

Nov. 9, 1965

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POSITIVE PRESSURE CONNECTOR

Filed Dec. 22, 1964

2 Sheets-Sheet 1

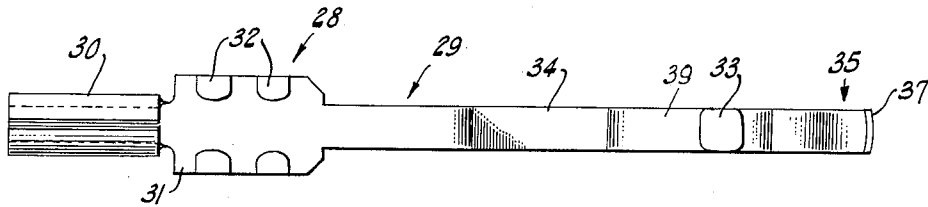


Fig. 1

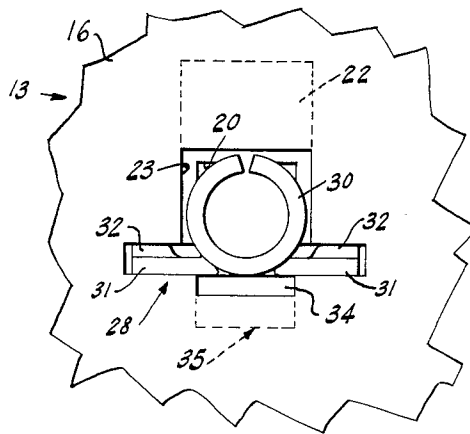


Fig. 2

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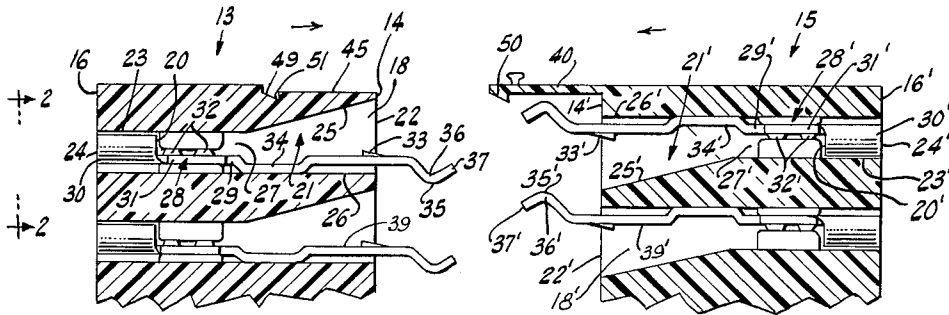


Fig. 3

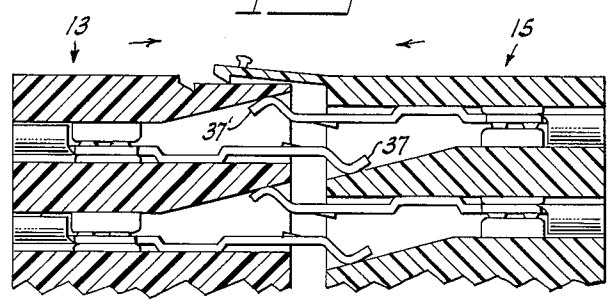


Fig. 4

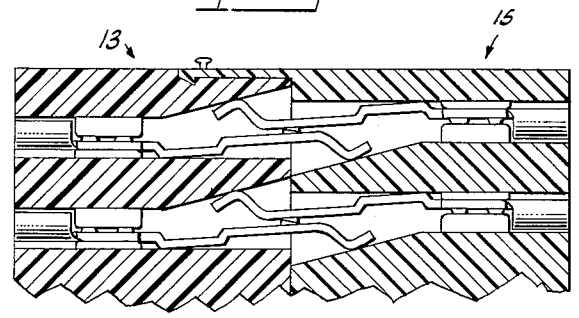


Fig. 5

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**POSITIVE PRESSURE CONNECTOR**

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 6 Claims. (Cl. 339-49)

This invention relates to electrical connectors and more particularly to an electrical connective assembly having positive pressure connector means therein.

