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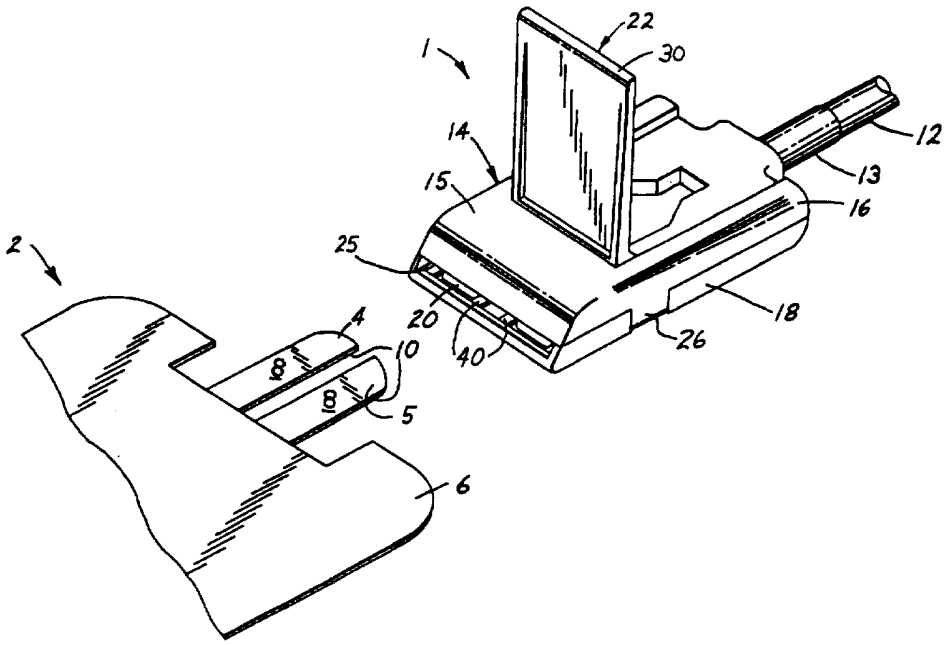

(57) Abstract

A clamp (1) for a dispersive electrode is disclosed. The clamp comprises: (a) a housing (14) having an exterior surface (15), an interior surface (25) being formed within the housing for receiving projecting tabs of the electrode, and a slot (20) in the housing disposed between the exterior surface and the interior surface; (b) means (22) for releasably engaging the tabs at the interior surface; (c) a reinforcement (54) on the releasably engagement means; and (d) a slot (56) on the exterior surface of the housing having a shape matching the reinforcement.

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CLAMP FOR ELECTROSURGICAL DISPERSIVE ELECTRODE

Field of Invention

This invention relates to clamps for dispersive electrodes.

Background of Invention

Biomedical electrodes are used in a variety of applications and are configured to operate according to the size, type, and direction of current flowing into or out of a body of a patient.

Dispersive electrodes are used in electrosurgery. In modern surgical practice there are many times when electrosurgery is more preferable than the use of the traditional scalpel. In electrosurgery, cutting is performed by an intense electrical current passing through a cutting electrode. The surgeon directs this current to exactly where cutting is required by wielding the cutting electrode, which because of its cylindrical shape and the way it is held in the hand is commonly called an "electrosurgical pencil". By activating controls which change the characteristics of the electrical current being sent to the pencil by an electrosurgical generator, the surgeon can use the pencil either to cut or to coagulate areas of bleeding. This makes electrosurgery particularly convenient when surgery requiring extra control of blood loss is being performed. Because of concerns to minimize the transmissions of blood-borne illnesses between health care patients and health care providers, in both directions, electrosurgery is becoming increasingly important.

In electrosurgery, as in all situations where electrical current is flowing, a complete circuit must be provided to and from the current source. In this case, the current that enters the body at the pencil must leave it in another place and return to the generator. It will readily be appreciated that when current enough to deliberately cut is brought to the body of a patient in one place, great care must be taken that unintentional damage is not also done to the patient at the location where that current is leaving the body. The task of collecting the return current safely is performed by a dispersive electrode.

A dispersive electrode performs this task by providing a large surface area through which the current can pass; the same current which was at cutting intensity when focused at the small surface area at the tip of the pencil is relatively harmless, with the goal of being painless to the patient, when spread out over the large surface area of the dispersive electrode.

Between the dispersive electrode and the electrosurgical generator, the typical manner to complete the circuit is to electrically connect the end of the dispersive electrode to a clamp connected to an electrical wire ending in a plug compatible with the electrosurgical generator.

Any tendency toward disconnection of the clamp from the dispersive electrode is critical to maintenance of the electrical circuit.

Some clamps are known to those skilled in the art. Two examples of clamps are represented by U.S. Pat. Nos. 4,061,408 (Bast et al.) and 4,952,177 (Drake et al.). Commercially available clamps related to such patents are available from 3M Health Care of Minnesota Mining and Manufacturing Company of St. Paul, MN.

Smaller size clamps, known as clips, are used for smaller biomedical electrodes used to receive electrical signals from a patient's body. Examples of such clips are represented by U.S. Pat. Nos. 4,555,155 (Drake et al.); 4,700,997 (Strand et al.); 4,842,558 (Strand et al.); 5,407,368 (Strand); and 5,454,739 (Strand).

