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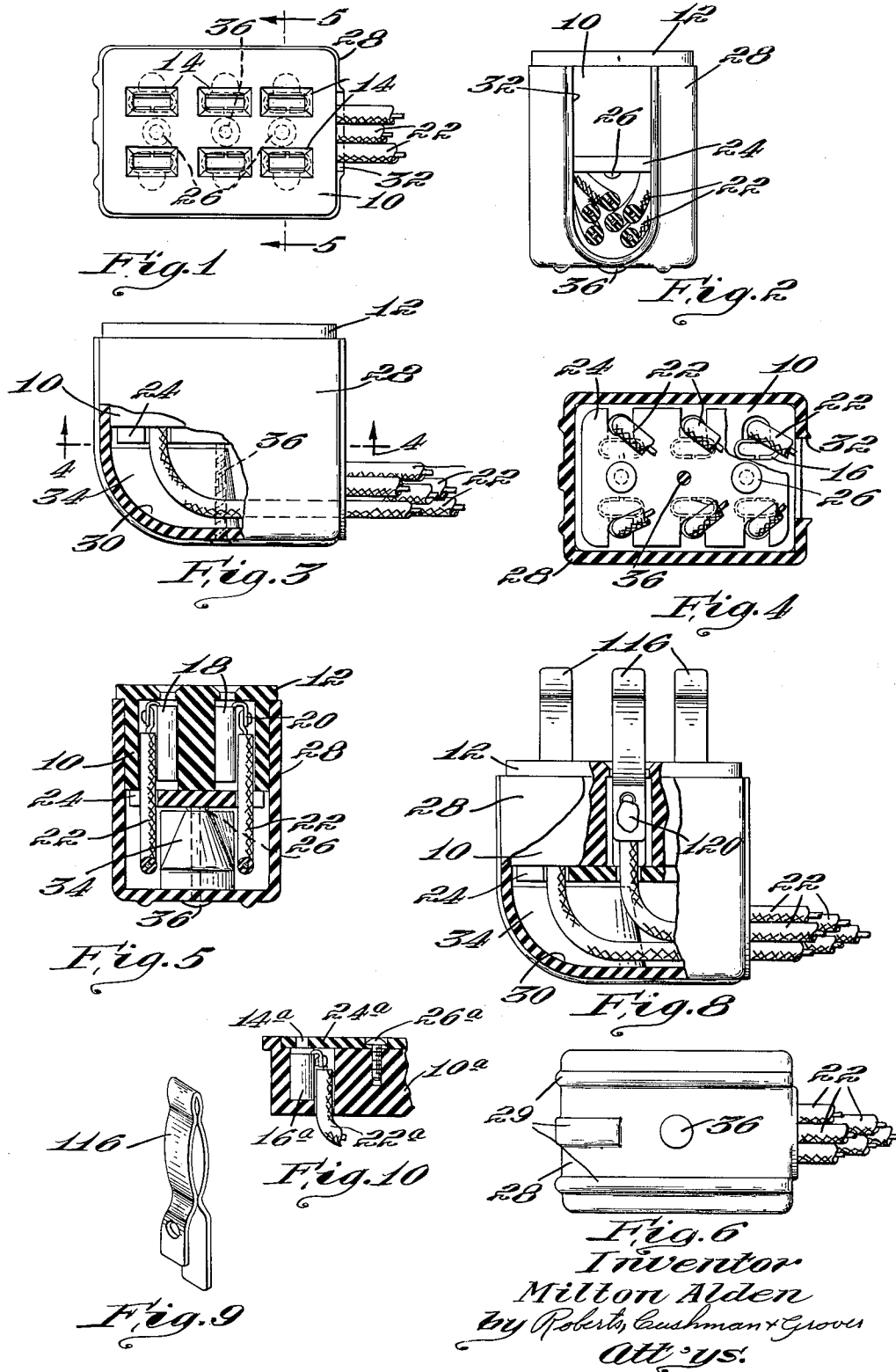
M. ALDEN

