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ELECTRODE LIMB CLAMPS

Filed Feb. 27, 1961

Fig. 1

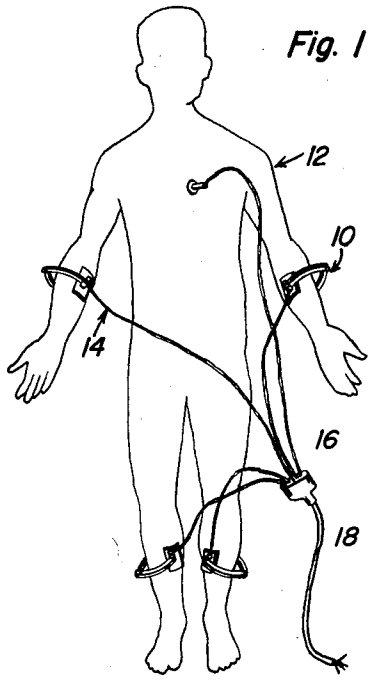
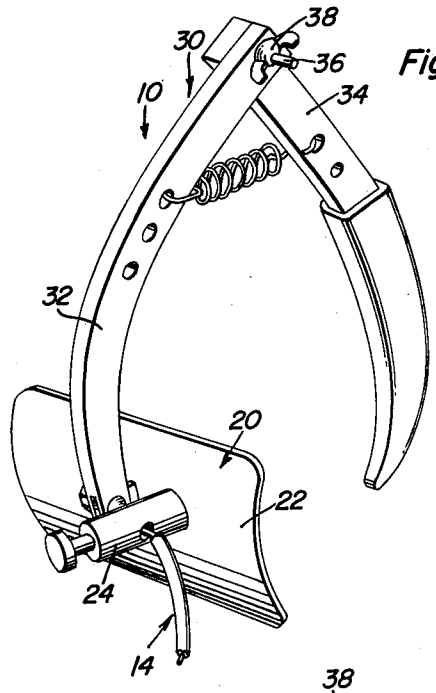


Fig. 2



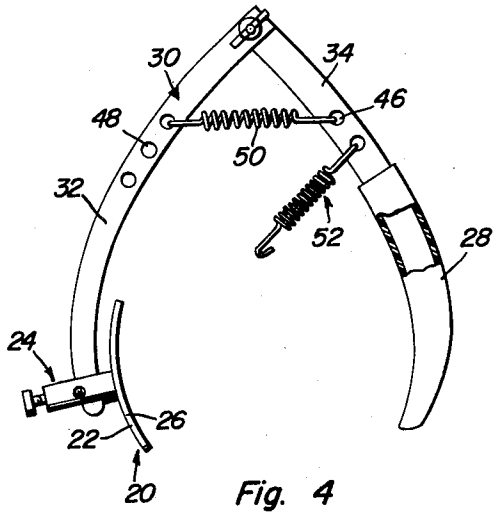


Fig. 4

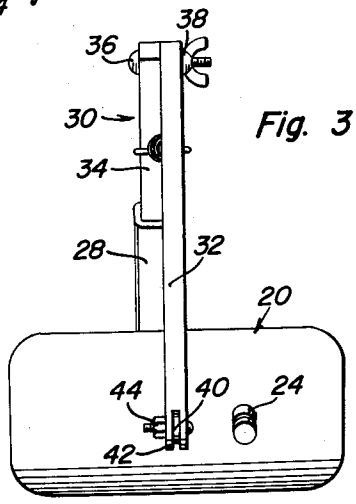


Fig. 3

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ELECTRODE LIMB CLAMPS

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This invention relates to a clamping device by means of which electrodes may be affixed to the limbs of a patient during examination performed with electrocardiograph or phonocardiograph machines or during the performance of electrocardiographic type examinations wherein electrodes are used.

In performing the above noted examination, it is necessary to secure adaquate electrical connection to the various limbs of the body. Accordingly, electrodes have heretofore been used for such purpose which are made of conductive material placed against the limb surfaces at the desired points thereon and held in place by rubber or leather straps secured about the limbs. Conductors attached to each of the electrodes may thereby be connected to the electrocardiograph type machine for the purpose of obtaining tracings of heartbeat characteristics of the patient. The electrode limp clamp devices of the present invention therefore provide an improved method for affixing the electrodes to the limbs by means of which discomfort to the patient is reduced, the obtaining of more accurate graphic tracing is enhanced and a more rapid examination may be performed.

