

- [54] **ELECTRICAL CONNECTOR**
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339/257, 128/DIG. 4, 128/2.06 E, 24/218
[51] Int. Cl. H01r 9/08
[58] Field of Search 339/217, 182, 183,
339/221, 212, 252, 256, 257; 128/2.1 E, 2.06
E, 416, 417, 418, DIG. 4; 24/155 SD, 108, 218

[56] **References Cited**
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[57] **ABSTRACT**

An electrical connector for an electrode assembly having a housing with a central opening therein and integral side and bottom walls so that the bottom wall is in intimate electrical contact with a flange on a releasable electrode, there being provided a recess in the bottom of the housing opening for receiving a C-shaped spring having parallel arm portions that are spaced apart by a diametral projection on a plastic plug that fits within the housing opening. The plug has a central opening which releasably receives a male projection on the electrode and the spring arms grasp a reduced portion of this male projection. The plug is held within the housing primarily by a press fit, and an electrical connector fitting is threadedly received in the housing and has a portion extending into the housing opening and into the plastic plug.

7 Claims, 5 Drawing Figures

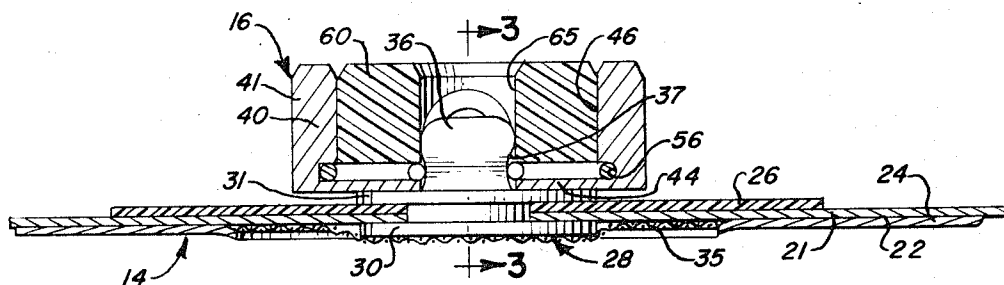


FIG. 1

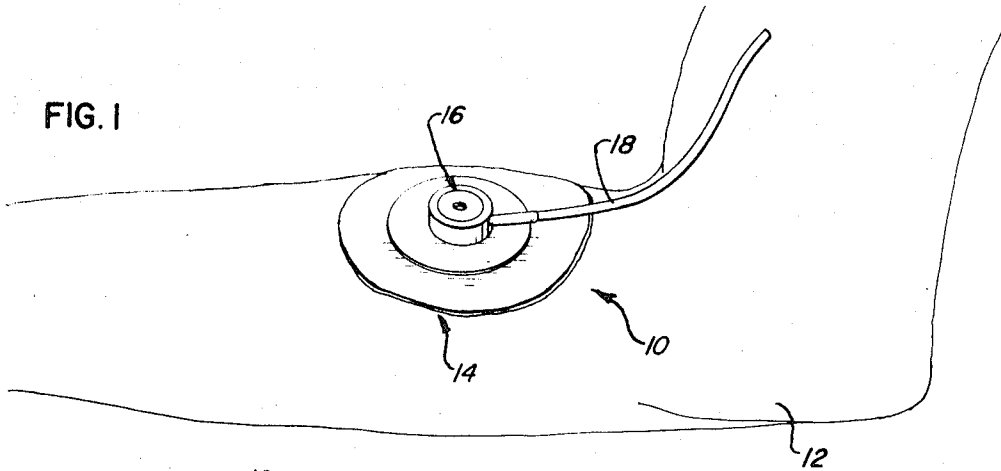


FIG. 2

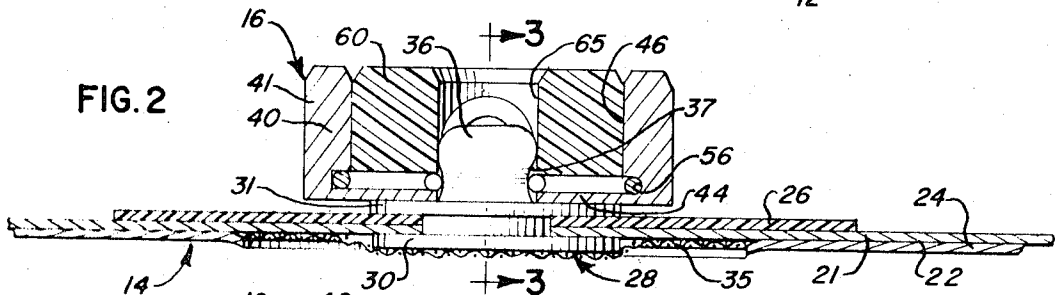


FIG. 3

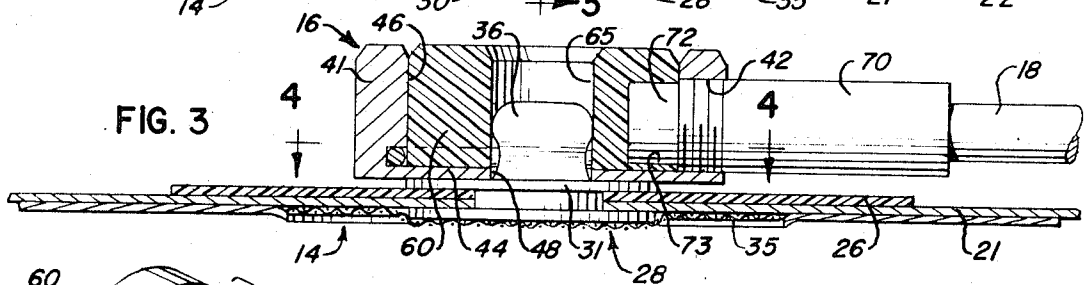


FIG. 5

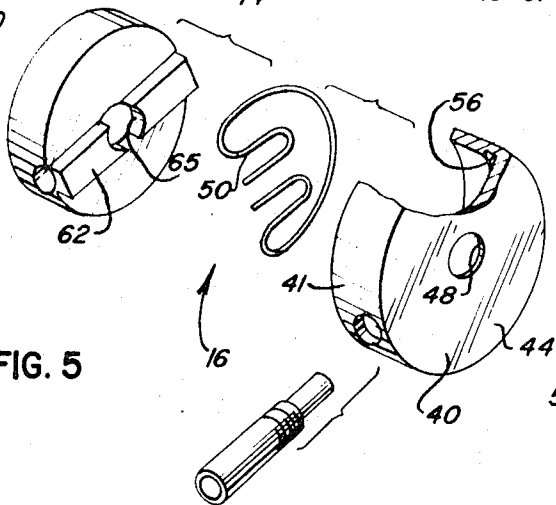
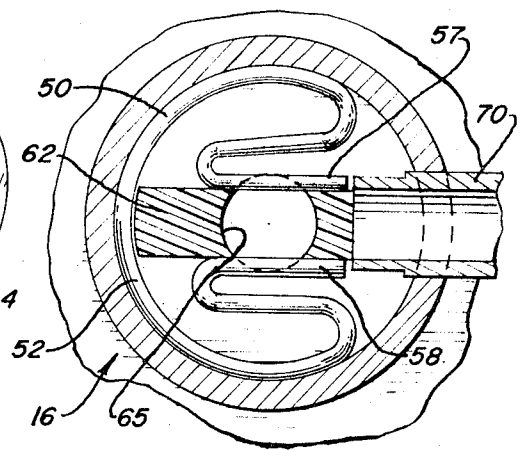


FIG. 4



ELECTRICAL CONNECTOR

BACKGROUND OF THE PRESENT INVENTION

The present invention relates to electrodes for electrocardiographs and more particularly to an electrode and releasable connector combination usable with an electrocardiograph.

As is well known to those familiar to electrocardiographs, it is an instrument constructed to record electrical impulses generated by the heart which when translated into wave form is referred to as the p q r s wave. This measurement is accomplished by electrodes which are placed on the patient's body in various locations and a voltage applied to the electrodes on the order of 0.70 to 1.80 millivolts.

In order to pick up these signals from the body, the construction of the electrode and its connector are extremely important and require ease of use, simplicity in manufacture, and good electrical conductivity. At the same time it is desirable to provide an electrode-connector combination in which the electrode may be adhered to the patient's body at one point and the connector relatively easily releasably attached to the electrode so that the connectors and their associated leads may be switched to get different electrocardiograph tracing variations as desired by the physician.

Thus, it is very desirable to provide a connector for an electrode assembly that may be readily releasably detached without detracting from the good electrical conductivity of the assembly or significantly increasing the complexity of the electrode-connector combination. This electrode-connector combination also permits the electrode portions themselves to be inexpensively made so that they may be disposed of after a single use.

