

Feb. 24, 1959

S. J. SKONY

2,875,426

ELECTRICAL CONNECTOR

Filed March 11, 1957

Fig-1

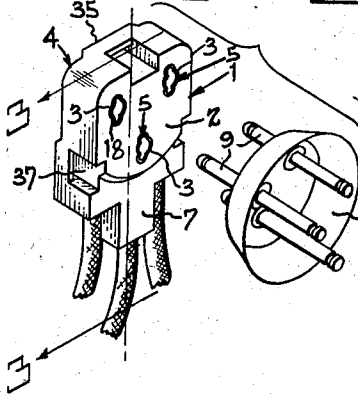


Fig-2

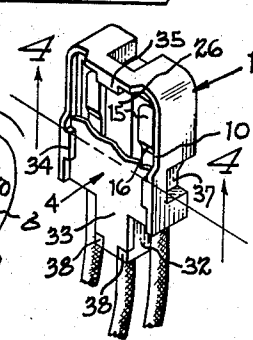


Fig-3

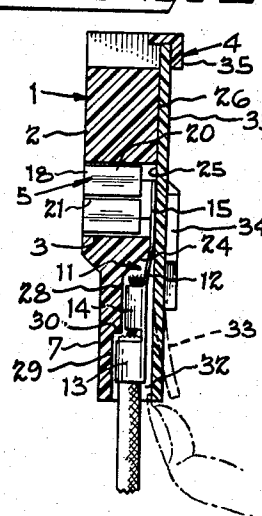


Fig-4

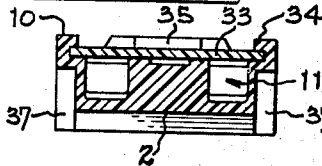


Fig-7

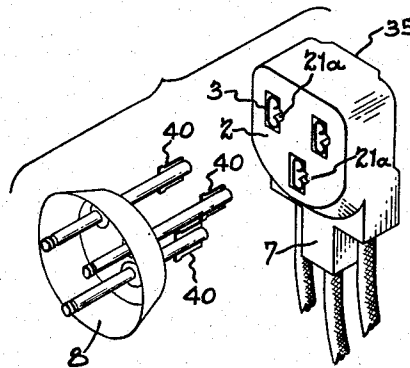
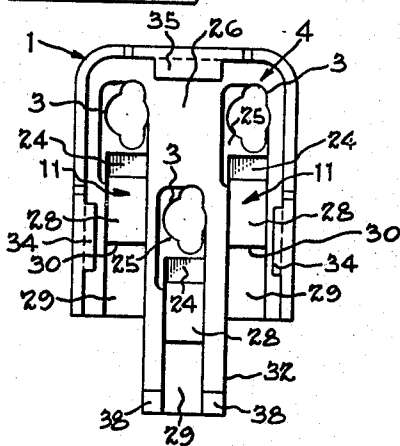
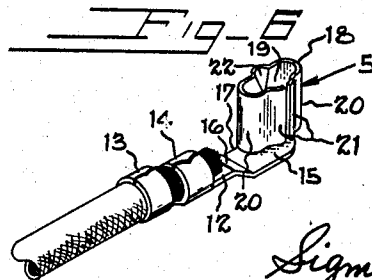


Fig-5



INVENTOR
Sigmund J. Skony
BY Word, Herrin & Evans.
ATTORNEYS.

1

2,875,426

ELECTRICAL CONNECTOR

Sigmund J. Skony, Cincinnati, Ohio, assignor to Van Engineering, Hermetic Terminal Division, Cincinnati, Ohio, a partnership

Application March 11, 1957, Serial No. 645,113

3 Claims. (Cl. 339—192)

This invention relates to an electrical connector and is directed particularly to a multi-conductor assembly adapted for interconnecting individual wires held in gang or cluster assembly with a corresponding number of post-like electric terminals.

A principal objective of this invention has been to provide a multi-conductor connector assembly which is small and compact in over-all size but which, nevertheless, provides adequate spacing of one conductor from another to prevent short-circuiting or electric creepage loss between individual conductors of the assembly.