There are multitudinous types of electrical connective devices wherein a great variety of cooperating slidable connectors are utilized. Unfortunately, many of these devices have questionable reliability notably in situations where vibration and shock are significant factors. One means for increasing reliability involves the use of tight-fitting complementary portions which are difficult to separate when such need arises. Alleviation of the tight fitting of cooperating connective elements, especially in multiple connector assemblies, has in some cases aggravated poor connections and arcing.

Accordingly, an object of this invention is to reduce the aforementioned disadvantages and to provide an improved electrical connective assembly device.

Another object is the provision of an assemblage of connectors wherein positive pressure is applied to the contact portions by mechanical means to effect low contact withdrawal resistance.

A further object is to provide a connective assembly that has improved vibration and shock reliability.

The foregoing objects are achieved in one aspect of the invention by the provision of an electrical connective assembly wherein two insulative connector blocks have compatibly formed junction surfaces with like conversely opposed recesses therein. Each of the opposing recesses has at least one wall formed as an inwardly extending inclined plane. A resilient longitudinal connector, securely affixed in each recess, has a contact portion thereon and a formed termination portion protruding from the respective junction surface and positioned to extend into the opposed recess. Since the opposing connectors are conversely related, they form a paired relationship as the two connector blocks are brought together. The opposing terminations are spacedly oriented to pass one another and enter the opposite recess where each touches and slidably follows the surface of the inclined plane therein to mechanically consummate positive pressured superimposition of the two contact portions which is simultaneous to the meeting of the junction surfaces of the two connector blocks. Cooperating guide and receiving means and complementary locking provisions associated with each of the blocks facilitates the proper positioning and fastening of the blocks together to form a reliable connective assembly having positive pressured contact means therein. Upon release of the complementary locking provisions, the connector resiliency in conjunction with the inclined planes permits slidable release of the contact pressure and enables facile separation of the assembly connector blocks.

For a better understanding of the present invention, together with other and further objects, advantages, and capabilities thereof, reference is made to the following specification and appended claims in connection with the accompanying drawings in which:

FIGURE 1 is a top plan view showing constructional details of a connector;

FIGURE 2 is an end view of the connector and recess portions taken along the line 2-2 of FIGURE 3; and

FIGURES 3, 4, and 5 are side sectional views illustrating the cooperating features of the connective assembly.

Referring to the drawings, an electrical connective assembly 11 is comprised of a pair of complementary insula-

tive members in the form of first and second connector blocks 13, and 15, respectively, with compatibly formed junction surfaces 14 and 14' individually thereon. Henceforth in this specification, the ensuing numerical identification notations with prime (') designations refer to like elements associated with the second connector block. These two blocks, 13 and 15, have like individual longitudinal recesses, 18 and 18' formed therein with apertures 22 and 22' opening on the respective junction surfaces 14 and 14'. Each of these recesses 21 or 21', has one wall formed as an inclined plane 25 or 25', to provide an inner cam surface. Within each of the recesses, there is positioned and affixed a like resilient longitudinal electrical connector 29 or 29' which has a termination portion 35 or 35' protruding from each of the respective apertures. Each of these connectors has a contact portion 33 or 33' formed thereon at substantially the plane of the respective junction surface. These two connector blocks are positioned with the apertured recesses of one being substantially conversely opposed to the recesses of the other to permit the individual protruding terminations 35 of the first block 13 to enter the recesses 21' of the second block 15 and vice versa; with the termination portions 35 and 35' slidably contacting the respective inclined recess surfaces.

Block 15 has cooperating guide means 40 and block 13 has opposing receiving means 45 with complementary locking provision 49 to facilitate the positioning and fastening of the two blocks together with the junction surfaces thereof in contiguous relationship. In so consummating this junction, the respective connector terminations mechanically follow the recess cam surfaces to effect simultaneous positive pressure super-imposition of the respective connector contacts 33 and 33'.

