

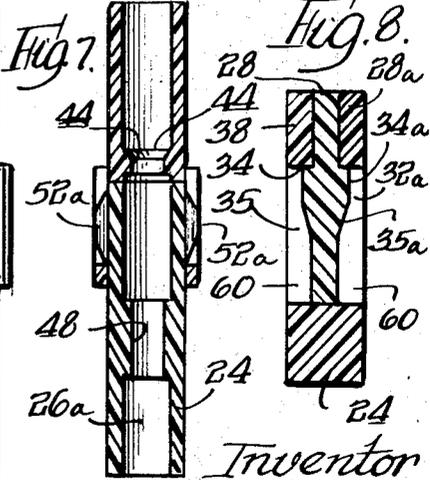
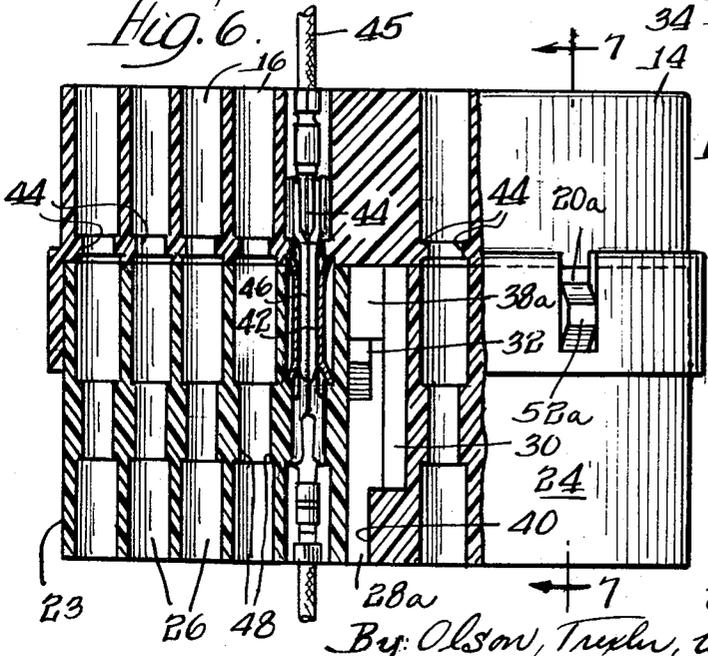
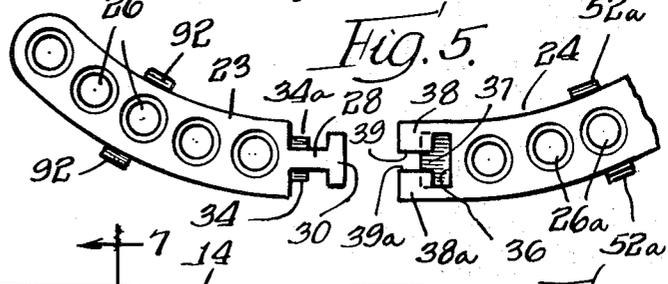
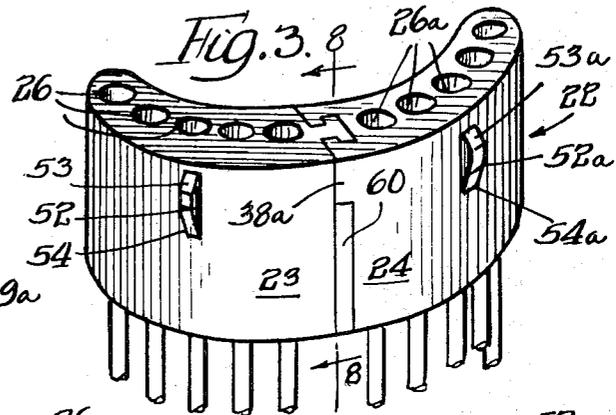
