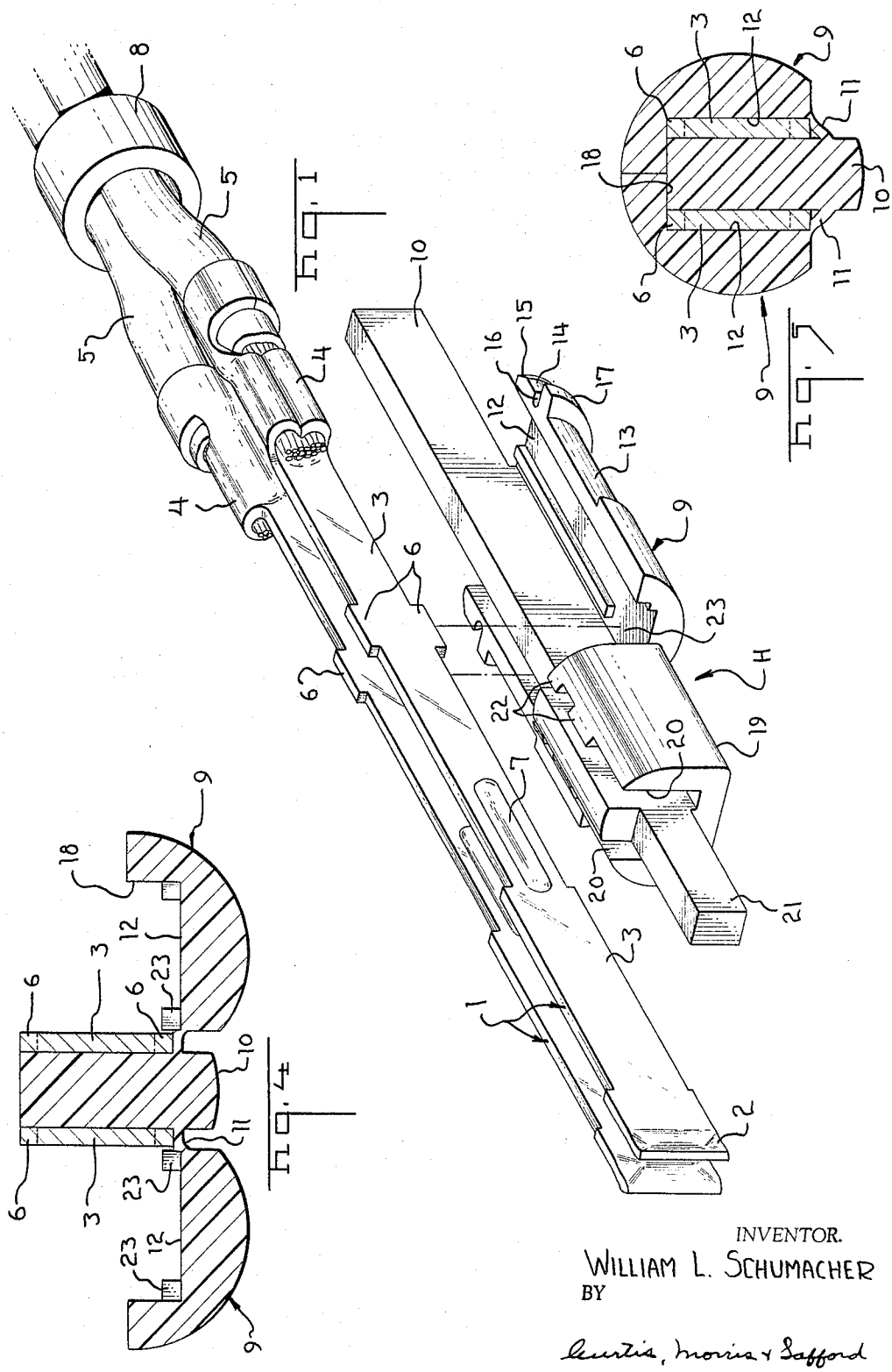
Dec. 6, 1966 W. L. SCHUMACHER 3,290,461

ELECTRICAL CONTACT ASSEMBLY WITH HINGED WING PORTIONS AND CONTACT SEPARATING MEANS

Filed Oct. 7, 1963 4 Sheets-Sheet 1

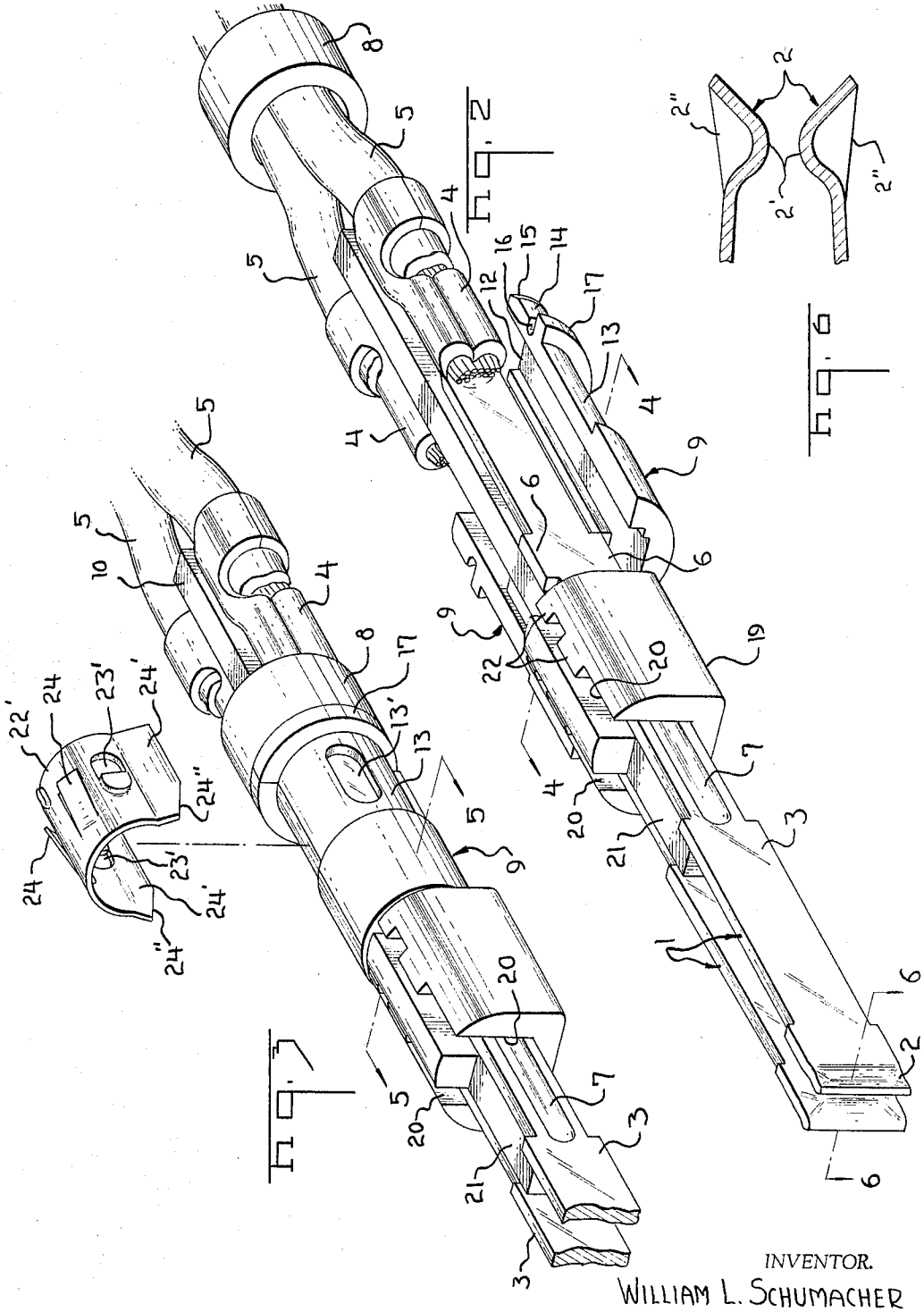


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ELECTRICAL CONTACT ASSEMBLY WITH HINGED WING PORTIONS AND CONTACT SEPARATING MEANS

Filed Oct. 7, 1963 4 Sheets-Sheet 2



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ELECTRICAL CONTACT ASSEMBLY WITH HINGED WING PORTIONS AND CONTACT SEPARATING MEANS