In greater detail, FIGURES 3, 4, and 5 show the sequential cooperation of the various elements in the mating of the two connector blocks 13 and 15. These insulative blocks can be mold fabricated from a number of suitable plastic materials having high impact strength, heat resistance, dimensional stability, and insulative properties. An appropriate example is the thermoplastic polycarbonate resin "Lexan" as manufactured by General Electric Company, Pittsfield, Massachusetts. Each block has a junction surface 14 or 14' and a connection surface 16 or 16' removed therefrom.

To aid in explicit delineation, there is illustrated in FIGURE 3 the two connector blocks 13 and 15, respectively, in position for subsequent cooperation. For specific detail, the first connector block 13 has therein a longitudinal contoured recess 21 with the longitudinally formed electrical connector 29 positioned and affixed therein. This recess, which is variably proportioned, extends through the block portion 13 with a substantially full-dimensioned rectangular-shaped aperture 22 opening on the junction surface 14 and an opposite channel opening 24 on the connection surface 16.

In the contoured recess there is, extending inwardly from the aperture 22 thereof, a primal wall portion formed as an inclined plane or inner cam surface 25. Oppositely disposed from the primal wall 25 is a secondary wall portion 26 which is substantially parallel to the longitudinal plane of the recess. These two walls 25 and 26 coextend interiorly from the aperture 22 to form a recess neck portion 27 having connector seating means 28 formed therein as two longitudinal slots, one on either side of the recess. Beyond the connector seating means 28 the neck portion 27 terminates in a channel 23 which extends to the connection surface 16 as a channel opening 24.

Positioned and seated within the recess 21 is the aforementioned electrical connector 29. This element is made of a resilient metal such as tempered Phosphor-bronze alloy. The connector has a basic terminal portion 30

which, in this instance, is formed as a sleeve to be encompassed within the recess channel 23. This sleeve terminal portion 30 is fashioned to provide a female connection contained within the block 16 to effect an exterior electrical junction. It is evident that this external electrical connection provision could feasibly be of other construction and still be in keeping with the intent of the embodiment of the invention. Adjacent to the basic terminal portion 30 and extending interiorly therefrom is a substantially flattened connector affixal portion 31 having increased width and a plurality of spaced raised areas or bosses formed thereon to be slidably secured in longitudinal seating slots 28 with the inner end of the terminal portion 30 seating against the recess wall portion 20. This seating feature is clearly illustrated in FIGURES 1, 2, and 3.

From the affixal portion 31, the connector extends integrally through the neck portion of the recess into the expansive portion 21 thereof; wherein there is formed in the connector a positioner portion 34 which is oriented and fashioned in a protuberant manner to be contiguous to at least a portion of the recess secondary wall 26. By having the connector so placed in a firm affixal seat and formed with the positioner portion 34 at least slightly tensioned against a portion of the secondary wall 26, accurate return placement of the connector is effected following operational action.

The connector integrally extends beyond the positioner portion to emerge from the recess and pass through the aperture 22 with a termination portion 35 protruding beyond the junction surface 14 of the block. This termination portion 35 is formed as a protuberance from the same side of the connector as the protuberant positioner portion to be substantially hook-shaped having a depression 36 with an integrant upturned end portion 37. Thus, the termination is aptly formed to function as a cam follower.

Intermediate the termination 35 and positioner 34 portions, and on the opposite side 39 of the connector therefrom, a discrete contact portion 33 of a precious metal such as gold or an alloy thereof, is formed at substantially the plane of the junction surface 14. It has been found that a substantially wedge-shaped contact portion is advantageous in achieving the subsequent superimposition of the two contacts 33 and 33'; each contact having a plane of inclined rise 38 or 38' defining an increased thickness in the region substantially toward the protuberant positioner portion 34 or 34'.

Usage has shown that the upturned termination 37 should have as a maximum limit the plane defined by the connector contact supporting surface 39.