Accordingly, one of the most important objects of the present invention is to provide an electrode clamping device of such novel design and construction, that the patient need not lift any of the limbs or extremities in order to affix the electrodes thereto. This is extremely beneficial in examining patients suffering from limb injuries and/or diseases and maladies causing pain in the extremities.

Another object of this invention is to provide a novel electrode clamp device which may be readily disassembled and reassembled for easy cleaning and sterilization.

A still further object of this invention is to provide an electrode clamp device which may be applied to the limbs of a patient more rapidly and removed therefrom more easily causing less discomfort to the patient and completing the examination in less time.

An additional object of this invention is to provide an electrode clamping device which is made of such material as to avoid the creation of magnetic fields which may tend to introduce errors into the graphic tracings obtained as a result of the examination.

Another object of this invention is to provide electrode clamp devices for the limbs of a patient by means of which the conductor wires connected to the electrodes may be arranged in a non-fouling manner which will be of much convenience to the one conducting the examination.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is a diagrammatic view of the attachment of the novel electrode clamping devices to the limbs of a patient in accordance with the principles of this invention.

FIGURE 2 is a perspective view of an electrode clamping device made in accordance with this invention.

FIGURE 3 is a front elevational view of the electrode clamping device.

FIGURE 4 is a side elevational view of the electrode clamping device.

Referring now to the drawing in detail, it will be observed that the present invention contemplates the use of a plurality of electrode limb clamps generally referred to by reference numeral **10** for attachment to the limbs (arms and legs) of a patient **12** for the purpose of making the proper connection to an electrocardiograph type of machine. Accordingly, all of the clamp devices **10** as seen in FIGURE 1 have conductors **14** connected thereto which are assembled within a fitting **16** centrally located with respect to the conductors for operative connection to the electrocardiograph machine by means of the cable **18**.

It will be observed from FIGURE 1, that the clamp devices **10** are so arranged that the wires **14** connected thereto extend to the common cable **18** in a non-fouling manner by virtue of the location of the connection of the wires **14** to the electrode clamp devices **10** as will be hereafter described with greater detail.

Referring now to FIGURES 2 through 4, it will be observed that each of the clamp devices **10** includes an electrode **20** which is of arcuate shape for surface contact engagement with the limb of the patient **12**. The electrode **20** is accordingly made of a conductive material and has mounted on the outside surface **22** thereof a terminal connector **24** of conventional construction, by means of which the conductor wire **14** may be connected to the electrode **20**. It will be observed, however, that the terminal connector **24** is located on the surface **22** of the electrode **20** in offset relation to the geometrical center thereof as more clearly seen in FIGURE 3. As a result thereof the non-fouling arrangement of the conductor wires **14** is achieved. The inside surface **26** of the electrode **20** accordingly engages the limb of the patient for surface contact therewith.

The opposite side of the limb of the patient is engaged by a rubber boot or resilient padding **28**. The padding **28** is also of arcuate shape for more comfortable engagement with the limb of the patient in opposing relation to the electrode **20**. The electrode **20** and the resilient padding **28** are therefore interconnected by a limb straddling arm assembly generally referred to by reference numeral **30** for the purpose of clamping the electrode **20** to the patient's limb.

The clamping arm assembly **30** comprises a pair of arcuate shaped arms **32** and **34** which are made of a relatively rigid and non-conductive material such as plastic. The arms are maintained in assembled relation by a pivot screw **36** having a threaded end for the purpose of threadedly receiving thereon a wing nut assembly **38** whereby the arms **32** and **34** are maintained in assembled relation and are pivotally displaceable with respect to each other. The resilient padding or boot **28** is accordingly received upon the lower portion of the arm **34** while the lower end of the arm **32** is connected to the electrode **20**.

In order to connect the electrode **20** to the lower end of the arm **32**, and permit the electrode to be pivotally displaced with respect thereto for better accommodating the surface of the patient's limb, a pivot ear projection **40** extends upwardly from the surface **22** of the electrode **20** substantially at the geometric center thereof and is received between the straddling portions **42** at the lower end of the arm **32**. A suitable fastener assembly **44** is provided for the purpose of maintaining the electrode **20** in assembled relation at the lower end of the arm **32** and permit pivotal displacement thereof with respect thereto.