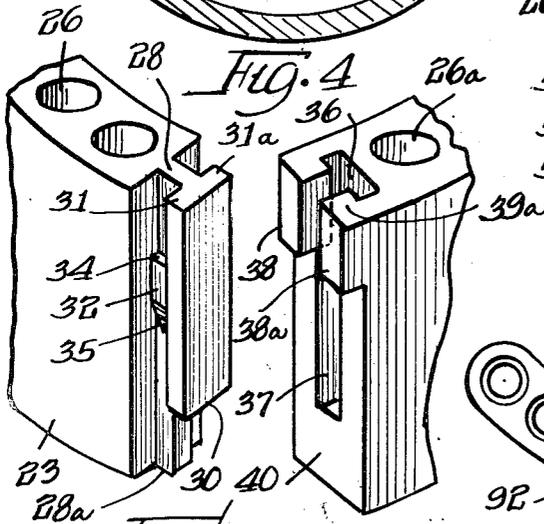
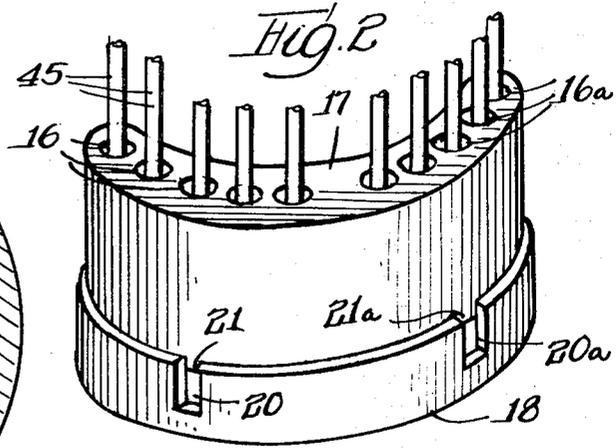
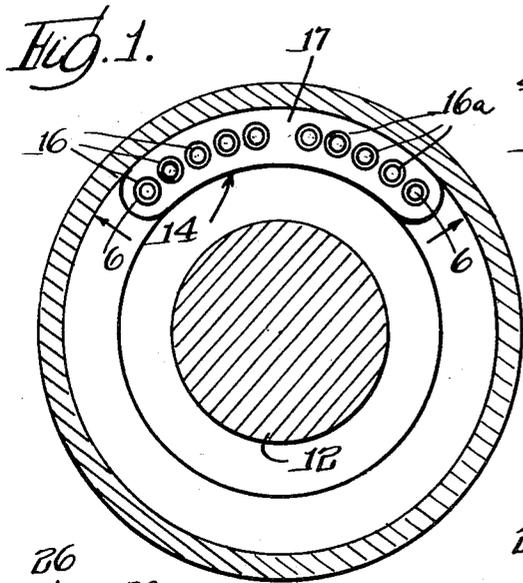
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PLUG AND TWO-PIECE RECEPTACLE

