

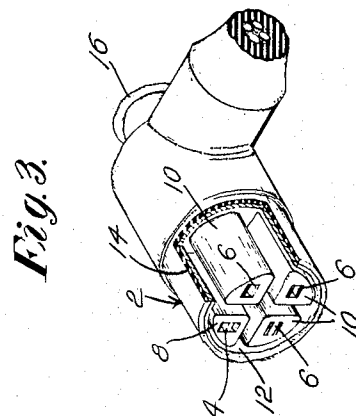
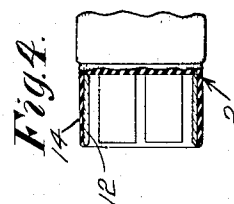
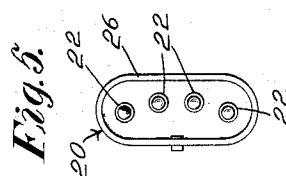
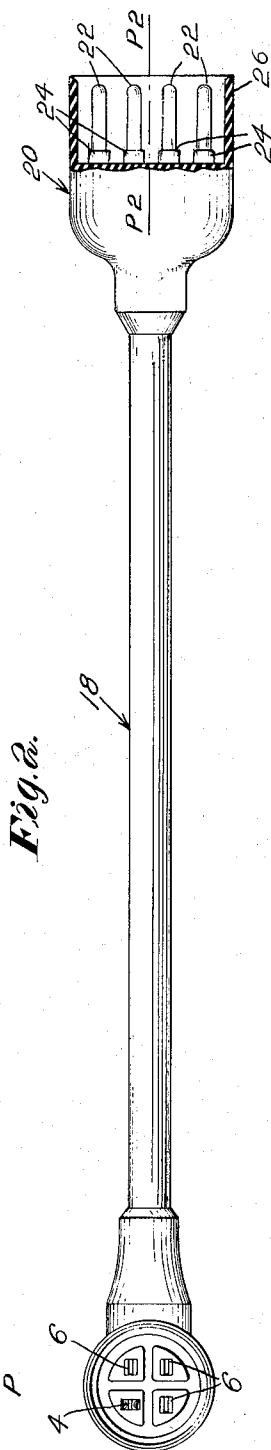
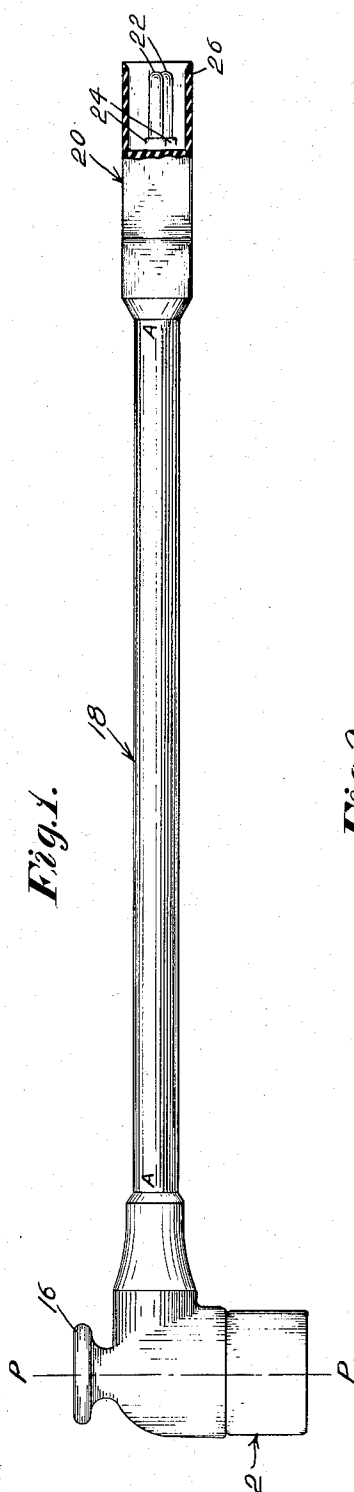
May 29, 1956

R. A. SWAN
ELECTRICAL CONNECTOR

2,748,359

Filed Jan. 24, 1952

3 Sheets-Sheet 1



INVENTOR:
RAYMOND A. SWAN.
BY *John F. Schmidt*
ATTORNEY.