2,739,293

CONNECTOR

Filed Jan. 23, 1952

2 Sheets-Sheet 1



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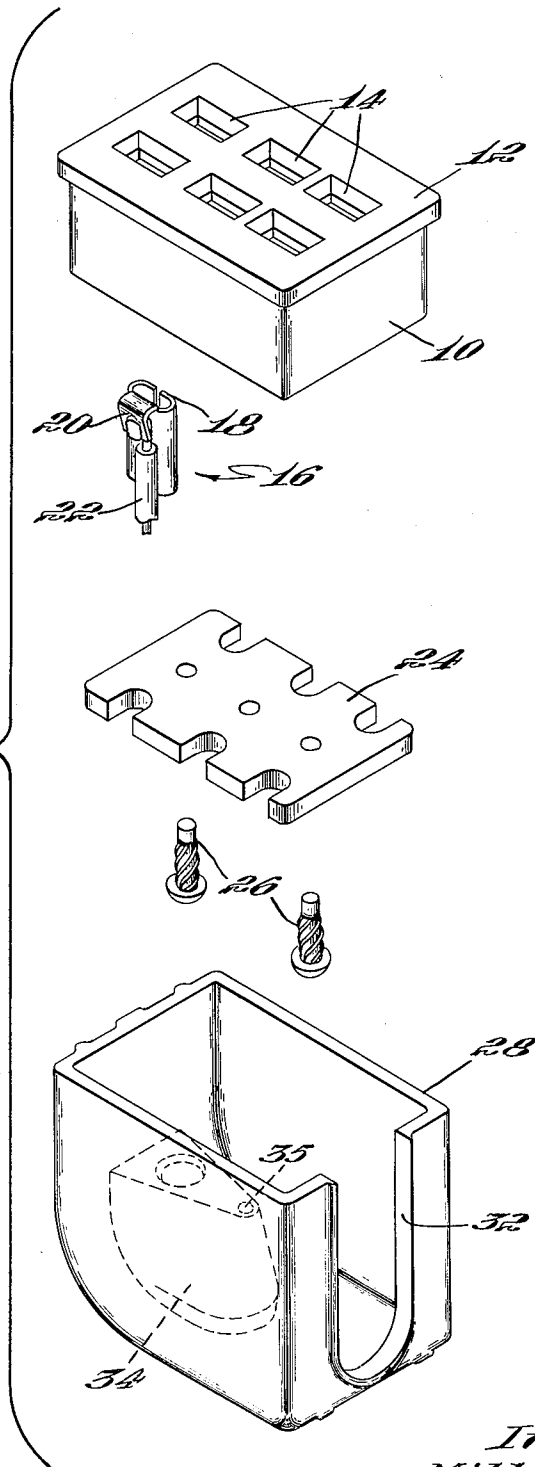
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Fig. 7



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CONNECTOR

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6 Claims. (Cl. 339-196)

This invention relates to electrical connectors and more particularly to connectors of the multiblade type which accommodate a plurality of conductors.

Objects of this invention are to provide an electrical connector which completely isolates the contact making elements from each other, which substantially reduces the danger of short circuiting between the leads thereto, which will withstand relatively high voltages, which provides strain relief for the leads, which simplifies the soldering of the leads to the contact making elements, which is compact and small in size, which is attractive in appearance, which is economical to manufacture, which is adapted to mass production techniques, and which advances the electrical arts generally.

A connector according to a broad aspect of the invention comprises a body of an insulating material, such as a suitable molded plastic, through which extends in parallel relationship a plurality of spaced apertures. An electrical contact is enclosed in each of the respective apertures so that the insulation surrounding a conducting lead, soldered or otherwise connected thereto, extends into the associated aperture. The contacts are restrained in the body apertures by means of a cover plate which is attached to one end of the body partially to cover the apertures so that the contacts are secured without interfering with the leads.

