

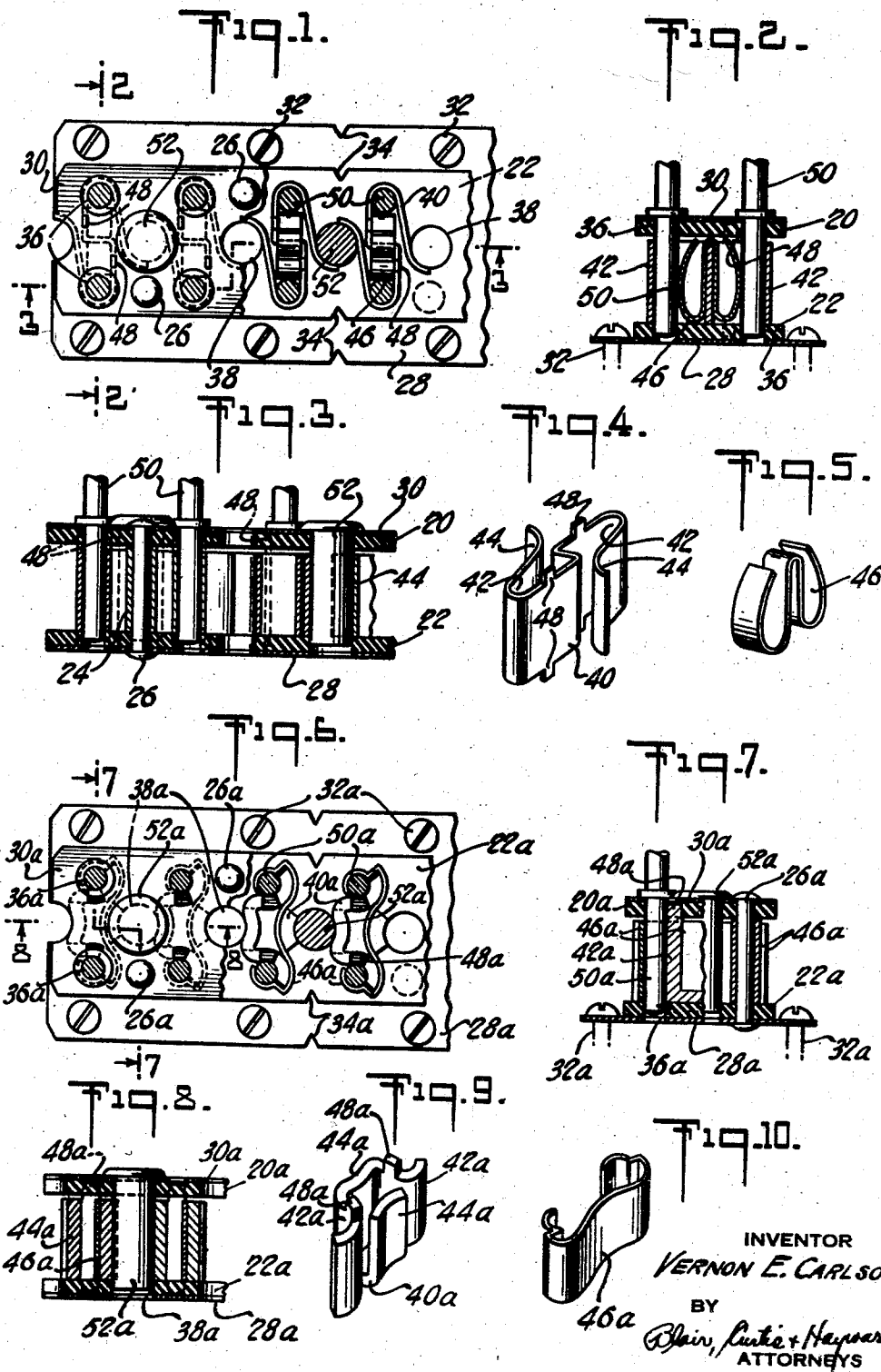
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ELECTRICAL CONNECTOR

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ELECTRICAL CONNECTOR

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This invention relates to electrical connectors and, more particularly, to an improved multiple plug strip connector of the type adapted for connecting together a plurality of electrical conductors.