It will be apparent, that the clamp device **10** in order to be clamped upon the limb of the patient, requires that the arms **32** and **34** be yieldably biased toward each other with the proper biasing pressure for securely holding the clamp device on the patient's limb and yet not cause too much discomfort to the patient. Accordingly, means is

provided for providing an adjustable spring clamping bias. A plurality of apertures 46 are therefore disposed within the arm 34 while a similar series of apertures 48 are disposed in the arm 32. The uppermost apertures 46 and 48 are interconnected by a spring 50 whereby the arms 32 and 34 are provided with an initial and permanent clamping bias. In order to provide for additional and yet adjustable clamping bias, which may be adjusted by the technician or the doctor performing the examination, an additional spring 52 may be provided for selectively interconnecting the arms 32 and 34 between the plurality of apertures 46 and 48 therein. As a result the spring bias may be increased or decreased for accommodating the different width limbs and the different limb dimensions of any particular patient.

As a further advantage that may be realized from the novel limb clamp construction of the present invention, it will be apparent that by virtue of the use of the plastic arms 32 and 34 different color plastic material may be selected in different color combinations for providing a color code in order to identify the limb for which a particular clamp device 10 has been adjusted and arranged, as will be apparent from FIGURE 1. For example, the arms of the three principal electrode clamp devices may respectively be colored, red, while and blue for the right arm, left arm and left leg respectively as viewed in FIGURE 1. The ground electrode, or neutral electrode, which is placed on the right leg during the examination, is of green plastic. Additionally, each of the electrode clamp devices may be further identified with respect to the limb with which it is attached by any suitable labeling indicia. As a result thereof, technicians of limited experience in the performance of the electrocardiographic examination, may make the proper attachment of the electrode devices as illustrated in FIGURE 1.

It will be further apparent from the foregoing description, that the beneficial attributes of the clamping devices heretofore mentioned, not only reduce the discomfort to the patient because of the more comfortable manner in which the clamp devices are secured to the limbs but also because of the rapidity with which the examination may be performed because of the more rapid and easy manner in which the electrode clamp devices may be attached to the limbs. Furthermore, disassembly of the parts of the clamp devices is facilitated so that they may be cleaned and reassembled. Also, by virtue of the discriminating selection of the material as heretofore mentioned, magnetic fields and contact interference with the electrodes are avoided.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. An electrode attaching device for a limb in an electrocardiographic examination or the like, comprising in combination a curved limb engaging electrode plate having a terminal connector to which a conductor wire is connected, a pair of arcuate limb-straddling arms made of rigid non-conductive material, assembly means pivotally interconnecting said arms at upper ends thereof, one of said arms being connected to the electrode plate at a lower end of said one arm, resilient limb engaging padding disposed about a lower portion of the other arm, initial tensioning spring means interconnecting said arms in spaced relation below the assembly means, and adjustable means on the arms disposed below the spring means for adjustably varying the limb clamping bias on the arms.

2. The combination of claim 1, including means for pivotally connecting the one arm to the electrode plate substantially at its geometric center for self-pivoting adjustment of the plate to a limb surface.

3. The combination of claim 2, wherein the terminal connector on the electrode plate is disposed toward one lateral side of the pivotal connecting means for non-fouling connection of the conductor wire to a common electrocardiograph cable.

4. The combination of claim 3, wherein said arms are made of limb identifying colored plastic.

5. The combination of claim 1, wherein said arms are made of limb identifying colored plastic.

6. An electrode attaching device for attachment to a limb comprising a pair of rigid non-conductive arcuate limb-straddling arms, means pivotally interconnecting said arms at the upper ends thereof, and elongated electrode plate curved about its longitudinal axis so as to accommodate a limb therein, and means pivotally interconnecting said plate to the lower end of one of said arms, said plate being located generally inwardly of said arm with the longitudinal axis of said plate extending perpendicular to said arm.

7. The combination of claim 6 including resilient limb engaging padding disposed about the lower portion of the second of said arms in opposed relation to the elongated electrode plate.

8. The combination of claim 7 including a plurality of holes in the upper portion of each of the arcuate arms, a first spring secured between the upper hole in each arm for inducing a fixed bias to said arms, and a second spring selectively engaged below the first spring between any predetermined remaining set of holes, one in each arm, for inducing an adjustable bias to said arms.

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