Associated with each of the connector blocks are complementary guide and receiving means, of which, one cooperating pair is shown wherein guide means 40 of the second connector block cooperates with receiving means 45 of the first block. In each instance, the guide means are of length greater than that of the connector portions protruding beyond the respective junction surfaces. Thus, the two connector blocks are properly oriented so that their respective junction surfaces 14 and 14' are in superjacent relationship with the apertured recesses 22 being conversely opposed to the apertured recesses 22'. This associated relationship permits the individual protruding connector terminations 35 of the first block 13 to assume a spaced apart conversely paired relationship with those terminations 35' protruding from the related second connector block 15. As the two blocks are guided in the approach of the respective junction surfaces, the paired terminations 35 and 35', being spacedly oriented to pass one another, individually enter the respective opposing recess. The formed termination portions 35 and 35' act as cam followers and in a mechanical manner slidably follow the respective recess inclined walls 25' and 25 to consummate positive pressured superimposition of the respective wedge-shaped contacts 33 and 33'; this being accomplished simultaneously with the meeting of

the junction surfaces 14 and 14' of the two connector blocks 13 and 15, respectively.

The complementary locking provision 49 on block 13 is adapted to hold the two blocks together once the junction surfaces have met. One type of locking means 50 is associated as a formed end portion on guide means 40. Complementary thereto is locking seat 51 which is formed in receiving means 45 to compatibly accept the respective locking means 50; locking means 50 mating with locking seat 51. It will be noted that when the complementary locking means are released, the resilient connectors 29 and 29' in conjunction with the inclined recess cam surfaces 25' and 25 provides for the positive contact pressure to be slidably released thereby enabling the connector blocks to be easily separated.

Thus, there is provided an electrical connective assembly device having improved shock and vibration reliability wherein two complementary members are formed and equipped with connective provisions for achieving, by cooperating mechanical means, a positive pressure between mated electrical contacts. Upon release of the assembly locking provisions, low contact withdrawal resistance is effected to enable facile separation of the complementary connector members.

While there has been shown and described what is at present considered the preferred embodiment of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the scope of the invention as defined by the appended claims.

What is claimed is:

1. An electrical connective assembly having positive pressure connector means therein comprising:

a pair of insulative connector blocks forming first and second complementary members each having a compatible junction surface formed to provide superjacent positioning therebetween and a connection surface removed from said junction surface;

at one longitudinal contoured recess formed within each of said connector blocks and extended there-through from said connection surface to an aperture opening on said junction surface, each of said recesses having at least one wall portion therein formed as an inclined plane cam surface;

a plurality of like resilient longitudinal electrical connectors adapted to be individually positioned and affixed within said recesses with a basic terminal portion extended to said connection surface to effect an external electrical junction, said connector extending internally and emerging from said recess aperture to protrude substantially therefrom beyond said junction surface as a termination portion formed to function as a cam follower, said connector having a contact portion formed thereon at substantially the plane of said junction surface; and

cooperating guide and receiving means and complementary locking provisions associated with each of said connector blocks to facilitate the positioning and fastening of said blocks together with said junction surfaces in related positions, said apertured recesses being conversely opposed to permit the individual protruding terminations of said first block to assume a spaced apart conversely paired relationship with those terminations protruding from said related second block, said paired terminations being oriented to pass one another and enter said respective opposite recess to slidably follow the cam surface therein to mechanically consummate positive pressured superimposition of said contact portions simultaneous to the meeting of said junction surfaces and the conjunction of said locking provisions.

2. An electrical connective assembly having positive pressure connector means therein comprising:

a pair of insulative connector blocks in the form of a first member and a complementary second member, each of said first and second members having a junc-

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tion surface compatibly formed to provide superjacent positioning therebetween, each of said first and second members having a connection surface removed from said junction surface;

at least one variably proportioned contoured recess 5  
formed within each of said first and second connector blocks and extended therethrough as first and second recesses respectively, each of said recesses being formed to provide a substantially expansive portion at one end with a full dimensioned aperture 10  
opening on a respective junction surface, each of said recesses having a primal wall portion formed as an inclined plane to provide an inner cam surface and a secondary wall portion oppositely disposed therefrom, both of said walls coextending interiorly 15  
through said expansive portion adjacent said aperture to form a neck portion having seating means therein, said neck portion terminating in a channel formed to accommodate exterior connective means being relative to said respective connection surface; 20

