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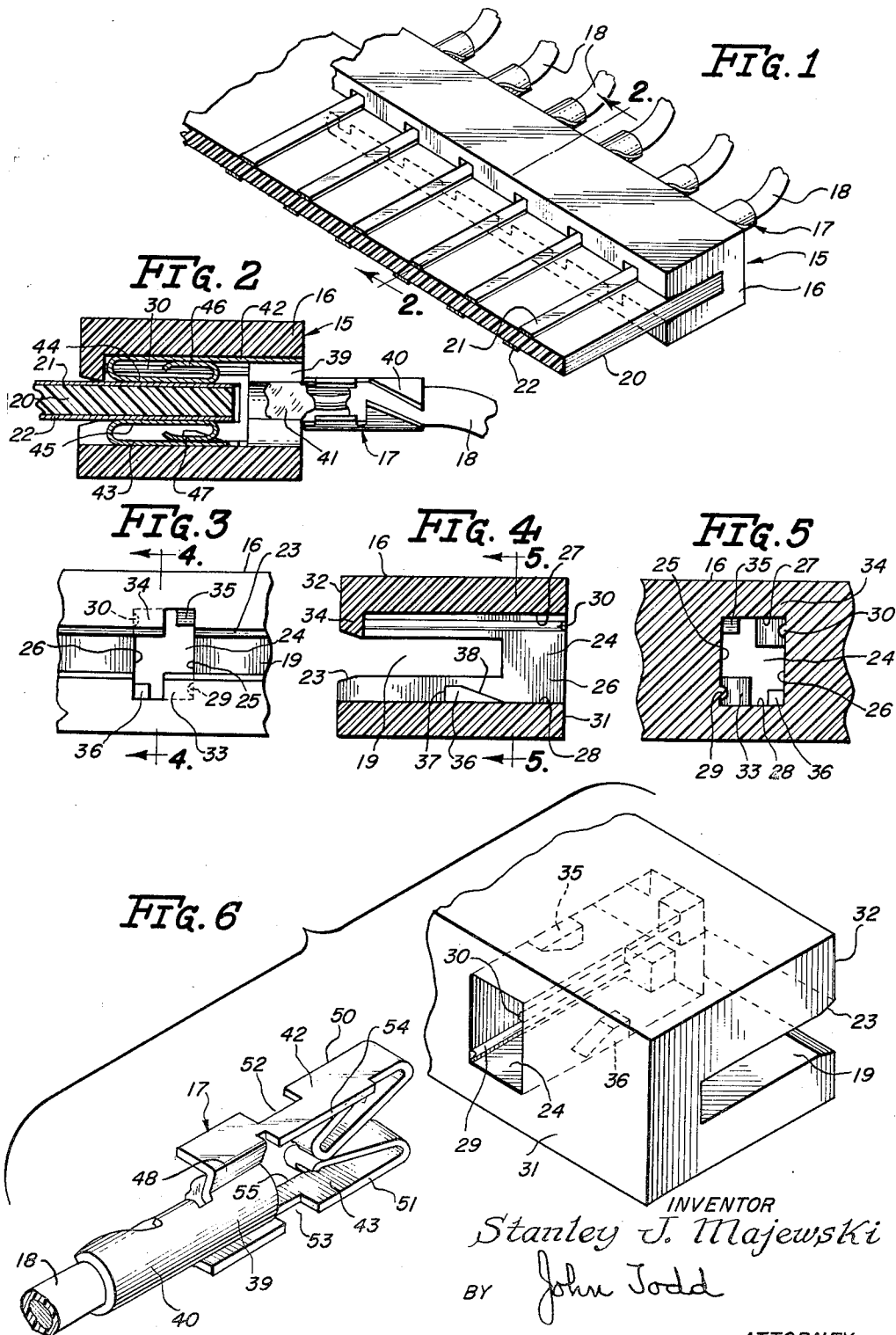
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SNAP-IN CONTACT FOR EDGE CONNECTOR