Filed Oct. 7, 1963 4 Sheets-Sheet 3

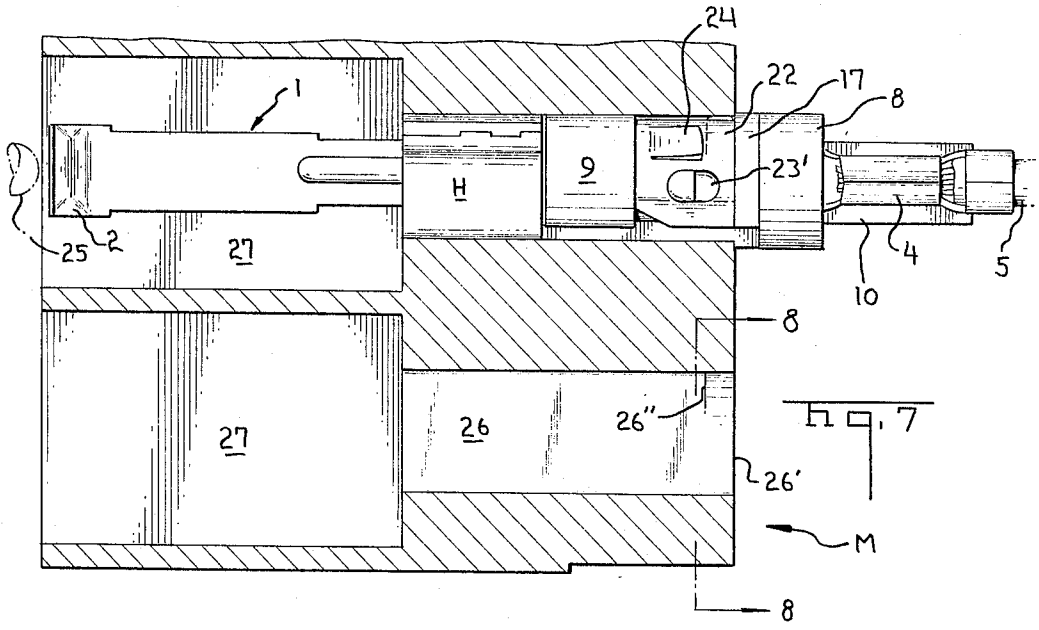



Fig. 7

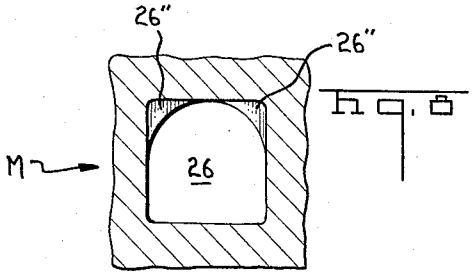



Fig. 8

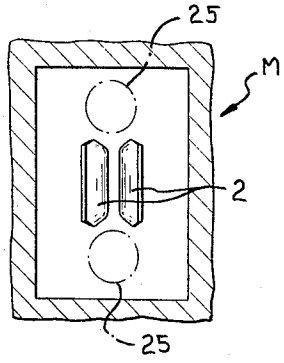



Fig. 9

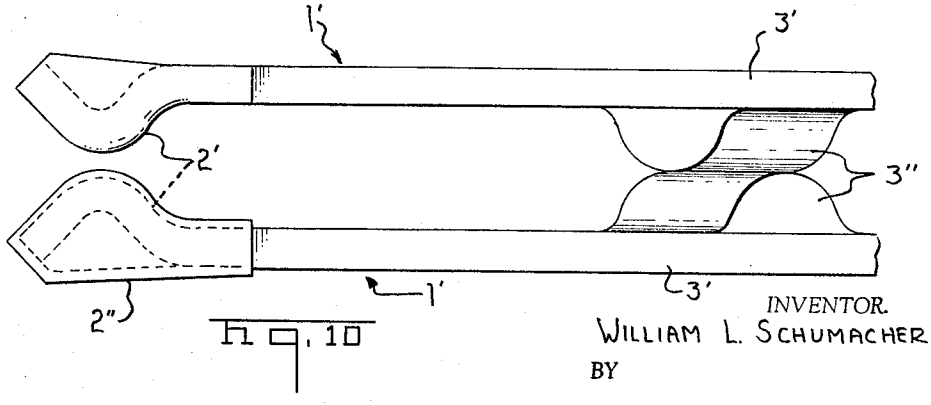



Fig. 10

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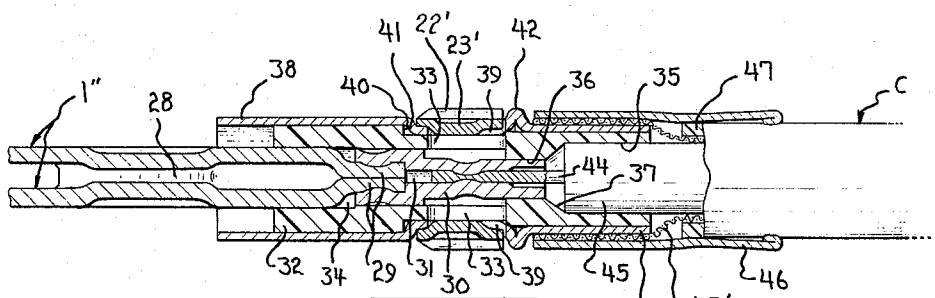



FIG. 11

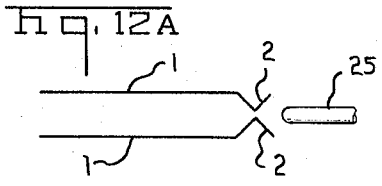



FIG. 12A

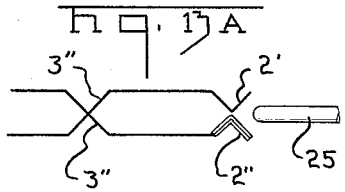



FIG. 13A

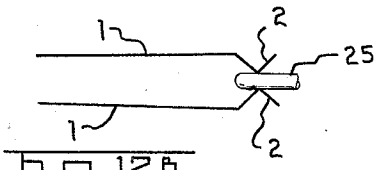



FIG. 12B

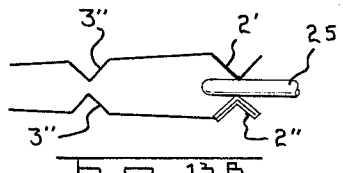



FIG. 13B

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# ELECTRICAL CONTACT ASSEMBLY WITH HINGED WING PORTIONS AND CONTACT SEPARATING MEANS

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14 Claims. (Cl. 200—51.1)

This invention relates to an electrical contact assembly for use in a plugboard assembly or for use in an electrical connector assembly in which a connector element engages another connector element in one or more directions.

In the electrical field, and more particularly the electronic field, especially in computers, plugboard assemblies are utilized to program a computer to perform various computations. It is, therefore, essential that the contact assemblies utilized by the plugboard assemblies provide optimum mechanical and electrical characteristics to effect proper operation of the computer; otherwise improper results will be obtained. It is also desirable to provide a plugboard assembly wherein the computer or other equipment can be programmed or operated simultaneously to effect computation or operation thereof as well as to provide subsequent individual computation or operation.

It is, therefore, an object of the present invention to provide an electrical contact assembly to effect optimum mechanical and electrical connection.

Another object of the present invention is to provide an electrical contact assembly which can effect electrical connection between the contact elements thereof upon another electrical connector element engaging same.

A further object of the present invention is to provide an electrical contact assembly which can effect disconnection between the contact elements thereof upon another electrical connector element engaging same.

An additional object of the present invention is the provision of retaining means on said electrical connector assembly to retain same removably in a mounting or housing means.

A still further object of the present invention is the provision of an electrical contact assembly which can be electrically connected to the housing or mounting means or insulated therefrom.

Still another object of the present invention is the provision of a contact assembly which is capable of simultaneous or individual energization of components connected thereto.

A still additional object of the present invention is the provision of an electrical contact assembly which can be engaged in one or more directions.

Other objects and attainments of the present invention will become apparent to those skilled in the art upon a reading of the following detailed description when taken in conjunction with the drawings in which there is shown and described an illustrative embodiment of the invention; it is to be understood, however, that this embodiment is not intended to be exhaustive nor limiting of the invention but is given for purposes of illustration in order that others skilled in the art may fully understand the invention and the principles thereof and the manner of applying it in practical use so that they may modify it in various forms, each as may be best suited to the conditions of a particular use.