Filed March 20, 1968



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PLUG AND TWO-PIECE RECEPTACLE

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8 Claims

ABSTRACT OF THE DISCLOSURE

A terminal connector including a composite multi-part insulating terminal block with multiple bores therethrough for mounting electrical terminals with attached wire leads and adapted for connection at a predetermined position of installation to another mating terminal block carrying mating electrical terminals; the composite insulating terminal block presenting an elongate cross-section transversely with respect to the width thereof and being divided into plural body parts each having interengageable surface formations along adjacent edges permitting separation thereof for independent threading of each body part and attached wire leads through relatively small and variously shaped spaces normally inaccessible for passage of the assembled composite terminal block, to the position of installation where the proximately located body parts are joined together by interengagement of the surface formations therebetween into the assembled composite terminal block for attachment thereof to a mating terminal block carrying mating terminals.

The present invention relates to new and useful improvements in terminal connectors for electrical circuits and more particularly to such improvements in a composite insulating terminal body carrying terminal elements to which are attached wire leads.

In many installations, space is too confined for locating terminal connectors of normal size and shape. This is particularly true where at least one of the terminal connectors with preassembled terminals and wire leads must be passed or "threaded" in one direction through elongate and relatively confined passages often partially obstructed along the length thereof to further limit the space available for passing the connector and attached wire leads therethrough to a final position of installation which is normally accessible from the opposite direction. As an example, multiple wires are led through the relatively small and arcuately shaped space within a steering column assembly, that is, the space between the housing and steering shaft. These wires and terminal connector are to be ultimately located at the head of the steering column which is accessible at that location for attachment of a mating terminal connector. This is but one example of an environment where space is limited and usually of a somewhat abnormal configuration. The problems outlined in the foregoing paragraph are overcome in the present invention by the provision of a pair of generally similar arcuate terminal bodies having interlocking, specifically T-shaped connecting means along confronting longitudinal edges thereof. The two bodies individually are small enough to fit into the restricted space, and are thereafter interlocked in an edge-to-edge relation providing a compound body of arcuate cross-section too large to have been moved as an entity into the restricted space.

According to the present invention, one of the principal objects is to provide a terminal connector which includes a composite multi-part insulating body apertured to receive included terminal members to which are attached lead wires and with permissive separate manipulation and

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passage of each body part with the wire leads through a limited space area for assembly together at a point of final installation.

Another object of the invention is to provide an improved multi-part insulating body of the above type wherein the body parts have mutually cooperating and engageable surface formations permitting initial separation therebetween for separate manipulation and location of each body part at the point of final installation and unitary assembly thereof at the point of final installation by interengaging the mutually cooperating surface formations.

A further object of the invention is to provide a terminal connector of the above type wherein the body parts are shaped to generally conform to the space available for installation such as an arcuate configuration.

A still further object of the invention is to provide a terminal connector of the above type and an additional terminal connector of one piece construction for mating association therewith at the point of installation which is usually externally accessible at that point for application of the additional terminal connector.

The invention still further aims to provide a composite terminal connector of relatively simple construction with improved interengageable surface formations facilitating joining of the body parts at the point of installation.

The above and other objects of the invention will in part be obvious and will be hereinafter more fully pointed out.

In the accompanying drawing:

FIG. 1 is a top view partly in section showing the terminal connector in relation to a steering column as merely an example of one installation;

FIG. 2 is a perspective view of the one piece terminal connector;

FIG. 3 is a perspective view of the multi-part terminal connector;

FIG. 4 is an enlarged fragmentary exploded view showing details of the connecting means between adjacent body parts of the connector shown in FIG. 3;

FIG. 5 is a fragmentary top plan view of the separated body parts of the connector shown in FIG. 3;

FIG. 6 is an enlarged sectional view taken substantially along the line 6—6 of FIG. 1;

FIG. 7 is a sectional view taken substantially along the line 7—7 of FIG. 6; and

FIG. 8 is a somewhat enlarged sectional view taken substantially along the line 8—8 of FIG. 3.

For purposes of illustration and example only, there is shown in FIG. 1 a steering column including a housing 10 and an internal shaft 12 with a rather limited radial space therebetween. This is to illustrate an installation where it might be impossible to pass through this space a normal size terminal connector with wire leads preassembled therewith for ultimate positioning of the connector at the head or outer end of the column. For example, additional mechanical instrumentalities may be included within the casing, as well as transverse struts, to further limit the space available for passage of a connector therethrough with attached wire leads. After positioning of the terminal connector at the outer end of the column with the attached wire leads now passing through the column, this terminal connector is now accessible for attachment thereto of a mating terminal connector 14 to complete the various connections and circuits. The terminal connector 14 is illustrated in FIG. 2 in the form of a one-piece insulating body block of arcuate configuration and of elongate cross-section with respect to the transverse width thereof. This insulating block has extending longitudinally through the body portion thereof a plurality of groups of bores 16, 16a arranged on oppo-

site sides of a medial portion 17. The body portion terminates at an outwardly offset and depending peripheral skirt 18 having spaced lateral openings 20, 20a there-through (similar openings being provided at the opposite side of the skirt) with the adjacent exposed surfaces 21, 21a of the body portion forming an upper boundary for the openings.