a plurality of resilient longitudinal electrical connectors adapted to be individually positioned within said respective recesses as first and second connectors respectively, each of said connectors having a basic terminal portion extended through said channel 25  
relative to said connection surface to effect an external electrical junction and an adjacent affixal portion firmly secured in said seating means, said connector integrally extending from said affixal portion into said recess, said connector being formed 30  
to provide a contoured positioner portion oriented substantially in the neck portion of said recess with said positioner portion contiguous to at least a portion of said recess secondary wall, said connector extending from said positioner portion and emerging 35  
from said recess aperture to protrude therefrom beyond said respective junction surface with a termination portion formed to function as a cam follower, said follower being formed as a protuberance from the same connector side as said positioner portion, 40  
said connector having a discrete contact portion formed intermediate said termination and positioner portions and oriented on the opposite connector side therefrom; and

cooperating guide and receiving means associated with each of said first and second connector blocks to facilitate the positioning of said blocks together with their respective junction surfaces in superjacent relationship, said guide means being of a length greater than that of the connector portions protruding beyond the respective junction surfaces, said apertured 50  
recesses opening on said respective junction surfaces being conversely opposed to permit said individual protruding terminations of said first block to assume a spaced apart conversely paired relationship with those terminations protruding from said related second 55  
block, said paired terminations being spacedly oriented to pass one another, enter the respective opposing recess and slidably follow the cam surface therein to mechanically consummate positive pressured superimposition of said contact portions simultaneous to the meeting of said junction surfaces. 60

3. An electrical connective assembly having positive pressure connector means therein comprising:

a pair of insulative connector blocks in the form of a first member and a complementary second member, each of said first and second members having a junction surface compatibly formed to provide superjacent positioning therebetween, each of said first and second members having a connection surface removed from said junction surface; 70

at least one variably proportioned contoured recess formed within each of said first and second connector blocks and extended therethrough as first and second recesses respectively, each of said recesses being formed to provide a substantially expansive 75

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portion at one end with a full dimensioned aperture opening on a respective junction surface, each of said recesses having a primal wall portion formed as an inclined plane to provide an inner cam surface and a secondary wall portion oppositely disposed therefrom, both of said walls coextending interiorly through said expansive portion adjacent said aperture to form a neck portion having seating means therein, said neck portion terminating in a channel formed to accommodate exterior connective means being relative to said respective connection surface;

a plurality of like resilient longitudinal electrical connectors adapted to be individually positioned within said respective recesses as first and second connectors respectively, each of said connectors having a basic terminal portion extended through said channel relative to said connection surface to effect an external electrical junction and an adjacent affixal portion firmly secured in said seating means, said connector integrally extending from said affixal portion into said recess, said connector being formed to provide a contoured protuberant positioner portion oriented substantially in the neck portion of said recess with said positioner portion contiguous to at least a portion of said recess secondary wall, said connector extending from said positioner portion and emerging from said recess aperture to protrude therefrom beyond said respective junction surface with a termination portion formed to function as a cam follower, said follower being formed as a protuberance from the same connector side as said protuberant positioner portion, said connector having a discrete contact portion formed intermediate said termination and positioner portions and oriented on the opposite connector side therefrom at substantially the plane of said respective junction surface; and 5  
cooperating guide and receiving means and complementary locking provisions associated with each of said first and second connector blocks to facilitate the positioning and fastening of said blocks together with their respective junction surfaces in superjacent relationship, said guide means being of a length greater than that of the connector portions protruding beyond the respective junction surfaces, said apertured recesses opening on said respective junction surfaces being conversely opposed to permit said individual protruding terminations of said first block to assume a spaced apart conversely paired relationship with those terminations protruding from said related second block, said paired terminations being spacedly oriented to pass one another, enter the respective opposing recess and slidably follow the cam surface therein to consummate positive pressured superimposition of said contact portions simultaneous to the meeting of said junction surfaces and the conjunction of said locking provisions.