In the drawings:

FIGURE 1 is an exploded perspective view showing members of the electrical contact assembly prior to being assembled;

FIGURE 2 is a perspective view showing the assembly of FIGURE 1 with the contact members in place in the housing member but with the housing member in an unclosed position;



FIGURE 3 is a perspective view similar to FIGURE 2 with the contact assembly completely assembled and with a spring retention member exploded therefrom;

FIGURE 4 is a cross-sectional view taken along lines 4—4 of FIGURE 2;

FIGURE 5 is a cross-sectional view taken along lines 5—5 of FIGURE 3;

FIGURE 6 is a cross-sectional view taken along lines 6—6 of FIGURE 2;

FIGURE 7 is a fragmentary sectional view showing the housing means with one contact assembly therein;

FIGURE 8 is a cross-sectional view taken along lines 8—8 of FIGURE 7;

FIGURE 9 is a view looking from the left in FIGURE 7;

FIGURE 10 is a fragmentary top view showing an embodiment of the contact members;

FIGURE 11 is a longitudinal cross-sectional view showing another embodiment of the contact assembly;

FIGURES 12*a* and 12*b* are diagrammatic views showing the operation of FIGURES 1–3; and

FIGURES 13*a* and 13*b* are diagrammatic views showing the operation of FIGURE 10.

While the present invention can be used in conjunction with various electrical applications, it will be described in relation to a plugboard assembly.

Turning now to the drawings, and in particular FIGURE 1, there is shown contact members **1**, **1** which are identical in configuration and therefore only one will be described. Contact member **1** is preferably stamped from a blank of resilient material such as brass, bronze or some other alloy having excellent spring characteristics. Contact member **1** comprises a contact engaging surface **2**, a shank portion **3**, and a ferrule portion **4**. A conductor means **5** is preferably mechanically and electrically secured in ferrule portion **4** by crimping or cold-forging techniques disclosed in U.S. Patent No. 2,600,012. Lug members **6** extend outwardly from the top and bottom of shank portion **3**. A recess **7** is disposed in shank portion **3** to provide strength thereto. A collar member **8** encompasses conductor means **5**, and this will be discussed later on.

Housing member H is shown below contact members **1**, **1** and is made of a suitable insulating material such as nylon, polypropylene, polyethylene, or other well-known plastic materials. Housing member H includes identical wing sections **9**, **9** which are hingedly connected to a separating member **10** by integral members **11**. Each wing section **9** has a longitudinal recess **12** on the exterior surface and a depressed section **13** on the exterior surface as well as a boss or securing section **14** to the rear of depressed section **13**. Boss **14** has an inclined rearwardly directed surface **15**. A groove **16** is disposed between boss **14** and a flange **17**. Engaging section **18** is disposed above recess **12**.

Forward of wing sections **9**, **9** is an arcuately shaped member **19** having parallel longitudinal slots **20** separated by a stabilizing member **21**. Each slot **20** has spaced projections **22** extending toward stabilizing member **21**. Diametrical slots **23** are disposed in the side walls of recess **12** and in communication therewith contiguous member **19** (see FIGURES 1 and 4).

In assembly contact members **1**, **1** are placed within housing H as shown in FIGURE 2 so that shanks **3** are disposed in slots **20** with projections **22** engaging them while lugs **6**, **6** are disposed in slots **23**. Wing sections **9**, **9** are next folded into position, as shown in FIGURE 3, so that recesses **12** envelop the portions of shanks **3** disposed therein while engaging sections **18** engage the top of separating member **10**. Collar **8** is then slipped over ferrule portions **4** and placed on bosses **14** to secure

wing sections 9 in a closed position thereby providing a completed contact assembly.

The forward end of each ferrule portion 4 preferably engages the rear section of each boss 14. Thus, with lugs 6 in slots 23, ferrule portions 4 abutting bosses 14 and wing portions 9 held in place by collar 8, contact members 1, 1 are securely held in position so that they cannot move while secured within the housing, this forms a locking means.

