March 16, 1954 L. A. BONDON 2,672,500

PRESSURIZED MULTICONDUCTOR BULKHEAD CONNECTOR ASSEMBLY

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FIG. 1.

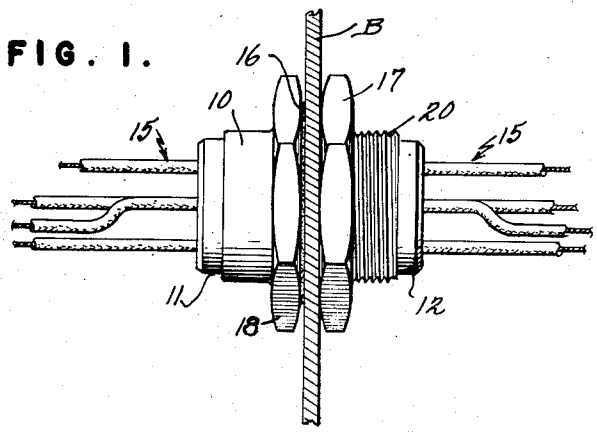


FIG. 2

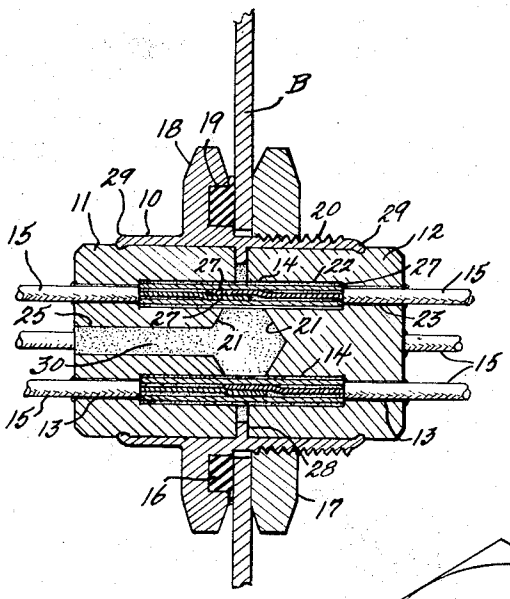


FIG. 3.

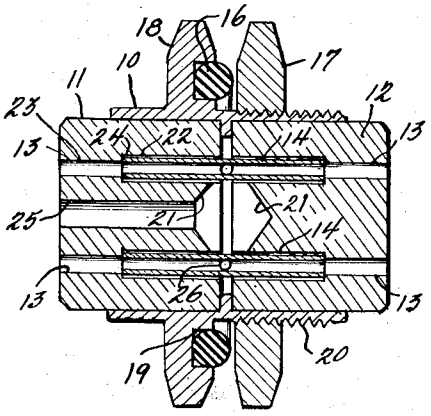
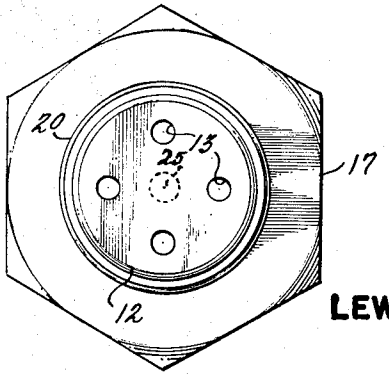


FIG. 4



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PRESSURIZED MULTICONDUCTOR BULKHEAD CONNECTOR ASSEMBLY

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6 Claims. (Cl. 174—153)

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This invention relates to connecting devices for insulated conductors and has more particular reference to a pressurized multi-conductor bulkhead connector assembly.

One object of the present invention is to provide a new and unique improved pressurized multi-conductor bulkhead connector assembly including a pressurized gland through which the conductors are mounted and sealed, enabling the assembly to be readily installed through the bulkhead of a pressurized compartment, making a gas or fluid-tight seal between the bulkhead member and gland.

A further object of the invention is to provide a pressurized multi-conductor bulkhead connector assembly, as characterized above, wherein means are provided within the gland to prevent any leakage of gas or moisture therethrough.

A further object of the invention is to provide a pressurized multi-conductor bulkhead connector assembly, as characterized above, wherein a portion of the insulation is removed from each of the conductors within the gland and the inside of the assembly is filled with a sealing compound to hermetically seal the gland against entrance of gas or moisture.