A further objective of the invention has been to provide a multiple or gang terminal connector in which the conductor elements may be inserted readily and then locked in place upon assembly, or from which the conductors readily may be removed without the use of tools for inspection or replacement. More specifically in this respect, it is an objective of the present invention to provide a housing having a plurality of cavities therein, each adapted to receive and support a conductor and a terminal lip or socket fastened to the end thereof, in conjunction with a slide plate which is adapted to be engaged over the conductors and terminal clips and to reside in locked interconnection with the housing of the unit so as to conceal and sustain all of the elements in assembly.

A further objective of the present invention has been to provide a multiple or gang connector in which each of the individual elements associated with the individual conductor leads is supported in an individual cavity which sustains the conductor and connector associated therewith against damage from being bent out of shape if the gang connector is applied improperly to the post terminals to which it is to be attached.

The connectors of the present invention are adapted to be used in a wide variety of different types of electrical apparatus, such as for making electrical connections to post terminals projecting through a hermetically sealed shell enclosing the refrigerating unit or through mounting brackets at bulkheads or walls where convenient disconnection facilities are required or where continuous electrical conductors cannot readily be employed. Similarly, gang connectors of the present invention are adapted for readily supplying electric current to electric motors or other apparatus equipped with fixed terminal posts onto which the gang connectors may be plugged.

In such equipment, especially in instances where space is at a premium, it is requisite that the gang connector be as small in size as possible, yet it is also requisite that adequate spacing be maintained between the electrically conductive parts to prevent short-circuiting or creepage of electric current from one terminal to another. The latter problem becomes particularly acute in the construction of connectors which are small in size but which are nevertheless required to accommodate distribution circuit voltages.

In the present construction, each lead wire entering the gang connector block carries a terminal which fur-

2

nishes a socket adapted for frictional engagement with a post; to avoid confusion these terminals hereafter are called clip terminals and the block in which they are housed and supported is called the connector block.

Each clip terminal is in the form of a sheet metal stamping having a shank portion which is crimped upon the insulation of the conductor, an adjacent portion which is crimped upon a bared portion of the conductor itself, and a socket portion which is adapted for reception of the prong or post to which connection is to be made. The socket portion preferably is of the type disclosed in Skony U. S. Patent 2,559,174 of July 3, 1951 and includes a central metal member having wings or ears bent from opposite sides thereof toward each other whereby contact with a post inserted into the socket is insured at at least three circumferential areas upon the post. The ears form a flexible sleeve of generally triangular or arcuate contour conforming to the cross-sectional contour of a terminal post; the portions at which the ears respectively are bent form the central area and are yieldable slightly to facilitate frictional engagement of the post within the socket.

The clip terminals, as shown in the aforesaid patent, form an "in line" connection with the posts, that is, the axis of the lead wires connected to the terminal pieces are longitudinally coextensive with the post. However, in accordance with the present invention, the axis of the socket portion of a clip terminal connected to each lead wire is generally perpendicular to the axis of the lead wire and shank portion of the terminal piece and preferably is also offset with respect thereto whereby the axis of the lead wire intersects the socket at a point intermediate its ends. By this arrangement the thickness of the connector block within which the individual clip terminal connectors and lead wires are installed may be reduced to a dimension only slightly greater than the post-receiving length dimension of the socket portion of each clip terminal, yet the lead wires may extend from the connector block substantially midway between the front and back of the block. By the lateral disposition of the socket of the clip with respect to the lead wire axis associated with the clip, the lead wires may extend at right angles from the posts to which the clip terminals are attached and thereby reside closely adjacent the surface of the apparatus from which the posts project.