4. An electrical connective assembly having positive pressure connector means therein comprising:

a pair of insulative connector blocks in the form of a first member and a complementary second member, each of said first and second members having a junction surface compatibly formed to provide superjacent positioning therebetween, each of said first and second members having a connection surface removed from said junction surface;

at least one longitudinally proportioned contoured recess formed within each of said first and second connector block and extended therethrough as first and second recesses respectively, each of said recesses being formed to provide a substantially expansive portion at one end with a full dimensioned rectangular-shaped aperture opening on a respective junction surface, each of said recesses having

a primal wall portion formed as an inclined plane to provide an inner cam surface and a secondary wall portion oppositely disposed therefrom being substantially parallel to the longitudinal plane of said recess, both of said walls coextending interiorly through the expansive portion adjacent said aperture to form a neck portion having substantially longitudinal seating means therein, said neck portion terminating in a channel formed to accommodate exterior connective means being relative to said respective connection surface;

a plurality of like resilient longitudinal electrical connectors adapted to be individually positioned within said respective recesses as first and second connectors respectively, each of said connectors having a basic terminal portion extended through said channel relative to said connection surface to effect an exterior electrical junction and an adjacent affixal portion of increased width having a plurality of bosses spaced thereon to firmly secure said connector in said longitudinal seating means, said connector integrally extending from said affixal portion into said recess; said connector being formed to provide a contoured protuberant positioner portion oriented substantially in the neck portion of said recess with said positioner portion contiguous to at least a portion of said recess secondary wall, said connector extending from said positioner portion and emerging from said recess aperture to protrude therefrom beyond said respective junction surface with a termination portion formed to function as a cam follower, said follower being formed as a protuberance from the same side of the connector as said protuberant positioner portion, said connector having a discrete contact portion formed intermediate said termination and positioner portions and oriented on the opposite side of said connector therefrom at substantially the plane of said respective junction surface; and

cooperating guide and receiving means associated with each of said first and second connector blocks to facilitate the positioning of said blocks together with their respective junction surfaces in superjacent relationship, said guide means being of a length greater than that of the connector portions protruding beyond the respective junction surfaces, said apertured recesses opening on said respective junction surfaces being conversely opposed to permit said individual protruding terminations of said first block to assume a spaced apart conversely paired relationship with those terminations protruding from said related second block, said paired terminations being spacedly oriented to pass one another, enter said respective opposing recess and slidably follow said cam surface therein to consummate positive pressured superimposition of said contact portions simultaneous to the meeting of said junction surfaces.

5. An electrical connective assembly having positive pressure connector means therein comprising:

a pair of insulative connector blocks in the form of a first member and a complementary second member, each of said first and second members having a junction surface compatibly formed to provide superjacent positioning therebetween, each of said first and second members having a connection surface removed from said junction surface;

at least one longitudinally proportioned contoured recess formed within each of said first and second connector blocks and extended therethrough as first and second recesses respectively, each of said recesses being formed to provide a substantially expansive portion at one end with full dimensioned aperture opening on a respective junction surface, each of said recesses having a primal wall portion formed as an inclined

plane to provide an inner cam surface and a secondary wall portion oppositely disposed therefrom, both of said walls coextending interiorly through said expansive portion adjacent said aperture to form a neck portion having seating means therein, said neck portion terminating in a channel formed to accommodate exterior connective means being relative to said respective connection surface;

a plurality of like resilient longitudinal electrical connectors adapted to be individually positioned within said respective recesses as first and second connectors respectively, each of said connectors having a basic terminal portion extended through said channel relative to said connection surface to effect an exterior electrical junction and an adjacent affixal portion firmly secured in said seating means, said connector integrally extending from said affixal portion into said recess, said connector being formed to provide a contoured protuberant positioner portion oriented substantially in the neck portion of said recess with said positioner portion contiguous to at least a portion of said recess secondary wall, said connector extending from said positioner portion and emerging from said recess aperture to protrude therefrom beyond said respective junction surface with a termination portion formed to function as a cam follower, said follower being formed as a protuberance from the same side of the connector as said protuberant positioner portion, said connector having a wedge-shaped contact portion formed on said connector surface intermediate said termination and positioner portions and oriented on the opposite side of said connector therefrom at substantially the plane of said respective junction surface, said wedge-shaped contact portion having a plane of inclined rise defining a thickness substantially toward said positioner portion; and