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2 Sheets-Sheet 1



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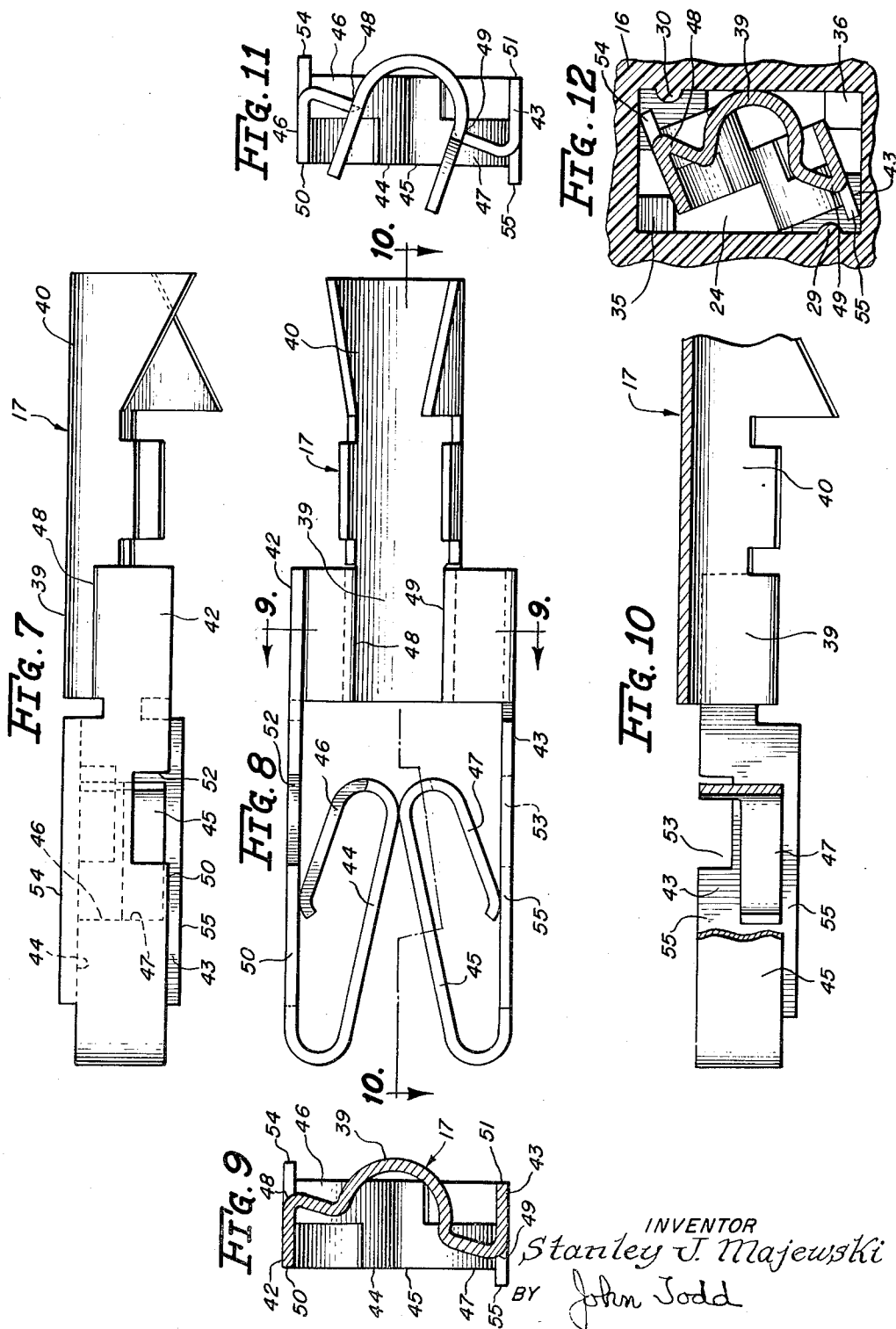
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SNAP-IN CONTACT FOR EDGE CONNECTOR
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12 Claims. (Cl. 339-176)

This invention relates to a snap-in contact structure, and more particularly to a snap-in contact structure adapted for use in an edge connector and especially in an edge connector for a single-circuit printed wire board or other conductor-equipped panel.