Separating member 10 separates ferrule portions 4 so that they can be insulated from each other, and stabilizing member 21 stabilizes shanks 3 so that one contact member cannot apply an excessive force to the other contact member if an excessive force is applied thereto.

While collar 8 is shown as being disposed on conductor means 5, it is preferable to place collar 8 over the wire engaging part of ferrule portions 4, because it is difficult to slip the collar over the insulation engaging part of the ferrule portions. Inclined surface 15 aids in placing collar 8 on bosses 14. Instead of collar 8, a C-shaped spring member can be inserted in notch 16 to hold wing sections 9 in position.

A retention member 22' (see FIGURES 3 and 7) is disposed on housing H within depressed sections 13 which contain inwardly directed recesses 13'. Retention member 22' includes inwardly directed dimpled areas 23' which are disposed within recesses 13' to maintain the retention member in proper position on housing H. Spring detent members 24 extend outwardly from retention member 22' toward ferrule portions 4 and will be discussed hereafter. Outwardly directed members 24' are disposed below dimpled areas 23' and include inclined surfaces 24'' extending from the front sides to the bottom thereof.

FIGURE 6 shows the configuration of contact engaging surfaces 2 which comprise inwardly directed curved sections 2' and the ends 2'' are curved outwardly. Thus, a mating contact member 25 (see FIGURES 7 and 9) can be easily inserted from either end or within the front section of the contact engaging surfaces; however, it should be emphasized that only one end need be curved outwardly in order that only this end and the front be used if desired.

Turning now to FIGURES 7–9, there is shown a mounting member M in which the contact assembly is to be removably secured. Mounting member M comprises a substantially rectangular passageway 26 in which housing member H of the contact assembly is disposed so that the sides of member 19 and wing sections 9 engage corresponding sides thereof. The rear entrance 26' of passageway 26 has a configuration similar to that of member 19 (see FIGURE 8) in order to admit housing H as well as to provide engaging surfaces 26'' against which spring detent members 24 engage in order to prevent the contact assembly from being removed from mounting member M except by the use of a tool (not shown) which disengages the spring detent members from engaging surfaces 26''; hence the reason for forming passageway rectangular so that the tool can be inserted along the top portion thereof which is not filled by housing member H. Also, outwardly directed members 24' of retention member 22' engage the sides of passageway 26 to stabilize the rear portion of the contact assembly therein, and inclined surfaces 24'' aid in the insertion of the rear portion of the contact assembly within rear entrance 26'. Flange 17 abuts against the outside surface of mounting member M in order to limit the inner movement of the contact assembly within passageway 26. Since rear entrance 26' and member 19 correspond in configuration, this always assures placing the contact assembly in the passageway 26 of mounting member M in the correct position.

Passageway 26 has a portion 27 which is larger in cross section and communicates therewith. Contact members 1, 1 of the contact assembly are disposed within portion 27 and are engaged by a plug member 25 from one or two side directions or from the front.

FIGURE 10 shows a modification of the contact members 1', 1', which include on the inner surface of each shank member 3' spaced from the contact engaging surfaces 2', projecting surfaces 3'' in opposed and engaging relationship. Projecting surfaces 3'' can be formed in the contact members during formation thereof or another piece of metal can be applied thereon after formation as by brazing or other conventional manner. One of contact engaging surfaces 2' has insulation 2'' of any suitable kind disposed thereon. Thus, a contact assembly as described above provided with contact members 1', 1', a circuit is normally completed through projecting surfaces 3''; however, when contact member 25 is inserted within engaging surfaces 2', projecting surfaces 3'' are disengaged thereby disconnecting this circuit and providing a new circuit with the non-insulating engaging surface engaging plug member 25 (see FIGURES 13*a* and 13*b*).

As can be discerned, the embodiment of FIGURE 10 provides a novel switching arrangement in conjunction with plugboard assemblies or otherwise that can provide a wider scope of operation.

IN FIGURES 12*a* and 12*b*, there is shown the operating principles of FIGURES 1–3 wherein contact engaging surfaces 2 are spaced from each other and contact member 25 is inserted therebetween to electrically connect them therewith.