cooperating guide and receiving means associated with each of said first and second connector blocks to facilitate the positioning of said blocks together with their respective junction surfaces in superjacent relationship, said guide means being of a length greater than that of the connector portions protruding beyond the respective junction surfaces, said apertured recesses opening on said respective junction surfaces being conversely opposed to permit said individual protruding terminations of said first block to assume a spaced apart conversely paired relationship with those terminations protruding from said related second block, said paired terminations being spacedly oriented to pass one another, enter said respective opposing recess and slidably follow said cam surface therein to consummate positive pressured superimposition of said wedge-shaped contact portions in a complementary sliding manner simultaneous to the meeting of said junction surfaces.

6. An electrical connective assembly having positive pressure connector means therein comprising:

a pair of insulative connector blocks in the form of a first member and a complementary second member, each of said first and second members having a junction surface compatibly formed to provide superjacent positioning therebetween, each of said first and second members having a connection surface removed from said junction surface;

at least one longitudinally proportioned contoured recess formed within each of said first and second connector blocks and extended therethrough as first and second recesses respectively, each of said recesses being formed to provide a substantially expansive portion at one end with full dimensioned aperture opening on a respective junction surface, each of said recesses having a primal wall portion formed as an inclined plane to provide an inner cam surface and a secondary wall portion oppositely disposed therefrom,

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both of said walls coextending interiorly through said expansive portion adjacent said aperture to form a neck portion having substantially longitudinal seating means therein, said neck portion terminating in a channel formed to accommodate exterior connective means being relative to said respective connection surface;

a plurality of like resilient longitudinal electrical connectors adapted to be individually positioned within said respective recesses as first and second connectors respectively, each of said connectors having a basic terminal portion extended through said channel relative to said connection surface to effect an exterior electrical junction and an adjacent affixal portion firmly secured in said longitudinal seating means, said connector integrally extending from said affixal portion into said recess, said connector being formed to provide a contoured positioner portion oriented substantially in the neck portion of said recess with said positioner portion contiguous to at least a portion of said recess secondary wall, said connector extending from said positioner portion and emerging from said recess aperture to protrude therefrom beyond said respective junction surface with a substantially hook-shaped termination portion having a depression with an integrant upturned end formed to function as a cam follower, said follower being formed as a protuberance from the same side of the connector as said positioner portion, said connector having a substantially wedge-shaped contact portion formed on said connector surface intermediate said

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termination and positioner portions and oriented on the opposite side of said connector therefrom at substantially the plane of said respective junction surface, said connector contact supporting surface forming a plane defining the maximum limit of said upturned termination end; and

cooperating guide and receiving means associated with each of said first and second connector blocks to facilitate the positioning of said blocks together with their respective junction surfaces in superjacent relationship, said guide means being of a length greater than that of the connector portions protruding beyond the respective junction surfaces, said apertured recesses opening on said respective junction surfaces being conversely opposed to permit said individual protruding terminations of said first block to assume a spaced apart conversely paired relationship with those terminations protruding from said related second block, said paired terminations being spacedly oriented to pass one another, enter said respective opposing recess and slidably follow said cam surface therein to consummate positive pressured superimposition of said wedge-shaped contact portions in a complementary sliding manner simultaneous to the meeting of said junction surfaces.

#### References Cited by the Examiner

##### FOREIGN PATENTS

930,509 7/63 Great Britain.

JOSEPH D. SEERS, *Primary Examiner.*

UNITED STATES PATENT OFFICE  
CERTIFICATE OF CORRECTION

Patent No. 3,217,285

November 9, 1965

Wade E. Barre

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, line 39, for "at one" read -- at least one --.

Signed and sealed this 16th day of August 1966.

(SEAL)

Attest:

ERNEST W. SWIDER

Attesting Officer

EDWARD J. BRENNER

Commissioner of Patents