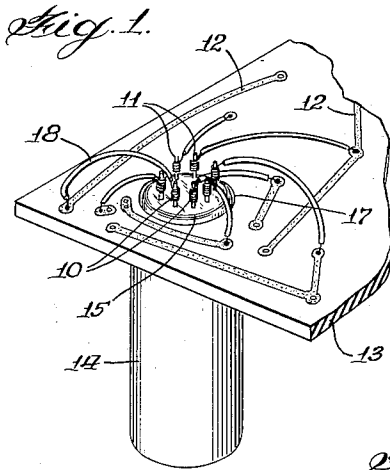
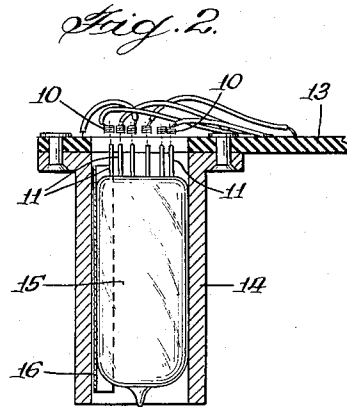
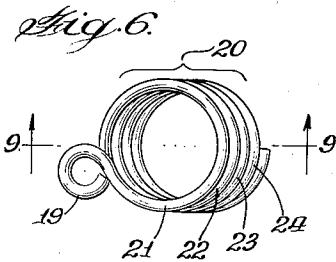
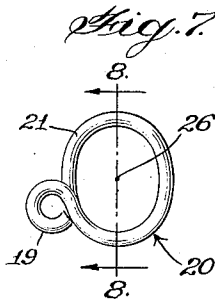
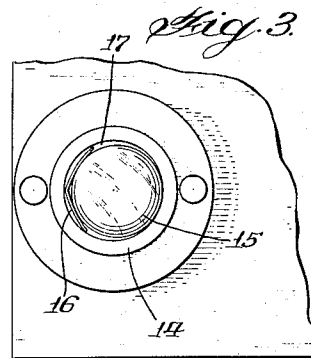
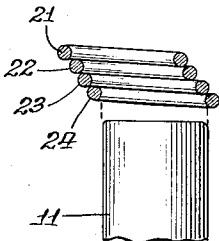
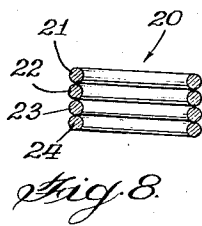
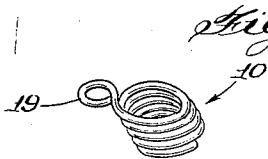
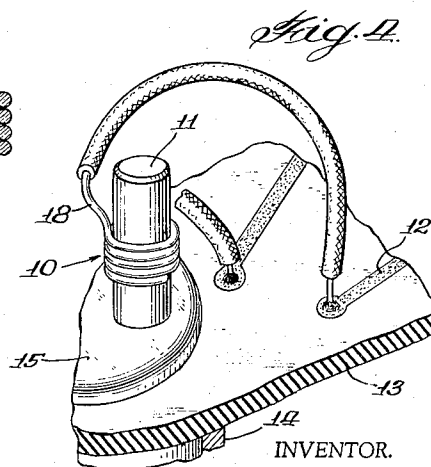


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F. M. OSBORNE
TILTED SPRING CONNECTOR

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3,013,245



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TILTED SPRING CONNECTOR

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1 Claim. (Cl. 339-256)

This invention relates to an electrical connector device, and more particularly to a device for making electrical connections to terminals in equipment which is subject to severe vibration.

Various types of connector devices have been proposed for connection to electrical terminals, but many of these are not suitable for use in equipment which is subjected to severe vibration. Those devices which are designed for use in the presence of vibration commonly employ a spring to exert pressure against the terminal. Tube sockets which are used in vibrating equipment have been provided with spring clips to engage the terminal pins of the sockets.