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Fig. 6.

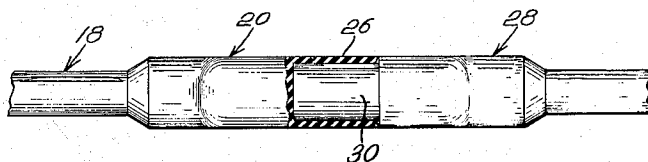


Fig. 7.

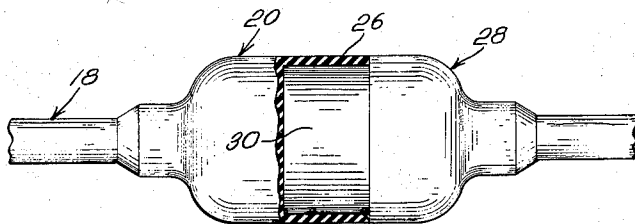
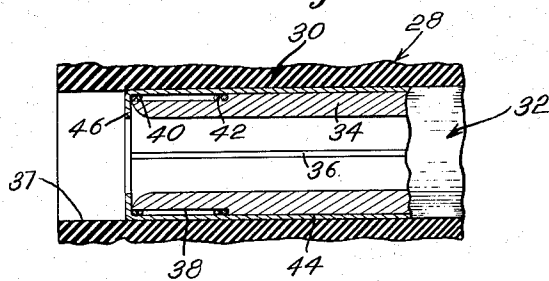


Fig. 8.



INVENTOR:
RAYMOND A. SWAN.
BY *John F. Schmidt*
ATTORNEY.

May 29, 1956

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Fig. 9.

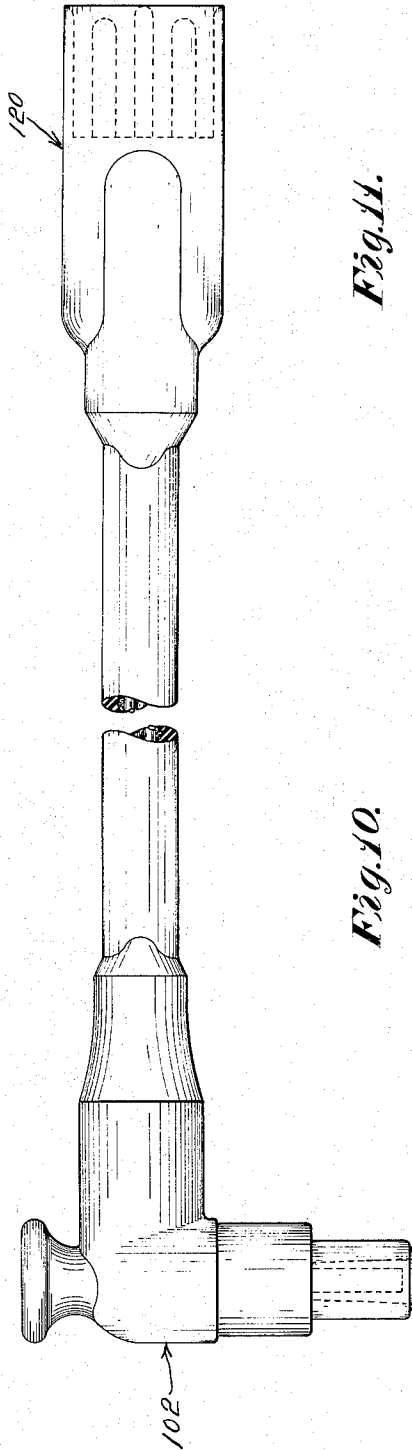


Fig. 10.