The connector block is provided with grooves at its rear face to receive and sustain a slide plate of insulating material which fits over the rear ends of the clip terminals and covers the cavities within which they and the conductor wires are disposed. In the preferred construction, the slide plate is equipped with a tail portion which is yieldable from the plane of the plate to clear an abutment as the plate is moved into the grooves whereby the plate snaps into locked position as soon as the tail portion of the plate moves inwardly past the abutment. This prevents disengagement of the slide plate unless its tail portion is lifted over the abutment. By inserting a fingernail under the tail piece, it may be raised sufficiently to clear the abutment and thereby easily may be removed to permit the individual conductors to be lifted out of the socket as desired.

Other features and advantages of the present invention appear in the following detailed description of the drawings illustrating a structure typically embodying the features of the present invention which have briefly been described. In the drawings:

Figure 1 is a perspective view showing a gang connector of the present invention, looking at the inner or front face thereof, and also shows a typical cluster of posts arranged in predetermined relationship to one another to which a gang connector is to be attached;

3

Figure 2 is a perspective view showing the back side or outer face of the gang connector with a portion of the back plate removed;

Figure 3 is a longitudinal sectional view taken on the line 3—3 of Figure 1;

Figure 4 is a cross-sectional view taken on the line 4—4 of Figure 2;

Figure 5 is a plan view showing the sets of cavities which are accessible from the outer face of the gang connector block when the slide plate is removed;

Figure 6 is a perspective view showing a conductor and associated terminal clip adapted for assembly with a connector block; and

Figure 7 is a view similar to Figure 1 but showing a gang connector having conductors equipped with terminals adapted to receive "wing"-type terminal posts.

The connector block shown in Figure 1 comprises a body 1 molded of electrically insulative plastic material. The inner or front face 2 of the body is substantially flat and contains socket apertures 3 which extend through the body to the back or outer side which is indicated generally at 4 (Figure 5). These apertures receive the socket portions 5 of the terminal clips of the type shown in Figure 6, which are subsequently described in more detail. Adjacent the front face 2 the body 1 is offset from the plane of the face as at 7.

Apertures 3 are spaced from one another in staggered relationship; the spacing for example may be in the form of a substantially equilateral triangle if a gang of three wires is to be served, but it will also be understood that the block may be constructed to accommodate as few or as many conductors as are required for a given type of installation. If more than three conductors are to be employed, then the block may be made wider than the one shown and additional cavities for additional terminal clips may be positioned in staggered relationship similar to those disclosed.

For purposes of illustration, the cluster of posts to which the connector block is adapted to be attached is shown in the drawings in the form of a metal mounting ring 8 adapted to be suitably fastened to a wall or shell of the apparatus to be served, and each of the posts 9 is held in place in an aperture of the ring by means of ceramic or plastic composition which supports the post in sealed, insulated relation to the ring and to the other posts. The spacing of the sockets 5 in the connector block, of course, conforms to the spacing of the posts.

The outer or back face 4 of the connector block includes a marginal flange 10 extending along the sides and across one end, and also includes cavities or openings 11 which respectively cooperate with the socket cavities 3 to accommodate the terminal clips. In order that the manner in which the cavities cooperate with the terminal clips may be understood, the terminal clips themselves will first be described.

Each terminal clip, as seen in Figure 6, is a sheet metal stamping in the form of a narrow flat strip having a shank portion 12 including any suitable means associated therewith to facilitate interconnection of the terminal clip to a conductor. In the structure shown, ears 13 and 14 extending from the shank are adapted to be clinched respectively about the insulation of a conductor and about a bared portion of the conductor projecting beyond the insulation. This structure is generally of the type shown in Schneider U. S. Patent 962,921 of June 28, 1910 and has been found to be quite suitable, although other arrangements may be used to facilitate the connection of the terminal clip to a wire if desired.

From the shank portion 12 of the terminal clip a head portion 15 preferably is offset in generally parallel relation to the plane of the shank 12 through an offset bend 16 and, in the preferred construction, a socket 18 is formed from one longitudinal edge 17 of the head portion 15. This socket comprises a central area 19 which resides at a right angle to the plane of the head portion

4

15, and wing portions 20, 20 extend from opposite sides of the central area 19 adjacent the bend at which the central portion joins the head portion 15. Wings 20 are bent reversely toward one another so as to reside over the head portion 15 in spaced relation thereto and they also include compound curvatures 21, 21 which, in conjunction with the central area 19, form a tubular-like socket which is adapted telescopically to receive a post 9.