It is known that a conventional coil spring will grip and hold an object which is placed within the turns of the coil if the internal diameter of the coil is smaller than the diameter of the object. Such a spring might be used in an electrical connector device, but if the spring were provided with a sufficiently small internal diameter so that it would grip the terminal tightly, it would be very difficult to mount. This is because the full gripping action of the coil would be exerted on the terminal during the mounting operation. There is no convenient way to expand the coil radially and increase its internal diameter temporarily to facilitate mounting it, and as a consequence, the size range of the terminal posts on which such a connector device could be mounted would be quite limited.

Accordingly, it is an object of this invention to provide an electrical connector device for connection to a terminal post which provides improved vibration resistant engagement therewith.

A further object of this invention is to provide an electrical connector device which is shaped to facilitate assembly and disassembly of the device with a terminal post.

A still further object of the invention is to provide an electrical connector device of simple construction which can be manufactured at low cost.

A feature of the invention is the provision of an electrical connector device for connection to a terminal pin including a wire which is wound with a plurality of turns to form a coil having an oblique cylindrical shape, and in which one inside diameter of the coil is smaller than the outside diameter of the pin so that the coil is flexed when mounted on the pin and has improved gripping action.

A further feature of the invention is the provision of a device as described in the preceding paragraph where the gripping action of the coil may be neutralized by applying force at the ends of the coil to facilitate assembly and disassembly of the device and terminal post.

A still further feature of the invention is the provision of an electrical connector device including a coiled wire having an oblique cylindrical shape which may be provided with an integral end portion of different lengths for making electrical connections to circuits located at remote points.

Referring now to the drawings:

FIG. 1 shows an assembly in which several electrical connector devices in accordance with the invention are mounted on the terminal pins of an electron tube;

FIG. 2 is a view partly in section of the assembly of FIG. 1 with the tube withdrawn from the connector devices;

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FIG. 3 is a plan view of the assembly of FIG. 1 showing the manner in which the tube is supported within its housing;

FIG. 4 is a view of a portion of the assembly of FIG. 1 showing in detail an electrical connector device which is connected to a printed circuit;

FIG. 5 is a perspective view of a connector device embodying the invention having an end portion with a loop for soldering a conductor wire thereto;

FIG. 6 is a plan view of the electric connector device of FIG. 5;

FIG. 7 shows the device of FIG. 5 viewed along its axis;

FIG. 8 is a sectional view showing the turns of an electrical connector device viewed along the line 8-8 of FIG. 7; and

FIG. 9 is a view similar to FIG. 8 showing the turns of the device viewed along the line 9-9 of FIG. 6.

In practicing the invention, there is provided a wire coil in which the individual turns or convolutions of the coil are offset from each other to give it an oblique cylindrical shape. When mounted on a terminal post or pin, the coil is distorted so that the turns shift towards an aligned relationship, but because the coil is resilient, the turns tend to return to their normal offset relationship and exert pressure against the post. The device, therefore, provides an improved gripping action which arises from the offset relationship of the turns. The gripping action may be neutralized conveniently when mounting the device on the post by applying force on the opposite ends of the device to align the coils. The device may then be slipped onto the post, and when the force is released, the turns will grip the post and hold the device in place. The device may be provided with a loop at one end to facilitate soldering a conductor wire thereto, or the device may be formed from a relatively long wire extending from the coiled part so that the non-coiled part serves as a conductor wire which may be directly connected to an associated circuit.

FIGS. 1, 2 and 3 show an assembly in which the electrical connector device of the invention is employed in making electrical connections between the terminal pins or posts 11 of an electron tube 15 and a printed circuit network 12 which is provided on a panel board 13. The tube 15 is protected by a shield or container 14 which is secured to the panel 13. The tube 15 may be supported within the container 14 by the spring 16. When the tube is inserted into the bottom of the container, the spring 16 flexes and forces the tube against the walls of the container. As the tube is further inserted into the container, the pins 11 extend through an aperture 17 in the board 13 as shown in FIG. 2. When the tube is completely seated, the connectors 10 may be slipped over the ends of the terminal pins 11, and conductor wires 18 may be soldered to the printed circuit network 12, thus completing electrical connections for the tube.