Various sorts of plug receptacles, multiple sockets and the like are known to the prior art. Many of the kinds available come in assorted sizes and in varying arrangements. They find wide application in automobiles, air planes, marine craft, signal and communication work, etc., and, in short, wherever relatively complicated electrical circuits may be required. Many of these multiple connectors, however, suffer the disadvantage that each individual connector is suited to a relatively narrow field of application. Thus, a multiple receptacle suited, for example, for use in the instrument panel of a given airplane does not lend itself well in establishing corresponding or similar circuits in the control tower of a naval vessel or even in the instrument panel of a different airplane. A result is that a great variety of multiple sockets and receptacles have, by necessity, come into more or less general use.

It has already been proposed and claimed in a copending application of Stephen N. Buchanan and James O. Johnson, Serial No. 430,028, filed February 9, 1942, which issued as Patent No. 2,424,966, on August 5, 1947, to make a standard multiple plug connector of indefinite length, by which groups of conductors can be connected together. These are made of indefinite length so that any number of groups can be had for any given application but are provided with standard group connectors so that two, four or some other limited number of plugs can be interconnected in each group.

It is an object of my invention to provide improved multiple electrical connector means of the general type described and claimed in the application of Buchanan and Johnson, aforementioned, but which will be more flexible in its adaptation to various uses and various circuits. Another object is the provision of continuous strip means presenting a series of receptacles for plug type terminals wherein any selected number of the receptacles may be interconnected with one another at will so that, for example, one electrical conductor may be led to the strip and the desired number of electrical conductors may be branched therefrom to other terminals connected into the receptacles. Another object of the invention is to provide a multiple connector receptacle wherein the several receptacles may

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be connected in pairs or groups of any desired number and may be divided at will into smaller groups or combined into larger groups at any time by a simple operation. Another object is the provision of receptacle means for interconnecting detachable terminals wherein high electrical conductivity is combined with relatively great resilience, whereby good electrical connections may be maintained throughout and the terminals can be easily inserted and removed. It is also an object of the invention to provide a structure wherein the resilience by which good electrical contact is maintained is not impaired by temporary overload of the current conducting parts. Other objects will be in part pointed out as the description proceeds and will in part become apparent therefrom.

The multiple electrical connector means described and claimed in the copending application of Stephen N. Buchanan and James O. Johnson, aforementioned, provides an ideal solution to many installation problems in the electrical field, especially where space is limited and where circuits must be made, broken, tested and/or rearranged rapidly. There are many instances, however, where it becomes desirable to be able to connect a series of electrical conductors into one main or master conductor rather than merely to connect one individual conductor to another individual conductor. I have now found that, by the use of means in accordance with the invention, it is feasible to make an indefinite series of insulated contact receptacles so that any adjacent receptacles can be quickly and adequately interconnected into one common multiple contact member, whereby, for example, one or more electrical conductors may be plugged into the multiple contact member to feed any desired number of branch conductors running therefrom. I have also discovered that such a device is much more perfect in operation and more secure against deterioration by temporary overloads if the functions of current conduction and maintenance of pressure contact are served, respectively, by different parts. Thus, for example, a pure, soft copper contact portion may be combined with a resilient phosphor-bronze or beryllium bronze contact spring in practicing the invention so as to use the resilient pressure of the spring in maintaining contact with the pure, soft copper conductor.

In this specification and in the accompanying drawings, I have shown and described a preferred embodiment of my invention and various modifications thereof; but it is to be understood that

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these are not intended to be exhaustive nor limiting of the invention, but on the contrary are 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 and adapt it in various forms, each as may be best suited to the conditions of a particular use.