With reference to FIG. 3, there is shown a multipart insulating terminal block 22 of arcuate configuration and cross-section complementary to that of the block shown in FIG. 2. As illustrated, this block 22 comprises a pair of body parts 23, 24 each having groups of bores 26, 26a complementing the groups of bores in the block 14 shown in FIG. 2. With particular reference to FIGS. 4 and 5, the interengaging surface portions between the body parts 23, 24 of the composite block 22 are shown more in detail. Thus, the body part 23 is provided with a rib 28 extending outwardly from substantially the center of the longitudinal edge thereof. This rib terminates in a key or plate portion 30 normal thereto and presenting oppositely directed flange portions 31, 31a. The plate portion 30 terminates short of the bottom edge of the body part 23 and the rib 28a therebelow projects outwardly from the body part a lesser distance than the primary rib 28. Intermediate the longitudinal extent of the key or plate portion 30 there are provided lug portions 32, 32a projecting outwardly from the adjacent surfaces of the rib 28. Each lug includes upwardly facing shoulders 34, 34a and at the opposite end thereof downwardly and inwardly inclined camming surfaces 35, 35a.

Still with reference to FIGS. 4 and 5, the body part 24 includes within the longitudinal edge thereof a vertical recess 36 having a transverse dimension complementing the transverse width of the plate portion 30 and a reduced slot portion 37 opening outwardly. Outwardly projecting lug formations 38, 38a present inwardly directed flanges 39, 39a spaced apart in accordance with the width of the slot 37 and dimensioned to complement and snugly receive the rib 28 therebetween. The depth of the recess 36 and slot 37 is essentially the same as the longitudinal length of the plate portion 30 so as to provide an interfitting T-like key connection in the nature of a modified dovetail joint. The vertical length of the projecting lugs 38, 38a and flanges 39, 39a is substantially equal to the distance at which the lug shoulders 34, 34a are disposed below the upper extremity of the rib 28. The outer face 40 of the longitudinal edge of the body part 24 is disposed inwardly of the outer extremity of the lugs 38, 38a so that when the body parts 23, 24 are interfitted, the lower portion 28a of the rib 28 will engage the adjacent surface of outer face 40 of the body part 24 and the lower end of the plate portion 30 and adjacent lateral edge portion of the rib 28 will bottom, respectively, on the bottom of the recess 36 and the bottom of the slot 37.

Both terminal blocks 14, 22 have metallic terminal elements mounted in the bores thereof, and either block may carry male or female terminal elements. However, for purposes of illustration and with reference to FIG. 6, the male terminal elements or prongs 42 are mounted within the bores 16, 16a of the block 14 by means of oppositely facing internal shoulders presented by an internal constricting portion 44 similar to that shown in the patent to John H. Krehbiel, No. 3,178,673. Where such male terminal elements or prongs with lead wires 45 preassembled therewith are mounted in the block 14, female socket type elements 46 will be mounted in the bores 36, 26a of the two-part block 22 as also shown in FIG. 6. Here, the bores are also provided with intermediate constricting portions 48 presenting oppositely facing shoulder surfaces to trap therein a female socket terminal 46 to the lower end of which lead wires 50 are preassembled. Thus, both the female socket elements 46 and the associated lead wires 50 are preassembled with the body parts 23, 24 of the multi-part block 22.