A typical environment for a snap-in contact embodying the invention is an edge connector for use with conductor-equipped panels such as printed wire boards and the like, but, in general terms, the contact has utility in conjunction with other connectors or socket structures whenever a contact is required that defines a receptacle adapted to receive and establish an electric connection with a male element. However, considering an edge connector in particular, and especially one adapted for use with a single-circuit conductor-equipped panel, such connector is ordinarily an elongated element having a body part or casting formed of insulating material and provided centrally along one side thereof with a longitudinally extending slot or channel adapted to receive an edge portion of a conductor-equipped panel therein. In combination with the insulating body part are a plurality of contact structures disposed in longitudinally spaced relation therein and isolated electrically each from the other. When a conductor-equipped panel is inserted into the connector, the contact structures respectively engage and thereby make electric connections with the conductors of the panel.

Each of the contact structures must be connected individually to one of a plurality of lead wires, and preferably such connections are made before the contact structures are mounted within the insulating body part. Additionally, it is advantageous to provide a snap-in contact structure that automatically seats itself within the body part in an interlocking relation therewith when the contact is inserted into the body part, for this simplifies assembly of the connector particularly after lead wires have been connected to the contact structures. While various arrangements may be provided for establishing such interconnection between the contacts and connector body, the arrangements most feasible and commonly employed require the contacts to be compressed or otherwise momentarily distorted during insertion thereof into the connector body. It has been found that such distortion of the contacts, although momentary, is frequently sufficient to give the contact a permanent set, which tends to destroy the essential resilience thereof that assures the frictional grip of the contact with the aligned conductor of a panel inserted into the connector. This problem is magnified whenever a contact must be removed and later reinserted into the connector body, and there are certain instances where this is required.

In view of the foregoing, an object of the present invention is to provide a contact structure that overcomes this problem. Still another object of the invention is that of providing a snap-in contact structure adapted for use with an edge connector or the like, and which is characterized by having a structural configuration accommodating distortion of the contact upon insertion thereof into a connector body but without the accompanying danger of the contact becoming permanently distorted or acquiring a set in the momentarily deformed condition thereof.

Yet another object is in the provision of a snap-in contact structure of the character described, in combination

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with a connector body part, and in which portions of the contact structure are rotated slightly with respect to the longitudinal axis thereof and impart a slight twisting movement to the contact upon insertion thereof into the cavity therefor in the connector body as the contact rides over cooperating abutment or locking elements provided in the body cavity. A further object of the invention is to provide a snap-in contact structure having a resilient contact leg adapted to frictionally engage a conductor-equipped panel and having a base formed integrally with the contact leg but being angularly oriented with respect to the plane thereof so as to form a natural pivotal axis for the contact leg to permit slight rotation thereof without permanent distortion upon insertion of the contact into the connector body.

Yet a further object is in the provision of a contact structure and connector body of the character described, and in which the contact structure is equipped with a pair of substantially parallel contact legs integrally connected at one of their ends to a base which extends generally diagonally therebetween in an angular orientation with respect to the plane of each leg so as to permit the legs of the contact structure to rotate slightly about the points of connection thereof with the base upon insertion of the contact structure into a connector body. Additional objects and advantages of the invention will become apparent as the specification develops.

An embodiment of the invention is illustrated in the accompanying drawings, in which—

FIGURE 1 is a broken perspective view of an edge connector embodying the invention and shown in cooperating relation with a conductor-equipped panel; FIGURE 2 is a transverse sectional view taken along the line 2-2 of FIGURE 1; FIGURE 3 is a broken top plan view of the connector body showing particularly one of the contact-receiving cavities but with the contact removed therefrom; FIGURE 4 is a transverse sectional view taken along the line 4-4 of FIGURE 3; FIGURE 5 is a transverse sectional view taken along the line 5-5 of FIGURE 4; FIGURE 6 is an enlarged, broken perspective view showing a portion of the connector body and a contact arranged in spaced apart relation with the contact in position for insertion into the cavity therefor; FIGURE 7 is a top plan view of one of the contact structures; FIGURE 8 is a side view in elevation of the contact structure shown in FIGURE 7; FIGURE 9 is a vertical sectional view taken along the line 9-9 of FIGURE 8; FIGURE 10 is a longitudinal sectional view taken along the line 10-10 of FIGURE 8; FIGURE 11 is an end view in elevation of the contact structure taken looking toward the left as the contact is seen in FIGURE 8; and FIGURE 12 is a transverse sectional view in elevation similar to that of FIGURE 9, but showing the condition of the contact structure when partially inserted into the connector cavity therefor.