FIGURE 11 shows a modification of a contact assembly similar to FIGURES 1–3 but to be used preferably in connection with a coaxial cable. As shown, contact members 1'' are similar to those used in conjunction with FIGURES 1–3 except that both of these members are preferably stamped as a one-piece unit with both contact members integrally connected at their inner end by a stabilizing member 28 which is disposed between the contact members to provide stability therebetween in the same manner as stabilizing member 21 on housing member H. Inner ends 29 of contact members 1'' are secured to a conductor receiving member 30 as by crimping and having a bore 31 therein.

Surrounding the inner part of stabilizing member 28, inner parts of the contact members, inner ends 29 and conductor receiving member 30 is an insulation member 32 having diametrical openings 33 disposed therein adjacent a section of conductor receiving member 30 which will be explained hereafter. Openings 33 communicate with a bore 34 in which the above-mentioned elements are disposed. Another bore 35 of larger diameter than bore 34 and a further bore 36 of less diameter than the other bores are provided in insulation member 32 in communication with each other. As can be seen, the end of conductor receiving member 30 opposite to the one secured to inner ends 29 is disposed in bore 36. An inclined surface 37 interconnects bores 35 and 36.

A metallic sleeve member 38 surrounds insulation member 32 and has openings 39 in correspondence with openings 33 of the insulation member. Insulation member 32 and sleeve member 38 have shoulder portions 40 and 41, respectively, which engage each other in order to limit the inner movement of insulation member 32 within sleeve member 38. Rearwardly of openings 39 is an outwardly directed projection 42 and rearwardly thereof is conductor receiving surface 43.

As can be discerned, coaxial cable means C is connected to the contact assembly of FIGURE 11. The inner conductor 44 is disposed in conductor receiving member 30 and the insulation 45 thereover is disposed in bore 35 and abuts inclined surface 37 to limit inner movement thereof. The outer conductor 45' is disposed on conductor receiving surface 43 and contiguous projection 42. A metal ferrule 46 is disposed over outer conductor 45' and outer insulation 47 of the coaxial cable. A crimping tool (not shown) is then used to crimp inner conductor 44 to conductor receiving member

30 through openings 33 and 39 of insulation member 32 and sleeve member 38 respectively. Ferrule 46 is also crimped onto outer conductor 45' and conductor receiving surface 43 as well as outer insulation 47 of the coaxial cable.

Retention member 22' is disposed on sleeve member 38 between shoulder 41 and projection 42, and the dimpled areas 23' thereof are disposed in openings 39 of the sleeve member to maintain it in place thereon.

The contact assembly of FIGURE 11 is likewise mountable within mounting member M in the same manner as that of FIGURES 1–3 and retention member 22' operates to orient and retain the contact assembly therein in a corresponding manner.

When using the contact assemblies of either FIGURES 1–3 or FIGURE 11, it is preferable that mounting member M be metallic since the insulated housing member H of FIGURES 1–3 insulates the contact members therefrom; whereas the contact assembly of FIGURE 11 is grounded to mounting member M which provides an electrical connection with a mating housing member (not shown) containing contact members which engage the contact assembly of FIGURE 11 and such electrical connection is effectively shielded by the metallic housing members thereby substantially reducing interference and cross-talk.

As can be discerned, there has been described unique contact assemblies which provide optimum mechanical and electrical characteristics as well as interchangeability in a single mounting member to effect different functions.

Changes in construction will occur to those skilled in the art and various apparently different modifications and embodiments may be made without departing from the scope of the invention. The matter set forth in the foregoing description and accompanying drawings is offered by way of illustration only. The actual scope of the invention is intended to be defined in the following claims when viewed in their proper perspective against the prior art.

I claim:

1. An electrical contact assembly comprising, in combination, a housing member of insulating material and contact members; said housing member having a separating member, wing sections hingedly connected to said separating member along a portion thereof, said wing sections having recesses disposed in surfaces adjacent said separating member and securing sections thereon, part of said separating member extending outwardly from said wing sections, an element extending outwardly from said separating member and having slots therein; said contact members having first and second sections, said first section defining contact-engaging surfaces, said second section being disposed in corresponding slots of said element and along said separating member with said contact-engaging surfaces extending outwardly from said element, said wing sections being disposed against said separating member with said second section lying within corresponding recesses of said wing sections, and means engaging said securing sections to secure said wing sections in position against said separating member to maintain said contact members in place in said housing.