In a typical installation where the composite block 22

and preassembled terminals and lead wires is to be passed through a limited space area offering internal obstructions to the through-passage thereof, the body parts 23, 24 are separated, as shown in FIG. 5. Each body part and the lead wires preassembled therewith may then be separately passed through the limited space area or "threaded" therethrough to by-pass obstructions in reaching the final position of installation. At such position, the two body parts 23, 24 are interconnected. For this purpose, these body parts are positioned adjacent one another with the lower end of the plate portion 30 of the body part 23 aligned with the recess 36 in the body part 24. In such position, the rib 28 will initially align with the space between the inwardly directed flanges 39, 39a. Relative sliding movement of the two body parts to reach the assembled position of FIG. 3 will result in the camming surfaces 35, 35a of the lugs 32, 32a initially spreading the lug portions 38, 38a until the lug shoulders 34, 34a are positioned therebeneath when the portions 38, 38a will snap inwardly over the shoulders 34, 34a and lock the two body parts in position. Thus, there is provided an interfitting rib and groove connection between the body parts and also cooperating lug formations on each body part to prevent separation thereof. The composite body assembly 22 may then be positioned at the point of installation for reception of the other block 14 with its terminals and wires preassembled therewith. To connect the two blocks 14, 22 and the included terminals, the body part 23 includes an outward lug 52 having upper and lower camming surfaces 53, 54, respectively. Similarly, the block 24 has an outward lug portion 52a with similar upper and lower camming surfaces 53, 54, respectively. It is to be understood that similar lugs are provided on the opposite surface of the two body parts, as shown in FIG. 5, for cooperation with corresponding openings in the skirt 18. When the block 14 is interfitted with the now assembled composite block 22, the upper camming surfaces 53, 53a will spread the skirt 18 outwardly and then the lug portions 52, 52a will snap into the comparable openings 20, 20a in the skirt. This will fix the two containers in circuit-completing position. In like manner, when the connector block 14 is to be disconnected from the composite block 22, the lower cam surfaces 54, 54a will again expand the skirt 18 for this purpose and permit separation. After such separation of the connector blocks 14, 22, it may be necessary or desirable for one reason or another to disassemble the body parts 23, 24 of the composite block 22, as for replacement, repair, relocation or the like. To facilitate such separation of the body blocks, there is provided an access space below the lug formations 38, 38a and one such an access space is designated at 60 in FIG. 3. Since the lugs 32, 32a do not extend outwardly the entire width of the rib 28 (see FIG. 6) there is space available for insertion of a suitable implement, such as one having a hooked end, into this access space for upward engagement between the inner surface of the flanges 39, 39a and the adjacent surfaces of the rib 28 to pry the lug formations 38, 38a outwardly to clear the respective shoulders 34, 34a and thus permit reverse relative sliding between the body parts 23, 24 for separation thereof.

The connector blocks are illustrated as being elongate and of relatively narrow transverse width or cross-section and specifically shown as being arcuate. The particular shape of the blocks may be varied in accordance with the space configuration available at the point of ultimate installation, that is, the blocks may be variously angled or shaped for this purpose. The important consideration is that the connector carrying the preassembled wires through relatively inaccessible or partially obstructed spaces, is divided into more than one body part with adjacent longitudinal edges of each body part provided with interengaging surface formations permitting assembly of the several parts into the composite connector block at the point of ultimate installation. Thus, these body parts can be ini-

tially separated and passed as smaller units individually through the relatively inaccessible or partially obstructed spaces with the trailing attached wire leads conforming to any irregularities in the traversed space. Then the several body parts are assembled together in predetermined shape of the composite connector block at the point of ultimate installation for receiving a mating connector.

What is claimed is:

1. An electrical terminal connector comprising a composite multi-part insulating body assembly presenting an elongate cross-section transversely with respect to the width thereof and having multiple bores spaced along the transverse extent of the assembly and extending longitudinally through the body parts and within the longitudinal edges thereof, means within each bore for mounting therein a metallic electrical member for preassembly with lead wires, and means providing interlocking surface formations along adjacent longitudinal edges of the body parts permitting independent manipulation and passage of each individual body part through limited space areas to a position proximate to that of final installation, and said interlocking surface formations including a pair of resiliently spreadable lugs on one body part with inward shoulders and a pair of camming lugs on the other body part with shoulders snapping behind the said inward shoulders after the camming lugs pass between and spread the resilient lugs and permit the same to return to normal position whereby to connect together the body parts as the composite assembly forming the terminal connector with a greater elongate cross-section adapted for attachment thereof as a unit to a mating terminal connector.