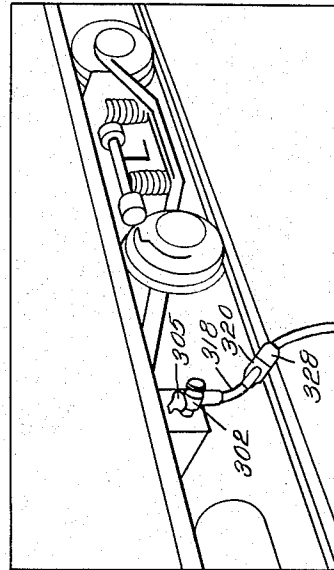
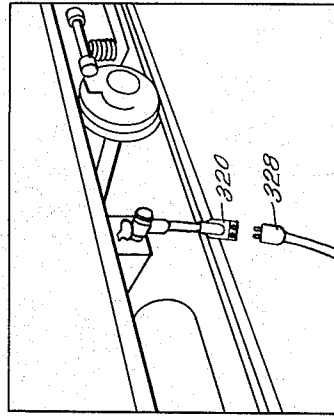


Fig. 11.



INVENTOR:
RAYMOND A. SWAN.
BY *John F. Schmidt*
ATTORNEY.

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ELECTRICAL CONNECTOR

Raymond A. Swan, St. Louis, Mo., assignor to Joy Manufacturing Company, Pittsburgh, Pa., a corporation of Pennsylvania

Application January 24, 1952, Serial No. 268,031

1 Claim. (Cl. 339—28)

This invention relates to an electrical connector, particularly to an electrical connector of the type used to connect a piece of electrical equipment which is mobile with another piece of electrical equipment which is normally stationary.

In the past few years, the American railroads have become increasingly solicitous of the comfort of the passengers. In order to make passengers more comfortable, the railroads have provided air-conditioning to keep the cars cool in the summer. In a good many cases, this air-conditioning equipment is operated by power devices which function only when the train is in motion. In cases of that sort, when the train (or individual cars thereof) is stationary in the railway station, the air-conditioning equipment does not function. Under these circumstances, the passengers have to board railroad coaches which are very hot and correspondingly uncomfortable, and it is to avoid this discomfort of the passengers that the railroads have devised means of keeping the equipment operating even though the car is stationary. Such means comprises electrical equipment which can be put in place in the yard or station beside the railway car, and can be connected with the car.

This practice of connecting the car with equipment parked in the yard has created another problem, mainly that of what happens to the equipment if the railway car starts up prior to its having been disconnected from the stationary electrical equipment. If the electrical connection is strong enough mechanically, the railway car may drag the stationary electrical equipment along at such a speed as to damage or completely destroy the normally stationary electrical equipment. It is to obviate or prevent such damage that this invention is provided. Other applications of this invention than to air-conditioning equipment are of course possible, and one that I contemplate is the application whereby batteries carried by railway cars are charged while the cars are stationary in the yard or in the station. The batteries for this purpose must be electrically connected with battery charging equipment or outlets from such equipment. The same problem of disconnecting or breaking this electrical connection arises when the car starts up, and the invention is equally applicable to equipment of this type.

It is an object of this invention to provide an electrical connector which makes possible an electrical connection from stationary equipment to mobile equipment, and which connection can be readily broken when the mobile equipment starts to move without doing any damage to the normally stationary equipment. This and other objects are accomplished in the invention disclosed and claimed herein.

In the drawings:

Fig. 1 is a side elevation, with parts broken away and in section, showing one embodiment of this invention.

Fig. 2 is a plan view, again with parts broken away and in section, of the embodiment of the invention shown in Fig. 1.

Fig. 3 is an isometric view, with parts broken away and

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in section, of one terminal of the connector shown in Figs. 1 and 2.

Fig. 4 is a longitudinal section through the terminal shown in Fig. 3.

Fig. 5 is an end view of the opposite terminal.

Fig. 6 is a side elevation, with parts broken away and in section, of the terminal shown in Fig. 5 connected with the cooperating terminal of the battery charging or air-conditioning power supplying equipment.

Fig. 7 is a plan view, again with parts broken away and in section, of the connected terminals shown in Fig. 6.

Fig. 8 is an enlarged detailed view in section showing a portion of one of the socket connectors. The connector is shown in its expanded condition, as though a plug contact were in engagement.

Fig. 9 is a view of another embodiment of the invention.

Fig. 10 is a sketch or schematic drawing showing the invention as used in actual operation, and

Fig. 11 is a view similar to Fig. 10, but shown with the connector terminals pulled apart.