In the accompanying drawings, in which exemplary embodiments for attaining the above objectives are set forth and in which similar reference characters refer to corresponding parts throughout:

Figure 1 is a plan view, with parts broken away and parts in section, of a piece of multiple connector strip made in accordance with the present invention;

Figure 2 is a sectional elevation taken along the line 2—2 of Figure 1 in the direction of the arrows;

Figure 3 is a transverse sectional elevation taken along the broken line 3—3 of Figure 1 in the direction of the arrows;

Figure 4 is a perspective view of a bus member forming a part of the invention;

Figure 5 is a perspective view of a contact spring member forming a part of the invention;

Figure 6 is a plan view, partly in section, of a modified type of multiple connector strip embodying the invention;

Figure 7 is a sectional view taken along the line 7—7 of Figure 6 in the direction of the arrows;

Figure 8 is a transverse sectional view taken along the line 8—8 of Figure 6 in the direction of the arrows;

Figure 9 is a perspective view of a bus member used in the embodiment illustrated in Figure 6; and

Figure 10 is a perspective view of a contact spring member used in the embodiment shown in Figure 6.

Figures 1 and 3 show, respectively, a plan view and a cross-sectional elevation of a piece from a multiple connector strip embodying the invention. Referring to Figure 3, an upper insulating strip 20 and a lower insulating strip 22 (see also Figure 2) are illustrated held in fixed spaced relationship by means of insulating tubular spacers 24 through which rivets 26 are passed. These rivets 26 as shown in this figure are of metal and are insulated with sleeves 24 and caps 25 of insulating material; but instead of this the rivets themselves may be made of a malleable material, e. g., vulcanized fiber, as is shown in Figures 6 and 7. Uninsulated metal fastenings can also be used where there is no disadvantage from their conductivity. Strip 20 is covered by a thin cover strip or facing sheet 30, and beneath strip 22, as shown in Figure 3, is a somewhat wider backing strip 28 (see also Figure 2).

Strip 28 is provided with openings to receive mounting screws 32 (see Figures 1 and 2). Strips 28, 22, 20, and 30 are notched, as at 34 to furnish guides for cutting any convenient length for a particular job from long, standard strip connectors. These strips are also provided with coaxial plug receiving holes 36 and pin receiving openings 38, for reasons which will become apparent hereafter.

Figure 4 presents a perspective view of one of the electrical buses, generally indicated by 40, such as are used in the present embodiment of the invention. Each bus is provided with a pair

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of plug contact portions 42, a pair of pin contact portions 44, and tabs 48 by which it held within the strips 20—22. These buses are held between strips 20 and 22 with each of the plug contact portions in alignment with a set of coaxial plug receiving holes 36 and with each pin contact portion in registration with a set of pin receiving openings 38, as illustrated in the plan view of Figure 1. A contact spring 46 (see Figure 5) is located over the central portion of each bus, as shown in Figure 2, to form therewith what may be termed a receptacle element, so that when a plug 50 (see Figure 2) is inserted into one of the openings 36, the contact portion of the plug is held in good conducting engagement with a contact portion 42 of the bus by means of contact spring 46.

Figures 1 and 3 show the manner in which interconnecting pins 52 may be inserted into a strip to bridge the gaps between contact portions 44 of adjacent buses 40 to establish a series of plug receiving outlets all in good conducting relationship with one another. By inserting the proper number of pins 52, the bus members 40 may be connected to form a bus of any desired length and to give the desired number of plug receiving holes which are in common conducting relationship with one another. By omitting a pin at any point, the bus connection is broken and a new group of interconnected receptacles is thus begun. These pins 52 may be simple pins of conducting material serving only to connect adjacent receptacles or they may be terminal connector plugs for connecting additional circuits or bus wires into the system.

It will be noted that plugs 50 are held in conducting relationship with the buses by means of contact springs 46. These contact springs are made from a resilient alloy, such as a phosphor-bronze, and the provision of these springs assures a good contact whenever a plug is inserted into an opening, even though the plugs may continually be inserted and withdrawn over an extensive period of time. The interconnecting pins 52, however, are held in interconnecting engagement with adjacent buses primarily through the inherent resilience of pin contact portions 44. These buses are made from sheets of relatively pure soft, ductile copper, but in view of the fact that the interconnecting pins 52 are not ordinarily shifted, as are the plugs 50, the natural resilience of the conducting material of which the buses are comprised has been found sufficient to maintain the pins in good contact relationship.