2. An electrical contact assembly according to claim 1 wherein means are provided on said contact members in said housing member to maintain said contact members in longitudinal position in said housing member.

3. In an electrical contact assembly adapted to be removably retained within a mounting means, contact members having contact-engaging surfaces thereon toward one end thereof, housing means of insulating material including a portion having spaced slots therein, said contact members disposed in said slots with said contact-engaging surfaces extending outwardly therefrom from one end of said portion, separating means extending from said portion and having a section of each contact member extending along opposite surfaces thereof, wing portions hingedly mounted on opposite sides of separating means, said wing portions being moved against said sections of said contact members so that they are encased between said wing portions and separating means, and securing means engaging said wing portions to maintain same in an encasing position.



4. An electrical contact assembly for connection to a coaxial cable having outer and inner conductor members separated by insulation and with an insulating sheath surrounding the outer conductor member, said contact assembly comprising, in combination, a housing member and contact members; said housing member including a metallic shell, a hollow insulation member disposable within said metallic shell, a conductor-receiving section on one end of said metallic shell having said outer conductor member disposable thereon, a ferrule member crimpable onto said outer conductor member and said conductor-receiving section and onto said insulating sheath; said contact members including a conductor-receiving portion disposable within said insulation member and having said inner conductor member connectable thereto and contact arms having inner and outer ends, said inner ends extending outwardly from said conductor-receiving portion and from said insulation member, said outer ends extending outwardly beyond another end of said metallic shell and defining closely spaced contact-engaging surfaces having inwardly-curved portions at outermost sections thereof for engagement with a single contact member therebetween, and a stabilizing member disposed between said contact arms to stabilize same to prevent undue force of one contact member on the other.

5. An electrical contact assembly according to claim 4 wherein said metallic shell and said insulation member include diametrical openings in communication with said conductor-receiving portion to permit said conductor-receiving portion to be crimped onto said inner conductor member.

6. A contact assembly according to claim 1 wherein said contact engaging surfaces have inwardly and outwardly curved surfaces so that said contact engaging surfaces can be engaged by a mating contact element in more than one direction.

7. An electrical contact assembly according to claim 1 wherein said housing member includes retaining means to retain said contact assembly within a passageway of a mounting means.

8. An electrical contact assembly according to claim 1 wherein additional contact engaging surfaces are disposed on said contact members which are in engagement and which maintain said first mentioned contact engaging surfaces apart, one of said first mentioned contact engaging surfaces having insulation thereon so that upon insertion of a contactor element between said first mentioned contact engaging surfaces the additional contact engaging surfaces are disengaged and the non-insulated contact engaging surface of said first mentioned contact engaging surfaces electrically engages said contactor element.

9. An electrical contact assembly according to claim 1 wherein a stabilizing means is disposed between said contact members to stabilize same to prevent undue force of one contact member on the other.

10. An electrical contact assembly according to claim 9 wherein said stabilizing means is made of insulation, and said contact engaging surfaces are spaced from each other.

11. In an electrical contact assembly according to claim 3 wherein said wing portions and contact members are provided with locking means to prevent relative movement therebetween after the wing portions are secured in position.

12. In an electrical contact assembly according to claim 3 wherein retaining means are provided on said

housing means to removably retain said contact assembly within a passageway of said mounting means.

13. In an electrical contact assembly according to claim 3 wherein additional contact engaging surfaces are disposed on said contact members between said housing means and said first mentioned contact engaging surfaces.

14. An electrical contact assembly comprising, in combination, a housing member of insulating material and contact members, said contact members having first, second and third sections, said second sections being disposed and secured in said housing member in a spaced and insulated relationship, said first sections extending outwardly from one end of said housing member and defining closely spaced contact-engaging surfaces having inwardly curved portions, for engagement with a single contact member therebetween, said third sections extending outwardly from another end of said housing member and having conductor-engaging members, for connection with conductor members, a separating member extending outwardly from the other end of said housing member between said third sections to insulate said conductor-engaging members from each other, and a stabilizing member extending outwardly from the one end of said housing member between the first sections to prevent one of said contact-engaging surfaces from applying undue force on the other of said contact-engaging surfaces.




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