A connector device 10 mounted on a terminal post 11 in accordance with the invention is shown in greater detail in FIG. 4. It is apparent from this view that the connector device may comprise a single elongated wire 18 which is coiled at one end in a particular shape to be further described. The other end of the wire 18 may be connected directly to the printed circuit network 12.

An alternate form of the connector device 10 of the invention is shown in FIG. 5 where the coiled wire is provided with a loop 19 at one end. A separate conductor wire may be readily soldered to loop 19 and then connected to an associated circuit.

The particular shape of the connector device of the

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invention is illustrated in FIGS. 6, 7, 8 and 9. The device comprises a wire wound spirally around an axis to form a coil 20. The coil includes a plurality of complete turns which, as shown in the plan view of FIG. 6, are uniformly off-set from each other. Although the individual turns appear to be circular in the view of FIG. 6, when the coil 20 is viewed along its axis 26 as illustrated in FIG. 7, it is apparent that the coil has an elliptical cross-section and therefore has the shape of an oblique circular cylinder. The shortest inside cross-dimension or diameter of the coil is somewhat smaller than the outside diameter of the terminal post which it is to engage, and thus the portions of the turns located at the opposite ends of this diameter will bear against the surface of the terminal post when the coil is mounted thereon.

FIG. 8 is a sectional view determined by a plane which passes through the axis of the coil 20 along its longest diameter, as indicated by the line 8—8 of FIG. 7. This view shows that the portions of the turns 21—24 located at the opposite ends of the longest diameter of the coil are disposed in aligned relationship. The view of FIG. 9 is similar to that of FIG. 8, but the plane which determines the sectional view passes through the axis of coil 20 along the shortest diameter of the coil, as indicated by the line 9—9 of FIG. 6. The portions of the turns located at the opposite ends of the shortest diameter of the coil as shown in FIG. 9 are offset from each other. These offset portions may be aligned by applying force to move the upper turns to the right. When the turns are aligned, the free diameter of the coil is increased because the coil now takes the shape of a right circular cylinder, and consequently, the coil may be readily slipped over the terminal post 11. When the force is released, the turns tend to return to their normal offset relationship and exert strong, uniform pressure against the surface of the post, thus providing vibration resistant engagement with it.

A connector device of particular dimensions may be used with terminal posts of a relatively great range of sizes since the device is self-contracting and adjusts to the size of the object it engages. The connector device of the invention lends itself to quick and easy mounting

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on a terminal post and each turn of the coil provides an effective biting engagement therewith, which will withstand severe vibration. A connector device in accordance with the invention has been found to maintain effective engagement with a terminal post even when subjected to the extreme vibration encountered in rocket powered ballistics missiles operating at high speeds.

I claim:

An electrical connector device adapted to grip and make electrical contact with a cylindrical terminal post having a predetermined diameter, said connector device comprising a one-piece coil consisting of a plurality of substantially circular convolutions of conducting wire of substantially the same size disposed along an axis with all adjacent convolutions being in engagement with each other and uniformly offset from each other in one direction, each of said convolutions of said coil being offset in the same angular direction with respect to said axis to provide a uniform oblique cylinder of elliptical cross section, said coil having an inside diameter in said one direction which is smaller than the predetermined diameter and an inside diameter in a direction perpendicular to said one direction which is substantially the same as the predetermined diameter, each of said convolutions being flexed when said coil is in position on the terminal post so that said coil has a cylindrical shape with a substantially circular cross section and each convolution grips the post firmly and all convolutions have substantially the same gripping strength, whereby said coil provides uniform vibration resistant engagement and electrical contact with the post.

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