The specific environmental embodiment of the invention as shown in the drawings is an edge connector designated generally with the numeral 15 and comprising a body part or casting 16 and a plurality of contact structures 17 respectively connected to lead wires 18. The body part 16 is formed from one of the well known insulating materials usually employed for such purpose, and is provided with a longitudinally extending slot or channel 19 adapted to receive the edge portion of a male component therein such as the conductor-equipped panel 20. In the specific form shown, the panel 20 is of the type frequently referred to as a single-circuit panel having a plurality of conductors 21 and 22 disposed on opposite sides thereof and arranged so that each pair of aligned conductors 21 and 22 are adapted to be connected to each other through one of the contacts 17. To facilitate inser-

tion of the panel 20 in to the channel 19, the mouth of the channel may be enlarged slightly as shown at 23.

The connector body 16 is also provided with a plurality of longitudinally spaced cavities 24 extending transversely thereof, and each of the cavities is adapted to receive a contact structure 17 therein. By referring to FIGURES 3 through 5 in particular, it will be noted that the panel-receiving channel 19 is centrally disposed with respect to each of the cavities 24 and extends thereinto. Each of the cavities 24 is provided with a first pair of transversely extending, facing walls 25 and 26, and with a second pair of longitudinally extending, facing walls 27 and 28. The facing walls 25 and 26 are equipped respectively with ribs 29 and 30, that are transversely oriented and extend inwardly toward the center of the cavity 24 from the walls 25 and 26 and that are located along diagonally opposite corners of the cavity 24 but in spaced relation with the respectively adjacent longitudinally extending walls 28 and 27. The ribs 29 and 30 extend from the rear face 31 of the connector body toward the front face 32 thereof, and terminate in substantially contiguous relation with abutment elements 33 and 34 located adjacent such diagonally opposite corners in overhanging relation with the cavity 24.

Disposed along the opposite longitudinally extending walls 27 and 28 intermediate the ends thereof are a pair of lands or locking elements 35 and 36. The elements 35 and 36 are disposed along diametrically opposite corners of the cavity 24 in substantially contiguous relation with the associated transverse walls 25 and 26, and project outwardly from the walls 27 and 28 toward the center of the cavity. As shown most clearly in FIGURE 4, each of the elements has a flat wall portion 37 generally normal to the plane of the walls 27 and 28 and disposed in facing relation with the forward surface 32 of the connector body, and each element has a rearwardly oriented, inclined cam surface 38 having an angular disposition of about 22° with the respectively associated longitudinal walls 27 and 28.

Each of the contacts 17 has a base 39 equipped at one end with a tail 40 adapted to be crimped about the insulating sheath of the lead wire 18, as shown best in FIGURE 2. The base 39 or a portion of the tail 40 is adapted to be electrically connected with the lead wire 18 as, for example, by means of the solder joint 41 shown in FIGURE 2. Extending forwardly from the base 39 along opposite sides thereof are a pair of generally parallel and spaced apart legs 42 and 43 that lie along the facing walls 27 and 28 when the contact structure is within the cavity 24 and substantially engage the overhanging abutment elements 33 and 34. At their forward ends, the legs 42 and 43 are turned upon themselves and define contact segments 44 and 45, that respectively extend along the planes of the legs 42 and 43 and terminate in spring segments 46 and 47 disposed between the respectively associated legs and contact segments 42—44 and 43—45. Such spring segments are formed integrally with the associated contact segments, and the associated contact segments are turned upon themselves to define the spring segments which then extend generally along the planes of both the legs and contact segments.

Each of the contact segments is formed of a resilient material having spring-like characteristics such as a Phosphor bronze composition, and the contact segments 44 and 45 are biased inwardly toward each other (as shown best in FIGURE 8) by the normal resilience thereof, and are further urged into such position by the spring segments 46 and 47 which bear against the respectively associated legs 42 and 43. However, when the printed wire panel 20 is inserted into the channel 19, it engages the contact segments 44 and 45 and compresses or displaces the same outwardly against the resilience thereof and against the spring force of the segments 46 and 47. Consequently, the contact segments frictionally grip the con-

ductors 21 and 22 of the panel 20 and thereby establish a good electrical connection therewith.