To facilitate the insertion of a post into the socket, the central area 19 may include an outwardly flared, inwardly tapered lip 22 which provides an enlargement of the socket mouth. Also, the reverse bends of the wing portions 20, 20 forming the socket are slightly yieldable whereby the socket is dimensioned frictionally to receive a post 9 and form therewith an electrical interconnection at lines extending respectively along the central area 19 and each of the curvatures 21, 21 which complement the post contour.

Since the wings 20, 20 are bent from the opposite edges of the central area 19, which itself is bent laterally from an edge of the head portion 15, the longitudinal axis of the socket overlies the head portion 15 and resides generally in alignment with the axis of the shank or of a conductor connected to the shank 12 but is disposed laterally or at a right angle thereto. Through the offset 16 between the shank 12 and the head portion 15, the axis of the conductor intersects the longitudinal axis through the socket at a point intermediate its longitudinal extremities.

Head portion 15 extending across one end of the socket serves as an abutment which, engaged by the end of a post inserted into the socket, limits the depth to which the post can be projected into the socket, and the engagement of the end of the post with the head portion 15 provides an additional point of electrical connection of the post with the terminal clip.

Since the bends of the wings reside on a line extending longitudinally of the conductor, the socket in over-all width, i. e., transversely of the conductor, may be approximately the same as, or less than, the width from one side of the head portion 15 to the other, which width may be approximately the same as the diameter of the insulation on the conductor. Thus, the terminal clip may be made no wider than the diameter of the conductor insulation.

Cavities 3 in the connector block 1 are preferably of the same contour as the external contour in cross section of the sockets 5 of the terminal clips but are slightly larger, at least at the area adjacent the wings 20, 20 of the socket to permit such outward, yielding movement of the wings 20, 20 as may be necessary to accommodate insertion of a plug into a socket. Cavities 11 are aligned with sockets 3 and preferably are arranged generally parallel to one another, although they may diverge angularly from one another if over-all width is not an important consideration.

Each cavity 11 is slightly greater in width than the width of the shank 12 of the terminal clip so as to readily receive the same and includes a shoulder portion 24 which preferably is on a slope complementing the slope of the offset 16, to form a seat therefor, and an entrance seat 25 which is approximately as deep as the thickness of the metal from which the terminal clip is made whereby the back side of the head portion 15 of the connector clip may reside flush with the surface of the central area 26 of the back side of the connector block.

From the shoulder 24 the bottom portion of each cavity 11 is configured to receive and support the structure through which the conductor is attached to the connector clip. For example, for clinch-type terminal clips of the type described, the bottom portion of the cavity adjacent the slope 24 includes a bottom surface 28 which forms a seat for the ears 14 which are crimped about the bared conductor, and a bottom surface 29 which is offset from the surface 28 by a shoulder 30 to receive and support the ears 13 which are crimped around the insulation of

5

the conductor which, as shown, are somewhat larger in diameter than the ears 14. Each cavity 11 extends beyond the end of a terminal clip received within the connector block whereby the metal of the terminal clip is fully housed. Inasmuch as the apertures in which the sockets of the terminal clips are arranged reside in staggered relationship to one another, the middle cavity of the plurality is formed in a projecting portion 32 of the terminal block, although it will be understood that the tail configuration is employed primarily to conserve molding material and that the block may be of rectangular outline rather than of the T shape imparted by the tail piece 32 in the structure shown.