In another aspect, the apertures are trefoil or "clover-shaped" in cross section, two of the sections or foils of each aperture forming a chamber in the body to accommodate a respective contact, the third foil forming a channel communicating laterally with the chamber throughout its (the channel's) length and extending only partially through the body, accommodates the correlated lead and soldered connection. The cover encloses only the two foils or chambers of each aperture so as not to interfere with the lead which protrudes from the third foil. Alternatively, the portion of each aperture enclosing the contacts is blind and the aperture portion receiving the connecting lead extends all the way through the body, the lead being inserted in one end thereof to attach to the contact. The cover plate is fastened to the other end of the body to enclose the opposite end of the aperture portions receiving the leads, openings being provided in the cover plate in alignment with the blind portions of the respective apertures to give access to the contacts.

In a further aspect a hollow housing fits one end of the body to bring the leads out at substantially right angles to the axes of the apertures, for example by curving the inner surface of the housing to bring the leads out through an opening in the side thereof so that when the leads are pulled, as when the connector is disconnected, the magnitude of the stress exerted upon the soldered connections between the leads and the contacts is reduced, and the stress is restricted to a direction parallel to the aperture axes in which direction the soldered connections are best able to withstand the stress.

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These and other objects and aspects will be apparent from the following description of several specific embodiments referring to drawings wherein:

Fig. 1 is a plan view of a female embodiment of the invention;

Fig. 2 is an end view of the embodiment illustrated in Fig. 1;

Fig. 3 is a side view with the housing partially broken away of the embodiment illustrated in Figs. 1 and 2;

Fig. 4 is a sectional view on line 4-4 of Fig. 3 with the cover plate partially broken away;

Fig. 5 is a sectional view on line 5-5 of Fig. 1;

Fig. 6 is a bottom view of the embodiment shown in Fig. 1;

Fig. 7 is an exploded isometric view of the embodiment illustrated in Figs. 1 through 6;

Fig. 8 is a side elevation view in partial section with parts broken away of a male embodiment of the invention;

Fig. 9 is an isometric view of one of the male contacts; and

Fig. 10 is a partial sectional view of an embodiment showing an alternate construction.

The first embodiment of the invention chosen for the purpose of illustration is a female connector comprising a body 10 (Fig. 7) consisting of a substantially rectangular block molded or otherwise formed from an insulating material such as a suitable plastic and having a flange 12 at one end thereof. Molded in spaced relationship in the body 10 are six parallel apertures 14 whose cross sectional shape through the greater part of their length is similar to a clover leaf or trefoil as is best shown by the dotted lines in Fig. 1. Two of the sections or foils of each aperture 14 form a chamber into which an opening enters, as is shown in Fig. 5, the walls of the opening adjacent the top end of the body being beveled to facilitate the entering of the contact portion of a mating connector which will be described in detail hereinafter. The third section or channel of each aperture is blind, that is it is offset from the opening and does not extend all the way through the body 10.

The chamber portions of the apertures 14 enclose respectively contact making elements such as the female contacts 16, each of which is formed by rolling the ends of the cross member of a T-shaped strip of a resilient conducting material back upon themselves thereby to form a socket portion 18 flat-sided as is shown in Fig. 7. The stem of the T-shaped strip is also bent back upon itself to form a tab 20 which is provided with a small hole for receiving the bare tip of a parallel, overlapping insulated conductor such as the lead 22 and interconnecting therewith. After the top of the lead 22 is inserted in the hole, the tab 20 is bent to crimp the lead so that it can be soldered without moving the joint. Solder is also drawn under the tab 20 by capillary action to give further assurance of undisturbed cooling of the joint.

After the leads 22 are soldered to the tabs 20, the respective socket portions 18 are inserted in the two foils or chambers of their correlated apertures 14 tab end first, so that each of the soldered joints is at the bottom of a blind foil or channel as is shown in Fig. 5, with the insulation of the lead 22 extending well into the aperture, thereby precluding the possibility of short circuits between the various leads.