A terminal 2 having therein one or more push-pull types of contacts 4 and 6 is provided. As will be well understood by those skilled in the art, the contacts 4 and 6 may all be of the same type or may be of different types.

In the embodiment shown in Figs. 1-4, the contact 4 is of the plug or male type and the contacts 6 are of the socket or female type. The contacts 4 and 6 may be shrouded or not as desired; in the embodiment shown, the contacts 4 and 6 are shown shrouded by a protective envelope 8 or 10 respectively, the envelopes 8 and 10 being made of a suitable resilient insulating substance such as rubber or any of a number of synthetic compounds well known to those skilled in the art. In addition to the shrouds provided by the envelopes 8 and 10, the entire assembly of contacts is protected and shrouded by a metal sleeve 12 and an insulating sleeve 14 which again may be rubber or any similar suitable substance.

Contacts 4 and 6 are of the push-pull type and are engageable and disengageable along a push-pull axis shown at P-P in Fig. 1. Suitable handle means 16 may be associated with the one or more push-pull contacts in order to provide for ready manipulation of the contact or contacts along the push-pull axis P-P.

The terminal 2 is associated with one end of two-ended electrical conduit means indicated generally at 18. As will be understood by those skilled in the art, the conduit means 18 encloses a plurality of electrical conductors equal in number to the number of push-pull contacts 4 and 6. These conductors are suitably covered with a satisfactory insulating material, and the whole is surrounded by an envelope of a suitable resilient insulating protective material such as rubber or any of a number of synthetic compounds. The outer covering for the entire connector is preferably of the same substance throughout the length of the connector, although of course not necessarily so. The shape of the conduit means 18 is shown in Figs. 1 and 2 as being substantially cylindrical, but such a shape is of course not essential to a successful practice of the invention; instead, the external shape of the conduit means may be oval, flat or any other desired shape.

Regardless of the external shape of the conduit means 18, the conduit means may be considered as having a long axis indicated generally at A-A. The axis A-A may be considered for all practical purposes as being coincident with the center line of the conduit means 18. The terminal 2 is secured to one end of the conduit means 18 in such a manner that the push-pull axis P-P is substantially perpendicular to the axis A-A of the conduit means 18. It will be noted that the handle 16 is available so that a user may grasp the handle 16 and may readily manipulate the terminal 2 in the direction of the axis

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P—P, either pulling on the terminal to disengage it or pushing on the terminal to engage it with suitable cooperating contacts.

A second or snap-out terminal indicated generally at 20 is secured to that end of conduit means 18 opposite to the end to which terminal 2 is secured. The terminal 20 is provided with a plurality of snap-out push-pull contacts 22 equal in number to the number of contacts in terminal 2. The terminal 20 may be considered to have a push-pull axis shown as P2—P2 in Fig. 2, this axis being substantially coincident with the geometric center of the terminal as seen in Fig. 5. As will be understood by those skilled in the art, the terminal 20 is secured to the conduit means 18 in such a manner that the axes A—A and P2—P2 are substantially parallel; or, in the embodiment shown, actually coincident.

The snap-out contacts 22 are preferably provided at their bases with substantially cylindrical bosses 24 known as cork seals. The contacts 22 are preferably shrouded by an extension 26 of the principal covering for the terminal 20. The covering and the shroud 26 are preferably made of a suitable resilient insulating material, as detailed above.

The snap-out terminal 20 of a connector made according to this invention is adapted to cooperate mechanically and electrically with a terminal 28 (Figs. 6, 7 and 8), the terminal 28 being provided with the proper number and size of socket type contacts adapted to receive the plug type contacts 22. The socket contacts are not shown in Figs. 6 and 7, but are covered by a suitable resilient insulating material such as rubber or the like shown at 30, which forms a fairly firm body. The body of material formed by the compound or rubber 30 fits easily in the shroud 26. In other words, it has what is known in the art as a "non-interfering fit."

For a detailed understanding of the contacts used in the terminal 28, reference may be had to Fig. 8, wherein the terminal 28 is shown broken away and in section. As can be seen in Fig. 8, the socket type of contact 32 incorporated in terminal 28 includes a tubular member 34 made of a resilient substance which is also a good electrical conductor, and having one or more saw slots 36 to give it greater yieldability when engaged by a plug type of contact such as those shown at 22 in Figs. 1, 2 and 5. The cork seal 24 has a non-interfering fit with the body of material 30 in the space 37.