When the terminal clips on the conductors are placed within the cavities as described, their upper surfaces are substantially flush with or reside below the surface 26 at the back of the block, which surface, in turn, is surrounded by the marginal flange 10. In this relationship the parts are held in place within the block by a slide plate 33 having its edges received in groove means formed in the marginal flange 10. The groove may be continuous within the flange or, as shown, the groove means may be delineated by portions 34, 34 which project inwardly from the sidewise portions of the marginal flange 10 over the rear face of the central area of the block in spaced groove-forming relationship thereto and one or more portions 35 at the head edge of the block. Thus, the slide plate 33 may be introduced between the ears 34, 34 extending from the opposite sides of the plate and then pushed forwardly until its end portion rests underneath the ear 35 at the head whereby the conductors and associated terminal clips are held in place in the block by the plate. To conserve the amount of molding material which is required in the formation of the block and also to facilitate molding, the block may be provided with side recesses 37 which terminate at the underneath faces of the ears 34, 34.

Slide plate 33 is preferably in the form of a stamping of relatively thin fiberboard or plastic material which is slightly yieldable, at least at the portion thereof residing rearwardly beyond ears 34, 34. To lock the plate in place once it is slid into the grooves, the tail piece 32 has one or more abutments 38 at its rear end which project above the plane of the rear face 26 of the block. When the forward edge of the plate is introduced beneath the side ears 34, 34, the rear area of the plate will reside over the abutments 38, but the yieldability of the plate will permit it to slide into the groove over these abutments. However, when the plate is slid to its forward limit under ear 35, the tail end of the plate will pass beyond the shoulders of the abutments 38 and the plate will then snap into place in a plane over the rear surface of the block whereby the abutments 38 will prevent the plate from moving out of the groove. By inserting a fingernail placed underneath the slide plate at the rear end between the side walls of the tail portion forming the central cavity 11, as is shown in Figure 3, the slide plate may be sprung outwardly to clear the abutments 38 and then moved rearwardly from the groove. It will be seen, therefore, that the insertion of conductors into the connector block and their removal readily is accomplished without the use of tools and in a simple and convenient manner.

The shank portions of the terminal clips reside flush with or below the plane of the rear face 26 of the connector block so that no obstructions appear in the path of the leading edge of the block as it moves into the groove until the leading edge of the slide plate engages the forwardly slanted offset portions 16 of the terminal pieces. When such engagement occurs, the terminals are pushed downwardly into fully seated positions in the sockets and the conductors and terminal clips thereon are held singly within the terminal block. When the terminal block is pushed onto a cluster of posts and the ends of the posts come into engagement with the head

6

portions of the terminal clips 15, the sockets of the terminal clips are restrained against backward movement by engagement of the flat faces of the head portions thereof with the inside face of the slide plate. When the connector is removed from the posts, the shank portions of the terminal clips retain them in the block.

In some instances it is desired to insure attachment of a cluster of conductors with a cluster of posts in predetermined order or orientation. For this purpose the interengaging posts and sockets may be disposed in an unsymmetrical spacing or one or more of the posts may be provided with keys 40 of the type shown in Figure 7. In this event, the major axes of the sockets of the terminal clips may be arranged in longitudinal alignment with the axis of the conductors as previously described, but the ear portions 21, 21 forming the socket as previously described may be bent inwardly to engage the wing 40 instead of outwardly to extend around the post whereby the wings 40, when socketed, will reside facially in engagement with the central areas 19 of the sockets and be held in place by the friction of the inwardly turned ears, as shown at 21a in Figure 7. The wings 40 thereby provide good electrical interconnection but also prevent insertion of the prongs into the sockets in other than the order predetermined.

In either type of construction, it will be seen that even though the parts are arranged compactly with respect to one another, ample distance is maintained between metallic portions of the respective terminal clips to prevent creepage loss from one conductor to another. Where size limitations are not important, the sockets of one or more of the terminal clips may be disposed so that their major axes extend at right angles to the longitudinal axes of the clip shank or conductors attached thereto, but in this event their reverse bend portions of the sockets will project beyond the side edges of the clip shank and minimum spacing cannot readily be achieved. In the present construction, ample inter-conductor spacing may be obtained in a conductor block which is only approximately $1\frac{3}{16}$ of an inch in over-all width in conjunction with walls at the sides and between the cavities which are sufficiently thick to provide adequate strength in the connector block.