As shown most clearly in FIGURES 9 and 11, the base 39 is generally semi-cylindrical throughout the center portion thereof, and extends substantially diagonally between the legs 42 and 43 and is formed integrally therewith. Thus, the base is angularly disposed with respect to the plane of the leg 42 and also with respect to the plane of the leg 43. The joinder of the base with the legs extends along the length of the base and defines axes 48 and 49 about which the legs are slightly pivotal in a direction that tends to reduce the included angle between each of the legs and the base at the point of connection of the base thereto. This action of the legs is important during insertion of the contact into the cavity therefor, as will be described subsequently in greater detail.

The legs 42 and 43 are respectively provided along the free longitudinally extending edges 50 and 51 thereof with openings 52 and 53 which are adapted to align with the interlocking elements 35 and 36 and seat the same therein when the contact is fully inserted into its cavity. The opposite longitudinal edges 54 and 55 of the legs 42 and 43, and which might be considered confined edges since they are effective continuations of the lines of joinder 48 and 49 of the base with the legs but extend slightly outwardly therefrom, are adapted to be disposed behind the ribs 29 and 30 when the contact structure is inserted into the cavity 24, whereupon the ribs cooperate with such edges 54 and 55 to prevent inward displacement of the legs toward the center of the cavity.

In assembly of the connector, each of the contact structures 17 is connected to a lead wire 18, and thereafter each contact is disposed with respect to the connector body 16 (as shown in FIGURE 6) with the contact in alignment with the cavity 24 along the rear face 31 of the body. The contact is then moved into the cavity; and as the contact advances toward the face 32 of the connector body, the legs 42 and 43 engage the cam edges 38 of the elements 35 and 36 and ride thereover. At substantially the same time, the outwardly projecting longitudinal edges 54 and 55 of the legs are respectively disposed between the longitudinal wall 27 and rib 30 and longitudinal wall 28 and rib 29. Ultimately, the recesses or openings 52 and 53 come into alignment with the elements 35 and 36, and seat such elements therein. At this time, the contact is locked within the cavity because displacements thereof are prevented in a direction toward the rear face 31 by engagement of the surfaces 37 of the elements 35 and 36 with the forward edges of the openings 52 and 53 of the contact legs; and similarly, displacements toward the face 32 of the body are prevented by substantial abutment of the turned forward end portions of the legs 42 and 43 with the overhanging shelves or abutments 34 and 33. Thus, the conductor-equipped panel may be inserted into the channel 19 and removed therefrom without displacing any of the contacts 17.

The locking elements 35 and 36 are located at approximately the center portion of the cavity 24 or substantially midway between the faces 31 and 32 of the connector body, and as a result the contact 17 is inserted a substantial distance into the cavity before the elements 35 and 36 are engaged by the contact. As the edge portions 50 and 51 of the contact legs engage the inclined cam surfaces 38 of the elements 35 and 36 and ride upwardly thereon, the legs are necessarily displaced in order for the legs to ride thereover. In the present structure, such displacement is not accommodated wholly through compression of the legs 42 and 43 toward each other; but rather, the legs are compressed slightly, and at the same time are rotated or pivoted about the axes or edges 48 and 49, as is shown most clearly in FIGURE 12.

Since this twisting action occurs along the joinder of the respective legs 42 and 43 with the base 39, it has substantially no effect on the resilience of the contact

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legs, and more particularly the segments 44—46 and 45—47 thereof. Consequently, the necessary resilience and spring-like qualities of these segments are not adversely influenced nor partially destroyed by a compression of such magnitude that would tend to give the legs and segments a permanent set in the deformed, compressed condition thereof. A loss of resilience is undesirable, for the quality of the electrical connection defined between the contact segments 44 and 45 with the respectively associated conductors 21 and 22 of the panel 20 is wholly dependent upon the resilience of the contact legs and segments thereof and the frictional grip defined thereby.