Figures 6 through 10 illustrate a modified type of multiple connector strip embodying the invention. This strip differs from the first embodiment described primarily in the configuration of the bus 40a, shown in Figure 9, and the contact spring 45a, shown in Figure 10, whereby the contact spring of each receptacle element aids in maintaining the bus contacts at 44a as well as the circuit contacts at 42a. Each bus 40a is provided with tabs 48a which are received in recesses in strip 20a (see Figures 6, 7, and 8) to hold the buses against lateral movement with respect to strips 20a and 22a. Other means for holding these members in position may be substituted, as will be evident to those skilled in this art.

As many embodiments of the invention may be made and as variations in the embodiments illustrated are easily possible, the invention is not intended to be limited to anything presented in the accompanying specification and drawing or

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as set forth by example but is intended to be limited solely by the scope of the accompanying claims.

I claim:

1. An electrical conductor comprising an insulating body, a bus of high conductivity metal, said body surrounding said bus, said bus having a plurality of contact faces, and integral projections of the bus connecting the bus and insulating body closely adjacent at least two of the contact faces so that those faces are fixed relative to the body, at least one face of said bus being remote from the integral projections and being resiliently connected to the other faces by a bend, said body having access apertures registering with each of said faces.

2. An electrical conductor comprising an insulating body, a plurality of connector units, said body surrounding said units, each unit having a plurality of contact faces, integral projections of each unit connecting the unit and the insulating body closely adjacent at least two of the contact faces so that those faces are fixed relative to the body, at least one face of each unit being remote from the connecting projections of that unit and being resiliently connected to the other faces of that unit by a bend, said units being arranged in closely spaced relationship with the remote face of each unit in position to coact with a bridging connector bridging one unit and another, said body having access apertures registering with each of the faces of each of the units.

3. A continuous strip connector of the multiple plug type, said connector including a plurality of plug receiving receptacles each adapted to accommodate a pair of conductors, whereby a series of pairs of conductors may be plugged into the connector, each said receptacle including a bus adapted to carry a high electric current and a contact spring for maintaining good electrical contact with the bus, each said bus being generally S-shaped in plan view with the upper and lower parts of the S each forming a plug contact portion, and each said contact spring being generally W-shaped in elevational view with the central part of the W straddling and embracing the central part of the S of the associated bus, whereby each outer part of the W is in position to hold an inserted plug in good conducting relationship with the adjacent plug contact portion of the associated bus.

4. The invention of claim 3 wherein each plug contact portion is extended to form a pin contact portion, whereby an interconnecting pin may be used with the connector between adjacent receptacles to form a direct short circuit between the buses thereof.

5. The invention of claim 3 wherein each plug contact portion is extended to form a pin contact portion and wherein clearance is provided in the

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strip connector between adjacent receptacles, whereby an interconnecting pin may be used with the connector between adjacent receptacles to form a direct short circuit between the buses of the adjacent receptacles and wherein adjacent pairs of conductors may be mutually interconnected, or whereby without an interconnecting pin good insulating characteristics are maintained between the adjacent receptacles, or whereby the connector may be severed between adjacent receptacles to give self-sustaining connector strips for independent use.

6. A continuous strip connector of the multiple plug type, said connector including a plurality of pairs of plug receiving receptacles each adapted to accommodate a pair of conductors, whereby a series of pairs of conductors may be plugged into the connector, each said pair of receptacles including a common bus adapted to carry a high electric current and a contact spring for maintaining good electrical contact with the bus, each said bus being generally U-shaped in plan view with each of the upper parts of the U curving arcuately outwardly and forming an individual plug contact portion, and each contact spring being generally of an inverted U-shape in plan view with each of the lower parts of the inverted U curving arcuately inwardly, the associated bus and spring of each receptacle being assembled with the legs of the inverted U of the spring straddling and embracing the ends of the legs of the U of the bus and with the inwardly curving parts of the spring cooperating with the plug contact portions of the bus.

7. The invention of claim 6 wherein each bus includes an extension forming a short-circuiting pin contact portion.

8. The invention of claim 6 wherein each bus includes an extension forming a short-circuiting pin contact portion and wherein a clearance space is provided in the strip connector between adjacent pairs of receptacles.

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