Another object of the invention is to provide a pressurized gland connector assembly for use in connecting ends of multiple conductors together where they pass through the bulkhead of a pressurized compartment and provide a fluid-tight joint between the bulkhead and gland and prevent leakage of gas or moisture through the gland.

A further object of the invention is to provide a pressurized gland connector assembly, as characterized above, which is simple in construction, quickly and easily installed on the job by a workman, and efficient in accomplishing its function after installation.

Other objects and advantages of the invention will appear in the following specification when considered in connection with the accompanying drawings, wherein:

Fig. 1 is a side elevational view of a pressurized multi-conductor bulkhead connector assembly constructed in accordance with the present invention;

Fig. 2 is a longitudinal sectional view of the assembly shown in Fig. 1;

Fig. 3 is a longitudinal sectional view similar to that shown in Fig. 2, but with the conductors and sealing compound omitted; and

Fig. 4 is an end elevational view of the assembly shown in Fig. 3.

When one or more insulated conductors are

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passed through a gland or bushing extending through a bulkhead or wall enclosing a pressurized compartment, it is extremely difficult to prevent air from leaking through the gland or to maintain stable electrical values. Particularly is this so in an insulated stranded wire conductor where the air may pass along the stranded conductor beneath the insulating covering, or even a single wire conductor when the insulating covering is made of woven or braided material, where the air may pass through the openings in the covering.

The present invention provides a pressurized multi-conductor bulkhead connector assembly which overcomes these difficulties and prevents any leakage of air or moisture therethrough and providing stable insulation resistance values.

In general, the invention comprises a pressurized multi-conductor bulkhead connector assembly including a pressurized gland or bushing having external flanges or the like by means of which a fluid-tight joint is made between the bushing and the bulkhead; a pair of insulating terminal blocks mounted in longitudinal alignment within the bushing and having a plurality of longitudinally extending and aligned bores therein; an insulated conductor extending into each of the bores in said terminal blocks and having a portion of its end free of insulation; means for electrically connecting and sealing the opposed ends of the conductor in each aligned pair of bores; and a sealing compound filling the air spaces in said bushing for hermetically sealing the assembly against leakage of air or moisture therethrough, thus maintaining stable electrical conditions through this assembly.

The invention contemplates that completed assemblies, including the conductors, be manufactured to specification and shipped ready to be installed merely by passing the conductors through the designed opening in the bulkhead and securing the bushing therein to make a fluid-tight joint between the bulkhead and the bushing.

The invention further contemplates that integrally packaged bulkhead assemblies, including the bushing, the terminal blocks and sleeve connectors, be supplied ready for installation by the worker on the job by securing the opposed ends of corresponding conductors within the assembly and then forcing a sealing compound therein to hermetically seal the assembly. Such assemblies find many uses in the aircraft building industry, as for example, in the installation of low tension electric control systems.

Referring now to the drawings, there is shown

a preferred embodiment of a pressurized multiconductor bulkhead connector assembly constructed in accordance with the present invention. In Figs. 1 and 2, the connector assembly is shown complete and mounted through a bulkhead or wall. In Figs. 3 and 4, the assembly is shown with the conductors and sealing compound omitted. The completed connector assembly comprises an outer sleeve-like shell or bulkhead bushing 10, shown in Figs. 1 and 2 as extending through an opening in a bulkhead B; a pair of insulator terminal blocks 11 and 12, each having a plurality of circumferentially spaced longitudinal aligned bores 13 extending therethrough; a plurality of sleeve connectors 14; a plurality of corresponding insulated wire conductors 15 extending through aligned bores in said bushing and with their ends making electrical contact inside of a sleeve; an O-ring gasket 16; and a lock nut 17 threadedly mounted on one end of the bulkhead bushing for securing the bushing on the bulkhead.

The bulkhead bushing 10 may be made of any suitable material, preferably, and as shown, it is made of cadmium plated brass. The bushing 10 is provided with an integrally formed outwardly extending flange 18 having an annular recess 19 formed therein for the reception of the O-ring packing or gasket 16. The gasket 16 may be made of any suitable material, but, preferably, and as shown, is made of neoprene. One end of the bulkhead bushing is threaded, as indicated at 20, for the reception of the lock nut 17.