The above described construction also provides strain relief for the contacts 16 and the soldered connections, the contacts and walls of the respective channels restricting the corresponding leads so that the stress upon each of the tabs 22 and the soldered connections is in a direction parallel to the axes of the apertures, eliminating bending

and twisting of the contacts. The stress upon the contacts 16 and soldered connections is further reduced by bringing the leads 22 out of the connector at substantially right angles to the axes of the apertures 14. To this end, the leads 22 are brought out through recesses such as the notches in the periphery of a cover plate 24 which is held against one end of the body 10 by two threaded drive pins 26 so that the ends of apertures 14 are partially covered to restrain the contacts 16 therein, the blind foils being aligned with the notches in the cover plate 24 through which the leads 22 protrude.

A hollow housing 28 of an insulating material fits over the same end of the body 10 as that to which the cover plate 24 is attached, the sides of the housing extending over the sides of the body to contact the body flange 12. The outer surface of the housing 28 is provided with three stiffening ribs 29. The inner surface of the housing 28 is curved as at 30 so as to conform with the curvature of the leads 22 which are brought out through an opening 32 in one side of the housing. An integral boss 34 extends inwardly from the curved surface 30 and is provided with an aperture 35 (Fig. 7) which accommodates a threaded drive pin 36. The pin extends through an aperture in the cover plate 24 to engage the body 10 thus securing the housing to the body.

In Fig. 8 is shown a flat-sided mating male connector for the female connector described above. It will be apparent that with the exception of the contact making elements, the same components are used in both the female and male connectors, either connector readily being changed to the other type of connector by a substitution of the suitable contact making elements. The male contact making element, which is shown in detail in Fig. 9, consists of an elongated strip of resilient conducting material which is bent upon itself to form two loops and with its ends lying adjacent each other to form a bayonet 116. One of the ends is made longer than the other end to bear against the backing member 24. The shorter end is provided with an aperture or opening for the bare tip of a correlated lead 22 which is soldered thereto as at 120 (Fig. 8). The apertured end is foreshortened so that the soldered connection 120 rests at the bottom of the blind foil whereby the same insulating and stress relief advantages are realized with the male connector as those described in detail with respect to the above described female connector.

An embodiment incorporating an alternate construction is shown in Fig. 10 wherein the body 10a is also provided with apertures extending therethrough, but the portion of the aperture accommodating the socket portion of the contact flat-sided 16a is made blind and the lead 22a connected thereto is brought out through a circular portion of the aperture. The cover plate 24a is provided with rectangular apertures 14a which are proportioned to admit the male contact of the mating plug without permitting the female contacts 16a to escape from the aperture. The cover plate 24a is held in position by means of a drive pin 26a which engages the body 10a. It will be understood that it is also possible to substitute a male contact similar to that shown in Fig. 9 which will project through the rectangular apertures in the cover 124.

It should be understood that the present disclosure is for the purpose of illustration only and that this invention includes all modifications and equivalents which fall within the scope of the appended claims.

I claim:

1. For enclosing a plurality of contacts each having an interconnection with the overlapping end of a lead, a holder comprising a body of insulating material having spaced, parallel internal chambers for receiving said contacts, openings through one side of said body to said chambers respectively and a channel offset from each of said openings for receiving a lead, each of said chambers and channels opening on the other side of said body, each channel communicating laterally with a chamber

throughout its length so as to admit said contact, lead end and interconnection wholly in said chamber and channel, and said channel being shaped to be laterally closed by said contact so as to surround said lead and support the lead against movement laterally of said contact.