Having described my invention, I claim:

1. An electrical plug-on type connector comprising a mounting block having opposed front and back faces, said block having a plurality of contact mounting openings extending therethrough, an electrical contact loosely mounted in each contact-mounting opening, said contacts having open ends presented to the front face for making plug-on connection with a respective plurality of terminal posts, a slide plate normally residing in a closed position overlying the said back face and confining said contacts therein, said block having groove means slidably engageable by and overlying at least a portion of the edges of said slide plate, said slide plate having a yieldable portion, and abutment means on said block normally engaging the yieldable portion of the slide plate and locking the same in said closed position, said yieldable portion being yieldable outwardly to a disengaged position relative to the abutment means for shifting the slide plate to an open position exposing said open face for inserting said contacts into said contact-mounting openings.
2. An electrical plug-on type connector comprising a connector block having a body portion and a projecting portion at one end of the body portion, said block having opposed front and back faces and a peripheral wall, said block having a plurality of openings extending therethrough, the said back face having a plurality of open cavities extending from the said openings and terminating at a wall of the block, an electrical terminal clip element loosely mounted in each of said openings and presented to the said front face for making a plug-on connection with a post terminal, each terminal clip element

having an electrical wire connected thereto, said wires respectively residing in said open cavities and extending outwardly beyond the wall of the block, a slide element formed of yieldable material and having generally parallel side edges, said element overlying the said back face of the connector block thereby confining said terminal clip elements and electrical wires therein, retaining means extending outwardly from the back face of the body portion of said block and slidably engaging the edge portions of the slide element, and abutment means projecting outwardly from the end of said projecting portion in the slide path of the slide element, the slide element being installed upon the block by springing the slide plate and sliding the same over the abutment means with the edges thereof slidably engaged in said retaining means, whereby the slide element is free to relax upon passing beyond the abutment means thereby locking the slide element to the block.

3. An electrical plug-on type connector comprising a mounting block having opposed front and back faces, said block having a plurality of socket-mounting openings extending therethrough, an electrical socket mounted in each socket-mounting opening, said sockets having open ends presented to the front face for making plug-on connection with a respective plurality of terminal posts, a slide plate normally residing in a closed position overlying the said back face and confining said sockets therein, plate retaining means extending outwardly from the back face of said block and overlying at least a portion

of the edges of said slide plate when said slide plate is in closed position, abutment means projecting outwardly from the back face of said block at one end of said block and spaced from said retaining means, the slide plate being installed upon the block by springing the slide plate while sliding the same over the abutment means with the side edges of said plate slidably engaged in said retaining means, whereby the slide plate is free to relax upon passing beyond the abutment means thereby locking the slide plate to the block.

References Cited in the file of this patent

UNITED STATES PATENTS

962,921	Schneider	June 28, 1910
1,194,287	Grant	Aug. 8, 1916
1,591,773	Nero	July 8, 1926
2,133,651	Baker	Oct. 18, 1938
2,205,878	Eby	June 25, 1940
2,435,341	Crumrine	Feb. 3, 1948
2,517,593	O'Brien et al.	Aug. 8, 1950
2,559,174	Skony	July 3, 1951
2,563,865	Pottle	Aug. 14, 1951
2,724,813	Leland	Nov. 22, 1955
2,728,060	Doeg	Dec. 20, 1955
2,804,986	Veffer et al.	Sept. 3, 1957

FOREIGN PATENTS

34,278	Denmark	Mar. 16, 1925
--------	---------	---------------

Notice of Adverse Decision in Interference

In Interference No. 90,908 involving Patent No. 2,875,426, S. J. Skony,
Electrical connector, final judgment adverse to the patentee was rendered Nov.
27, 1962, as to claim 1.

[Official Gazette April 30, 1963.]

Notice of Adverse Decision in Interference

In Interference No. 90,908 involving Patent No. 2,875,426, S. J. Skony, Electrical connector, final judgment adverse to the patentee was rendered Nov. 27, 1962, as to claim 1.

[Official Gazette April 30, 1963.]