The insulator terminal blocks 11 and 12 may be made of any suitable material, but, preferably, and as shown, they are made of hard rubber or "Textolite." The insulators 11 and 12 are mounted within the bulkhead bushing in longitudinal alignment and each is shown as having a cylindrical shape with a conical shaped recess 21 formed in its inner end and with its outer end substantially flat. Circumferentially spaced cylindrical bores 13, four such being shown, extend through the bushing and are radially spaced an equal distance from the longitudinal center lines thereof. Each of the bores 13 is identical in construction and each is counterbored to provide an inner portion 22 having a diameter slightly greater than the diameter of the remainding outer portion 23, so that the juncture point of the two portions forms a radial shoulder 24.

The insulator terminal block 11 is provided with a centrally positioned longitudinal bore 25 communicating with the space between the two insulator terminal blocks 11 and 12 (see Fig. 2).

The sleeve connectors 14 are of identical construction and may be made of any suitable material, preferably, and as shown, they are made of brass. Each sleeve comprises a hollow cylindrical open-ended member having a centrally positioned radial opening 26 through its side wall, for a purpose hereinafter to be described. The external diameter of the sleeves 14 is slightly smaller than the diameter of the inner end portions 22 and is slightly larger than the diameter of the outer end portions 23 of the bores 13 formed in the insulator terminal blocks. Each sleeve is mounted in a pair of corresponding aligned bores 13 in the terminal blocks 11 and 12 with its ends abutting the shoulders 24 in the respective bores.

The corresponding opposed ends of each of the insulated conductors 15 are mounted in the corresponding aligned pairs of bores 13 in the terminal blocks 11 and 12. The end portions 27 of the insulated conductors 15 which extend into the sleeve connectors in abutting or overlapping relation are bared of insulation and are soldered together by melted solder being poured in the radial openings 26 in the sleeve connectors (see Fig. 2).

The two insulator terminal blocks 11 and 12 abut a centrally positioned annular shoulder 28 formed integral with the bushing 10. The peripheral outer end edges of the bushing 10 are rolled or crimped, as indicated at 29, to hold the two terminal blocks in place.

The space between the terminal blocks 11 and 12 and all of the air spaces in the bores 13 and the sleeve connectors 14 are filled with a gasoline and oil resistant sealing compound 30, preferably a "neoprene" base potting compound or a polyvinyl chloride potting compound, to effectively hermetically seal the interior of the bushing against gas and fluids, including the passage of gases along the conductors.

The lock nut 17 is made of brass and is screwed on the threaded end of the bulkhead bushing 10 after it has been mounted in the opening in the bulkhead in which the connector is to be mounted, as shown in Figs. 1 and 2, thus effectively making the joint between the bulkhead and the bushing fluid-tight.

When the pressurized gland assembly, as shown in Figs. 3 and 4, is shipped as a unit for use by a workman in making a pressurized multiconductor connector assembly on the job, the installation may be made as follows: the inner end of each of the individual conductors which are to be connected have their insulation removed to expose the bare conductor for a distance equal to one-half the length of a sleeve connector, then, the left hand conductors are individually threaded through the bores in the left hand insulator terminal block 11, as viewed in Fig. 3, and the right hand conductors are individually threaded through the bores in the right hand insulator terminal block 12; next, the terminal blocks are pushed back on the conductors and the bulkhead bushing is passed over all of the left hand conductors and pushed back thereon; next, the bare ends of the corresponding conductors are inserted in the opposite ends of sleeve connectors 14 until they contact or overlap each other; then, melted solder is poured into the radial openings 26 in the sleeve connectors to solder the bare ends of the conductors together; next, the bulkhead bushing is pushed forward on the left hand conductors until it encloses the sleeve connectors; then, the left hand and right hand insulator terminal blocks are pushed inwardly on the conductors and into the bulkhead bushing until they come up against the inwardly extending flanges 28 of the bulkhead bushing; this movement results in each of the sleeve connectors being seated in corresponding bores in the insulator terminal blocks, with the ends of the sleeves abutting the shoulders 24 in the bores 13; next, the outer peripheral ends of the bulkhead bushing are crimped into the outer surface of the two insulator terminal blocks to secure the assembly; and, finally, a suitable sealing compound is forced, under pressure, through the central bore 25 in the insulator terminal block 11 until it fills all the voids in the assembly and exudes out of the outer ends of the bores 13 in each terminal block around the insulated conductor therein. After the sealing compound solidifies, the bulkhead connector as-

sembly is complete and is pressure-tight against gases and liquids; then, the bulkhead bushing is secured in the designated opening in the bulkhead by the lock nut 17 to form a fluid-tight joint between the bulkhead and the bushing.