Thus, in the insertion of a contact into its cavity, the deformation necessarily enforced on the contact is distributed between a partial compression of the various segments of the contact legs and a pivoting or slight rotation of the contact legs about the axes 48 and 49 extending along the jointure of the contact legs with the contact base 39. Once the contact has been inserted to the extent that the elements 35 and 36 are respectively aligned with the openings 52 and 53, the contact snaps back into its pre-deformed condition and seats the elements in the openings therefor as previously explained. While the contact is insertable without the use of tools into the connector block, removal of the contact therefrom requires the use of a tool for displacing the contact legs so as to release the same, and more particularly the edges of the openings 52 and 53 from the elements 35 and 36. It will be noted especially in FIGURES 7 through 11 that the spring segments 46 and 47 are reduced in width, and therefore are offset laterally from and do not extend over the openings 52 and 53; and such offsetting of the spring segments is provided so as to clear the same of the locking elements 35 and 36 so that such elements do not interfere with free flexing of the contact segments 44 and 45 and spring segments 46 and 47 when a conductor-equipped panel 20 is inserted into the channel 19.

While in the foregoing specification an embodiment of the invention has been set forth in considerable detail for purposes of making a complete disclosure thereof, it will be apparent to those skilled in the art that numerous changes may be made in such details without departing from the spirit and principles of the invention.

I claim:

1. In combination with a connector body part provided both with a transversely extending contact-receiving cavity adapted to receive a terminal of a mating connector, said cavity having a pair of spaced apart and generally parallel, facing walls equipped intermediate the ends thereof with a pair of locking elements respectively disposed along diagonally opposite corner portions of said cavity, a contact structure mounted within said cavity and having a pair of generally parallel legs respectively disposed along said facing walls and being provided with openings therein respectively receiving said locking elements to constrain said contact structure against displacements in a transverse direction, and said contact structure being provided with a base adapted to be connected to a lead wire and being formed integrally with said legs and extending diagonally therebetween, said contact structure being adapted to snap into an interlocking engagement with said cavity upon insertion therein and to ride over said locking elements during such insertion to align the same with said openings and thereby seat the locking elements therein and said legs being rotatable slightly about the respective locations of connection thereof with said base during such insertion and movement of the legs over said locking elements so as to avoid excessive compression of said contact legs and thereby facilitate insertion of said contact structure into said cavity.

2. In combination with a connector body part provided both with a transversely extending contact-receiving cavity and with a longitudinally extending channel centrally disposed with respect to said cavity and adapted to receive

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an edge portion of a conductor-equipped panel therein, said cavity having a pair of spaced apart and generally parallel, facing walls equipped intermediate the ends thereof with a pair of locking elements respectively disposed along diagonally opposite corner portions of said cavity, a contact structure mounted within said cavity and having a pair of generally parallel legs respectively disposed along said facing walls and being provided with openings therein respectively receiving said locking elements to constrain said contact structure against displacements in a transverse direction, each of said legs being provided with a resilient contact segment formed integrally therewith and extending therealong and terminating in a resilient spring segment extending angularly therefrom toward the associated leg, and said contact structure being provided with a base adapted to be connected to a lead wire and being formed integrally with said legs and extending diagonally therebetween, said contact structure being adapted to snap into an interlocking engagement with said cavity upon insertion therein and to ride over said locking elements during such insertion to align the same with said openings and thereby seat the locking elements therein and said legs being rotatable slightly about the respective locations of connection thereof with said base during such insertion and movement of the legs over said locking elements so as to avoid excessive compression of said contact legs and thereby facilitate insertion of said contact structure into said cavity.

3. In combination with a connector body part provided both with a transversely extending contact-receiving cavity and with a longitudinally extending channel centrally disposed with respect to said cavity and adapted to receive an edge portion of a conductor-equipped panel therein, said cavity having a pair of facing, transversely extending walls and a pair of facing, longitudinally extending walls, one of said pairs of walls being equipped with a pair of ribs respectively extending along diagonally opposite corner portions of said cavity in spaced relation with the respectively adjacent walls of the other of said pairs, said cavity also being equipped along the other of said pairs of walls with a pair of locking elements respectively disposed along the other diagonally opposite corner portions of said cavity, a contact structure mounted within said cavity and having a pair of generally parallel legs respectively disposed along the locking element-equipped walls and being provided with openings therein respectively receiving said locking elements to constrain said contact against displacements in a transverse direction and having edge portions respectively disposed between said ribs and the respectively associated walls spaced therefrom so as to enable said ribs to constrain said legs against displacements toward the center of said cavity, and said contact structure being provided with a base adapted to be connected to a lead wire and being formed integrally with said legs and extending diagonally therebetween, said contact structure being adapted to snap into an interlocking engagement with said cavity upon insertion therein and to ride over said locking elements during such insertion to align the same with said openings and thereby seat the locking elements therein and said legs being rotatable slightly about the respective locations of connection thereof with said base during such insertion and movement of the legs over said locking elements so as to avoid excessive compression of said contact legs and thereby facilitate insertion of said contact structure into said cavity.