In my prior U.S. Pat. No. 3,610,229, I describe such a releasable connector electrode combination. The connector has a female portion that receives the male projection on the electrode and holds the two together to maintain electrical contact between a portion of the surface of the electrode and the surface of the connector. The female portion has a ridge that holds the male portion, but it has been found desirable to provide a separate spring for holding the male projection within the female portion of the housing to assure more intimate metal to metal contact between the electrode and the connector. Moreover, the connector surface that engages the electrode conducting surface is defined in a part separate from the main housing of the connector and this detracts somewhat from the electrical conductivity of the connector-electrode assembly.

While springs for holding the male projections have been provided in the past, they have required the fabrication of rather expensive holding plates that are difficult to attach to the main connector housing.

It is a primary object of the present invention to provide an electrical connector-electrode assembly that overcomes the problems noted in the prior art above.

SUMMARY OF THE PRESENT INVENTION

In accordance with the present invention, a releasable connector-electrode assembly is provided that holds the electrode in intimate electrical contact with an integral portion of the connector housing and is constructed in a much simpler manner and easier to fabricate than prior art devices. Toward this end, an annular connector housing is provided with integral side and

bottom walls so that the bottom wall may directly engage a flange on the male portion of the electrode to assure intimate electrical contact between the electrode and the connector housing to which a connector fitting is directly fitted.

For the purpose of holding the electrode in this intimate contact, a generally C-shaped spring is mounted within a recess in the bottom of a central opening in the integral housing with the springs having generally parallel spaced arms that releasably engage the male projection on the electrode to hold the electrode intimately against the connector housing. For the purpose of spacing the arms of the spring to maintain uniform spring pressure, a solid plastic plug is received within the opening in the housing and has a central aperture defining the female opening for the male projection. Extending diametrically and integrally from the plug is a rectangular projection that flanks the opening in the plug and engages the inside bottom wall of the housing. The plug is substantially less expensive to manufacture than plates heretofore designed for holding the spring arms in a spread position.

A further feature of the present invention is that the plug is easily held in position by a press fit, and a threaded connector fitting is received in the side wall of the integral housing and has a portion extending into the plastic plug for assisting in holding the same in position. Since the housing is integral, this connector fitting has good electrical contact with the flange, noted above, on the male portion of the electrode.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a patient's arm with the connector-electrode assembly in position;

FIG. 2 is an enlarged cross-section of the connector-electrode assembly according to the present invention;

FIG. 3 is a cross-section of the connector-electrode assembly taken generally along line 3—3 of FIG. 1;

FIG. 4 is a fragmentary section of the connector-electrode assembly taken generally along line 4—4 of FIG. 3 illustrating the spring position; and

FIG. 5 is an exploded view of the connector according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings and more particularly to FIG. 1, a connector-electrode assembly 10 according to the present invention is shown applied to the forearm 12 of a patient. The connector-electrode assembly is seen to consist generally of an electrode 14 having a releasable connector 16 connected thereto with a lead 18 adapted to transmit signals to an associated electrocardiograph unit in conventional fashion.

Viewing FIGS. 2 and 3 in more detail, electrode 14, which may be disposable, is seen to consist of an annular flexible member 21 having an adhesive bottom surface 22 adapted to be attached to the patient. A removable annular paper piece 24 protects the surface 27 prior to use. Fixed to the annular member 21 is a backing piece 26 that may be constructed of paper or plastic or other materials as desired. The electrode 14 is provided with a central male conducting member 28 having flanges 30 and 31 that hold the annular pieces 21 and 26 in position therebetween. Extending over the conducting member flange 30 is a plastic or metal circular screen 35 which is fixed to the lower surface of

the annular piece 21 or also to the lower surface of the electrode flange 30. A conductive jelly may be applied to the screen 35 if desired.

Extending integrally upwardly from the male electrode member 28 is a male projection 36 within housing 16 having a recessed portion 37 that is grasped by portions of the connector 16 to hold the flange 31 in intimate electrical contact with the connector.

The connector 16 is seen to include an electrically conductive circular housing member 40 having a side wall 41 and a bottom wall 44 defined by a central opening or counter bore 46. The bottom wall 44 has an opening 48 for receiving the male projection 36.

To hold the projection 36 within the connector 16, a generally C-shaped spring 50 is provided as shown more clearly in FIGS. 4 and 5. The C-shaped spring has an arcuate portion 52 received within an annular recess 56 (FIG. 2) in the bottom of the counter bore 46 and the housing 41. Spring 50 has spaced parallel arm portions 57 and 58 that grasp and hold the recessed portion 37 of the male projection 36 of the electrode. In this manner, the connector may be snapped over the electrode holding the flange 31 in intimate conductive contact with the bottom wall 44 of the housing 40.