The open end of the socket type of contact 32 is provided exteriorly with a stepped-down diameter 38, and at the end of the reduced-diameter section 38, there are provided short lengths (approximately one and one-half turns) of helical springs 40 and 42. The helical springs 40 and 42, together with the resilience present in the hollowed out member 34, give a resilience to the member 34 which can be quite closely controlled. The member 34 is encased in a tubular sleeve 44 which is flanged inward at its one end as shown at 46. The sleeve 44 serves to prevent compression of the member 34 by the insulating material 30, and enables a closer control of the contact pressure of the entire socket type of contact than would be possible were it not for the sleeve 44.

By a proper selection of material, dimensions, length of saw slot, size and location of springs 40, 42, etc. as will be understood by those skilled in the art, it is possible to provide a contact combination which gives a predetermined separating pull, or what may be called conduit tensile force. The pull necessary to separate the contacts will of course depend upon the particular application to which the invention is put. I have found that a desirable range for the battery charging connector is from 15 pounds to 25 pounds pull, and a desirable range for the air-conditioning connector is from 50 pounds to 65 pounds. Other ranges will of course be possible in the practice of this invention.

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Fig. 9 shows another type of connector very similar to that shown in Figs. 1-7, but having somewhat different terminals 102 and 120. Other variations in the practice of the invention will be apparent to those skilled in the art.

Operation

Reference will now be made to the schematic drawings of Figs. 10 and 11, which illustrate the use of a connector made according to this invention. To permit simplification of the drawings, the connector shown in Figs. 10 and 11 is illustrated as of the two-conductor type, having a terminal 302, a conduit means 318, a terminal 320 corresponding to terminal 2, conduit means 18, and terminal 20 of the embodiment shown in Fig. 1. As shown in Figs. 10 and 11, a connector made according to this invention is "plugged into" the railway car electrical terminal in such a way that terminal 302 engages the railway car terminal, cover plate 305 being first swung up out of the way.

With the connector hooked up, the push-pull axis P—P of terminal 302 is substantially perpendicular to the direction of travel of the car, and the axis A—A of the conduit means 318 is substantially parallel to the side of the car. In other words, the conduit means 318 does not stick out substantially perpendicular to the side of the car. As the car moves, a tensile force is set up in the conduit means 318 and the maximum of this tensile force is determined by the factors discussed above relating to the type of material, dimension of the socket, strength of springs, etc. As soon as the tensile force in the conduit member 318 reaches the predetermined maximum, the two snap-out terminals 320 and 328 separate, as seen in Fig. 11, and no damage is done.

It will be evident that I have provided in this invention an improved electrical connector which permits easy engagement and disengagement, and which disengages itself upon the attainment of a predetermined tensile force which is less than the force necessary to drag the auxiliary equipment along with a moving car, thus avoiding the damage which would occur if such equipment were dragged along. Other advantages will be apparent to those skilled in the art.

It will be noted that I have hereinabove stated that the auxiliary equipment which is connected electrically to the car by means of my invention is stationary or normally stationary. This basic concept is not altered by the fact that some of such equipment may be, and often is, mounted on a wheeled platform to permit its ready movement about the railroad yard. Even such wheel-mounted equipment is stationary while in use, and is of course not designed to travel alongside a railroad car at any of the speeds normally associated with railway trains.

While I have shown several forms of the invention in this application, it will be understood that the invention may be modified and embodied in various other forms without departing from the spirit of the invention or the scope of the appended claim.

I claim:

An electrical connector comprising a push-pull type of contact adapted to coact with a mating contact on a mobile support to establish an electrical connection, handle means associated with the contact to permit ready manipulation of the contact in either direction along a push-pull axis, two-ended electrical conduit means having a conduit axis and electrically connected at one end to the contact with the conduit axis substantially at right angles to the push-pull axis, and a second push-pull contact at the other end of the conduit, the push-pull direction of disengagement of the second contact being parallel to the conduit axis.

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