4. The combination of claim 3 in which each of said legs is provided with a resilient contact segment formed integrally therewith and extending therealong and terminating in a resilient spring segment extending angularly therefrom toward the associated leg.

5. The combination of claim 3 in which each of said locking elements is provided with an inclined cam surface to facilitate movement of the associated leg thereover when said contact structure is inserted into said

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cavity, said locking elements being effective to constrain said contact structure against displacements in one transverse direction, and in which said connector body part is provided with abutment elements respectively oriented in alignment with said contact legs and disposed in substantial engagement therewith so as to constrain said contact against displacements in the other transverse direction.

6. The combination of claim 3 in which each of said ribs extends substantially from end to end of said cavity.

7. The contact structure of claim 3 in which the jointure of said base with each of said legs defines a pivotal axis extending along the length of said contact structure.

8. In combination with a connector body part provided both with a transversely extending contact-receiving cavity and with a longitudinally extending channel centrally disposed with respect to said cavity and adapted to receive an edge portion of a conductor-equipped panel therein, said cavity having a pair of facing, transversely extending walls and a pair of facing, longitudinally extending walls and being equipped along said transversely extending walls with a pair of ribs respectively extending along the diagonally opposite corner portions thereof in spaced relation with the longitudinally extending walls respectively adjacent thereto, said cavity also being equipped along said longitudinally extending walls with a pair of locking elements respectively disposed along the diagonally opposite corner portions thereof in respective adjacency with said transversely extending walls, a contact structure mounted within said cavity and having a pair of generally parallel legs respectively disposed along said longitudinally extending walls and being provided with openings therein respectively receiving said locking elements therein to constrain said contact against displacements in a transverse direction and having edge portions respectively disposed between said ribs and the respectively associated longitudinally extending walls so as to enable said ribs to constrain said legs against displacements toward the center of said cavity, and said contact structure being provided with a base adapted to be connected to a lead wire and being formed integrally

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with said legs and extending diagonally therebetween, said contact structure being adapted to snap into an interlocking engagement with said cavity upon insertion thereinto and to ride over said locking elements during such insertion to align the same with said openings and thereby seat the locking elements therein and said legs being rotatable slightly about the respective locations of connection thereof with said base during such insertion and movement of the legs over said locking elements so as to avoid excessive compression of said contact legs and thereby facilitate insertion of said contact structures into said cavity.

9. The combination of claim 8 in which each of said legs is provided with a resilient contact segment formed integrally therewith and extending therealong and terminating in a resilient spring segment extending angularly therefrom toward the associated leg.

10. The combination of claim 8 in which each of said locking elements is provided with an inclined cam surface to facilitate movement of the associated contact leg thereover when said contact structure is inserted into said cavity, said locking elements being effective to constrain said contact structure against displacements in one transverse direction, and in which said connector body part is provided with abutment elements respectively oriented in alignment with said contact legs and disposed in substantial engagement therewith so as to constrain said contact against displacements in the other transverse direction.

11. The combination of claim 8 in which each of said ribs extends substantially from end to end of said cavity.

12. The combination of claim 8 in which the jointure of said base with each of said legs defines a pivotal axis extending along the length of said contact structure.

References Cited in the file of this patent

UNITED STATES PATENTS

2,468,368	Jackson	Apr. 26, 1949
2,575,161	Deakin	Nov. 13, 1951
2,741,751	Weiler	Apr. 10, 1956
2,911,612	Jackson et al.	Nov. 3, 1959