For the purpose of holding the spring arms 57 and 58 slightly apart so that a uniform force will be required to snap the connector 16 on the electrode 14, a plastic plug 60 is provided that has an integral projection 62 extending downwardly therefrom engaging the interior of the bottom wall 44 of the connector housing 40. The spring arms 57 and 58 engage the sides of the projection 62 when the male member 36 is not inserted into the connector so that there is always a uniform spacing of the spring arms 57 and 58 prior to connection with the electrode 14. The projection 62 has a width less than central opening 65 in the plug 60 so that the male projection 36 of the electrode spreads the spring arms 57 and 58 apart as the connector 16 is pushed over the electrode.

For the purpose of electrically connecting the connector and the electrode to the associated electrocardiograph, a cylindrical fitting 70 is threadably received in the housing side wall 41 as indicated at 42 in FIG. 3. Since the side wall 41 is integral with the bottom wall 44 of the housing, fitting 70 has a good electrical connection with the electrode flange 31 which is in intimate contact with the bottom wall 44 of the housing.

The fitting 70 also has a radially inwardly extending projection 72 that is received in an aperture 73 in the plastic plug 60 for the purpose of assisting the positioning of the plug 60 within the housing recess 46. The press fit of the plug within the housing provides an extremely simplified manner of holding plug 60 in the housing.

A further feature of the present invention is that the connector 16 may swivel a full 360° on the projection 36 and the electrode 14.

In assembling the connector, the spring 50 is compressed to fit in bore 46 and then released in recess 56. The spring arms 57 and 58 are then separated sufficiently to permit the insertion and press fitting of the plug 60 into the housing with the projection 62 between the spring arms. The spring arms 57 and 58 are then released into engagement with the projection 62. Thereafter the hole 42 is drilled and tapped extending into the plug 60 and the fitting 70 threaded thereto.

I claim:

1. An electrical connector for an electrode, comprising; a housing having an opening therein, a spring mounted in said housing and having generally parallel spring arm portions, a generally solid plug in said opening having a central aperture for receiving a male member of the electrode, said plug having a diametral projection adjacent said aperture holding said arm portions in a slightly spread position adapted to receive and hold the male member of the electrode said spring arm portions extending in a plane transverse to the axis of the opening and the male member.

2. An electrical connector for an electrode as defined in claim 1, wherein a connector lead fitting is threadably received in the housing.

3. An electrical connector for an electrode as defined in claim 1, wherein a connector lead fitting is received in the housing and has a portion extending into the plug.

4. An electrical connector for an electrode as defined in claim 3, wherein the plug extends into the plug in a direction parallel to the projection.

5. An electrical connector for an electrode, comprising; a housing having an opening therein, a spring mounted in said housing and having generally parallel spring arm portions, a generally solid plug in said opening having a central aperture for receiving a male member of the electrode, said plug having a diametral projection adjacent said aperture for holding said arm portions in a slightly spread position adapted to receive and hold the male member of the electrode said housing opening being generally circular in shape, said housing having a bottom wall, an annular recess in the opening adjacent the bottom wall for receiving and holding the spring, said spring having an arcuate portion in said recess.

6. An electrical connector and electrode assembly, comprising; an electrode having a male member projecting therefrom surrounded by an electrically conductive flange, a connector adapted to be releasably received on said electrode said connector comprised of a spring member enclosed in a conductive housing having integral bottom and side walls, and means within the housing for holding the male projection of the electrode to maintain the conductive flange in intimate contact with the integral bottom wall of the housing, said flange having a sufficient width to engage the bottom wall as the male member projects through a hole in said bottom wall and engages said means.

7. An electrical connector and electrode assembly as defined in claim 6 wherein said connector is adapted for 360° swivel movement on said electrode.

8. An electrical connector and electrode assembly, comprising; an electrode having a male member projecting therefrom surrounded by an electrically conductive flange, a connector adapted to be releasably received on said electrode including a housing having integral bottom and side walls, and means within the housing for holding the male projection of the electrode to maintain the conductive flange in intimate contact with the integral bottom wall of the housing said means for holding the male projection of the electrode includes a spring having parallel arm means that hold the projection, a plug in said housing having a central aperture for receiving the male projection and a diametral flange for slightly spreading the spring arm means.

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