2. An electrical terminal connector as claimed in claim 1, wherein the interengageable surface formations include a rib extending outwardly from the edge of one body part terminating in a transverse plate portion and a complementary T-shaped recess along a portion of the edge of an adjacent body part for receiving the rib and the plate portion in interlocking engagement therewith.

3. An electrical terminal connector as claimed in claim 2, wherein the T-shaped recess is partially defined by a pair of outwardly projecting lug members presenting inwardly directed flanges receiving the rib therebetween.

4. An electrical terminal connector comprising a composite multi-part insulating body assembly presenting an elongate cross-section transversely with respect to the width thereof and having multiple bores spaced along the transverse extent of the assembly and extending longitudinally through the body parts thereof, means within each bore for mounting therein a metallic electrical terminal member for preassembly with lead wires, and means providing interengageable surface formations along adjacent longitudinal edges of the body parts permitting independent manipulation and passage of each individual body part through limited space areas to a position proximate to that of final installation and interengagement of said surface formations at the position of final installation connecting together the said body parts as the composite assembly forming the terminal connector adapted for attachment thereto of a mating terminal connector, the interengageable surface formations including a rib extending outwardly from the edge of one body part terminating in a transverse plate portion and a complementary T-shaped recess along a portion of the edge of an adjacent body part for receiving the rib and the plate portion in interlocking engagement therewith, and the T-shaped recess being partially defined by a pair of outwardly projecting lug members presenting inwardly directed flanges receiving the rib therebetween, and wherein the rib includes outwardly projecting wedging lugs intermediate the ends thereof for spreading the lug members as the body parts are slidably assembled with upwardly facing shoulders

on said wedging lugs engaging beneath the lug members when the body parts are assembled.

5. An electrical terminal connector comprising a composite multi-part insulating body assembly presenting an elongate cross-section transversely with respect to the width thereof and having multiple bores spaced along the transverse extent of the assembly and extending longitudinally through the body parts thereof, means within each bore for mounting therein a metallic electrical terminal member for preassembly with lead wires, and means providing interengageable surface formations along adjacent longitudinal edges of the body parts permitting independent manipulation and passage of each individual body part through limited space areas to a position proximate to that of final installation and interlocking of said surface formations at the position of final installation connecting together the said body parts as the composite assembly forming the terminal connector adapted for attachment thereto of a mating terminal connector, the interengageable surface formations including outwardly projecting lug members adjacent the upper end of one body part and terminating short of the longitudinal extent thereof to leave access spaces therebelow, and wherein the other body part includes a T-shaped key member slidably interfitted with said lug members to join together the adjacent body parts, the rib of said T-shaped member being provided with wedging lug members intermediate the length thereof for spreading the projecting lug members on the other body part when the body parts are slidably interconnected and presenting upwardly facing shoulders to engage beneath the projecting lug members locking the parts in assembled position.

6. An electrical terminal connector as claimed in claim 5, wherein the wedging lug members terminate short of the lateral extent of the rib leaving a space communicating with said access space facilitating insertion of an implement to separate the projecting lug members away from engagement with said shoulders for disconnecting the body parts.

7. An electrical terminal connector as claimed in claim 1 wherein the said interlocking surface formations are relatively disposed for interfitting relatively edgewise sliding interconnection between the adjacent longitudinal edges of the body parts.

8. An electrical terminal connector as claimed in claim 7 wherein the spreadable lugs terminate short of the longitudinal edge of the associated body part to leave access space permitting implement insertion to separate the spreadable lugs for disconnecting the body parts.

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