2. For enclosing a plurality of contacts each having an interconnection with the end of a parallel and overlapping lead, a holder comprising a body of insulating material having spaced, parallel, internal chambers for receiving said contacts, openings through one side of said body to said chambers respectively and a channel offset from each of said openings for receiving a lead, each of said chambers and channels opening on the other side of said body and each channel communicating laterally with a chamber throughout its length so as to admit said contact, lead end and interconnection wholly in said chamber and channel, a cover member attached to one end of said body to cover each chamber thereby to secure the contacts therein without interfering with the leads, and a housing attached to the same end of the body as the cover member, said contact engaging the overlapping portion of the lead and cooperating with the channel to hold the lead on an axis parallel to said chamber, and said housing holding an adjacent portion of the lead substantially at right angles to the axis of the chamber forming a right angle end which tends to reduce the stress exerted upon the connection of the lead to its respective contact.

3. For enclosing a plurality of flat-sided contacts each having an interconnection with the overlapping end of a lead, a holder comprising a body of insulating material having spaced, parallel internal chambers for receiving said contacts, openings through one side of said body to said chambers respectively and a channel offset from each of said openings for receiving a lead, each of said chambers and channels opening on the other side of said body and each channel communicating laterally with a chamber throughout its length so as to admit said contact, lead end and interconnection wholly in said chamber and channel, a cover member attached to one end of said body to cover each chamber thereby to secure the contacts therein without interfering with the leads, and a housing attached to the same end of the body as the cover member to bring the leads out substantially at right angles to the axis of the chambers thereby tending to reduce the stress exerted upon the connections of the leads to their respective contacts, said chamber conforming closely to the shape of said flat-sided contact thereby to prevent twisting of the contact and lead and said channel being shaped to be laterally closed by said contact so as to surround said lead and support the lead against movement laterally of said contact.

4. A connector comprising a plurality of contacts each adapted for interconnection with the overlapping end of a lead, a holder comprising a body of insulating material having spaced, parallel internal chambers for receiving said contacts, openings through one side of said body to said chambers respectively and a channel offset from each of said openings for receiving a lead, each of said chambers and channels opening on the other side of said body and each channel communicating laterally with a chamber throughout its length so as to admit said contact, lead end and interconnection wholly in said chamber and channel, a cover member attached to one end of said body to cover each chamber thereby to secure the contacts therein without interfering with the leads, and a housing attached to the same end of the body as the cover member to bring the leads out substantially at right angles to the axis of the chambers thereby tending to reduce the stress exerted upon the connections of the leads to their respective contacts said channel and contact completely surrounding said lead and supporting said lead against movement laterally of said contact.

5. A connector comprising a plurality of contacts, for each contact a parallel and overlapping insulated lead, an

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interconnection between each contact and lead, a holder comprising a body of insulating material having spaced, parallel internal chambers for receiving said contacts, openings through one side of said body to said chambers respectively and a channel offset from each of said openings, each of said chambers and channels opening on one side of said body and each channel communicating laterally with a chamber throughout its length so as to admit said contact, lead end and interconnection wholly in said chamber and channel, with the lead insulation extending into the channel, a cover member attached to one end of said body to cover each chamber thereby to secure the contact therein without interfering with the leads, and a housing attached to the same end of the body as the cover member, said contact engaging the overlapping portion of the lead and cooperating with the channel to hold the lead on an axis parallel to said chamber and said housing holding an adjacent portion of the lead substantially at right angles to the axis of the chamber forming a right angle bend which tends to reduce the stress exerted upon the connection of the lead to its respective contact.

6. For enclosing a contact element having a substantially overlapping parallel lead element connected thereto, a holder comprising a body having a chamber portion for

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receiving said contact, a channel portion parallel to and laterally communicating with the chamber portion throughout the length of the channel portion so as to admit the contact and lead end wholly in said chamber and channel portion respectively, said body having openings to said portions respectively and an abutment opposite the end of one portion to confine one element therein, and a cover member detachably connected to the other end of said body to confine the other element in its respective portion, said channel portion being shaped to be laterally closed by the contact element in said chamber portion so as to surround the overlapping end of said lead element and support it against movement laterally of said contact element.

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