While the pressurized multi-conductor bulkhead connector assembly illustrated and described has been shown as designed to connect or carry only four insulated conductors, obviously, any reasonable number of such conductors could be included in the assembly.

While the bulkhead bushing has been shown as being adapted to be secured in an opening in a bulkhead by a lock nut, obviously, it could be secured to the bulkhead by bolts and nuts, or by soldering.

Obviously, the invention is not restricted to the embodiment thereof herein shown and described.

Having thus described the invention, what is claimed is:

1. A pressurized multi-conductor bulkhead connector assembly comprising a bulkhead bushing adapted to extend through an opening in a bulkhead and provided with means including an outwardly extending flange to permit it to be secured therein, a pair of longitudinally aligned insulator terminal blocks mounted in said bulkhead bushing, said insulator blocks having a plurality of horizontally extending circumferentially spaced and aligned bores extending therethrough, and an open-ended sleeve mounted between each aligned pair of bores in said insulator blocks with its ends extending part way into said pair of bores, a pair of longitudinally aligned conductors mounted in each of said sleeves with their inner adjacent ends in electrical contact with each other and with their outer ends extending through the respective bores in said insulating blocks in which the sleeve is mounted, and a gasoline and oil resistant sealing cement filling all air spaces within said assembly to the exclusion of air therefrom.

2. A pressurized multi-conductor bulkhead connector assembly, as set forth in claim 1, wherein the end portions of the electrical conductors in each of said sleeves are soldered together and the portions of the conductors in the bores in said insulating blocks are covered with insulation; wherein each of said sleeves is provided with a centrally positioned radial opening for the insertion of the solder required to solder the ends of the conductors therein and to permit the sealing cement to be forced therein; and wherein one of said insulator blocks is provided with an opening extending therethrough to permit said sealing cement to be forced into the interior of said connector assembly.

3. A pressurized multi-conductor bulkhead connector assembly, as set forth in claim 2, wherein said insulator blocks are slidably mounted in said bulkhead bushing and wherein said bulkhead bushing is provided with an inwardly projecting annular flange intermediate its ends which acts as a stop for said insulator blocks

and wherein the outer peripheral edges of said bulkhead bushing are crimped into the outer surfaces of said insulator blocks to hold said assembly together.

4. A pressurized multi-conductor bulkhead connector assembly, as set forth in claim 3, wherein the inner adjacent end portions of each of said aligned pairs of bores are counterbored to form circular shoulders which act as abutments for the ends of the sleeves extending into the respective bores.

5. In a bulkhead bushing assembly for connecting the ends of a plurality of insulated conductors and making a fluid-tight joint between the bushing assembly and a bulkhead or the like and hermetically sealing the interior of the bushing assembly, the combination comprising a bulkhead bushing adapted to extend through an opening in a bulkhead and provided with means including an outwardly extending flange to permit it to be secured therein; a pair of insulator terminal blocks each having a plurality of longitudinal, circumferentially spaced bores extending therethrough, said terminal blocks being slidably mounted in said bushing with the bores therein in longitudinal alignment, one of said insulator blocks being provided with an opening extending therethrough to permit a sealing cement to be forced into the interior of the assembly to exclude all air therefrom; a plurality of open-ended sleeve connectors, each mounted between an aligned pair of bores in said insulator blocks with its ends extending part way into the respective bores of the pair, said sleeve connectors being adapted to receive the bare free ends of individual insulated conductors when said conductors are inserted into said bores and said sleeves having centrally positioned radial openings therein through which melted solder may be poured to solder the free bare ends of said conductors together.

6. A bulkhead bushing assembly, as set forth in claim 5, wherein said bulkhead bushing is provided with an inwardly projecting annular flange intermediate its ends which acts as a stop for said insulator blocks and wherein the inner adjacent end portions of each of said aligned pairs of bores are counterbored to form circular shoulders which act as abutments for the ends of the sleeves extending into the respective bores.

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