While clamps and clips serve similar purposes to complete an electrical connection, the dispersive electrode used with a clamp differs from an electrocardiographic electrode used with a clip, in that the dispersive electrode can have two different electrically conductive surfaces for Contact Quality Monitoring ("CQM") circuitry that tests continued adequate electrical connection of the electrode with the clamp to avoid burning skin of the patient.

Summary of Invention

The present invention provides a clamp that has different features from that found in prior clamps or clips.

The clamp for an electrosurgical electrode comprises (a) a housing having an exterior surface, an interior surface being formed within the housing for

receiving projecting tabs of the electrode, and a first slot in the housing disposed between the exterior surface and the interior surface; (b) means for releasably engaging the tabs at the interior surface; (c) a reinforcement on the releasably engagement means; and (d) a second slot on the exterior surface of the housing having a shape matching the reinforcement.

A feature of the present invention is a reinforcement of the lever of the clamp.

Another feature of the present invention is a slot in the upper surface of the clamp that matches the shape of the reinforcement of the lever and also permits viewing of the placement of the dispersive electrode into the clamp.

Brief Description of Drawings

FIG. 1 is a perspective view of a clamp of the present invention, along with a portion of a CQM dispersive electrode known in the art, particularly showing the plurality of the projecting tabs entering the clamp.

FIG. is an exploded view of the clamp of the present invention as depicted in FIG. 1 revealing structure of the interior surface of the clamp.

FIG. 3 is a perspective view of the undersurface of the lever for the clamp of the present invention.

Embodiments of Invention

Referring to FIG 1, the clamp 1 is shown engaging the split-plate dispersive electrode 2 as a portion of the electro-surgical generating system (not shown).

The split-plate dispersive electrode 2 has two separate tabs, 4 and 5, projecting from a backing 6 of the electrode 2. Tabs 4 and 5 have opposed surfaces. One surface is an insulated surface 8 shown in FIG 1 as the upper surface on both tabs 4 and 5. The opposing surface is a conductive surface 10, shown in FIG 1 as the opposed under surface of tabs 4 and 5.

The clamp 1 is connected to a cable 12 having a strain relief 13 engaging a clamp housing 14 having an exterior surface 15. The cable 12 is

connected to the electro-surgical generator (not shown) which may require an electrical adaptor for proper electrical connection.

The housing 14 is divided into a first cover 16 and a second cover 18. The housing 14 is configured to have a tabs receiving slot 20 at a point on its exterior surface 15 of joinder between first cover 16 and second cover 18 to allow insertion of the tabs 4 into the housing 14.

A lever 22 in communication with interior surfaces 25 of the housing 14 extends through a lever slot 24 on the exterior surface 15 of the first cover 16.

Referring to FIG 2, the first cover 16 and the second cover 18 are secured by latches 26 received in notches 28 in the housing 14 on exterior surface 15 not adjacent to the tabs receiving slot 20.

The lever 22 is composed of a handle 30, a pivot portion 32, from which extend oppositely disposed pins 34. Pins 34 reside in complimentary grooves 36 on the second cover 18 of the housing 14.

On the interior surface 25 of housing 14, two receiving electrical contact strips 38 and 39 are shown in their restrained positions separated from one another within second cover 18 as held laterally in place by fingers 40. In this embodiment, strips 38 and 39 are generally U-shaped flat springs configured to receive tabs 4 and 5, respectively.

Wires 44 from lead cable 12 and strain relief 13 pass through a collar 46 on second cover 18 and are secured by soldering or other electrically conductive securing means to the respective separated electrical contact strips 38 and 39.

Referring again to FIG 1, tabs 4 and 5 may be inserted through tabs receiving slot 20. As seen in FIG 2, tab 4 contacts strip 38 and tab 5 contacts strip 39.

When tabs 4 and 5 are inserted into clamp 1 through slot 20, the tabs must be releasably engaged to maintain continuous electrical connection with the separated electrical contact strips 38 and 39. The means for releasably engaging the tabs 4 are composed of the lever 22 having the handle 30, pins 34 on pivot portion 32 and rotating in grooves 36, all previously described. The means further include a cam ridge 47, and desirably, projections 48 on one portion of U-shaped strips 38

and 39 mating with depressions 49 on an opposed portion of U-shaped strips 38 and 39.

As seen in FIG. 3, lever 22 has an undersurface 52 having a reinforcement wishbone 54 extending from undersurface 52 and cam ridge 47. To accommodate the shape of wishbone protruding from undersurface 52 of lever 22, first cover 16 also contains a wishbone slot 56 adjoining lever slot 24. When lever 22 is closed toward first cover 16, reinforcement wishbone 54 projects into wishbone slot 56.

Wishbone slot 56 also serves the feature of permitting the placement of tabs 4 and 5 of electrode 2 to be viewed as the tabs 4 and 5 are inserted into slot 20 of clamp 1.

While embodiments of the invention have been disclosed, the claims of the invention follow.

What is claimed is:

1. A clamp (1) for an electrosurgical electrode, comprising:

(a) a housing (14) having an exterior surface (15), an interior surface (25) being formed within the housing for receiving projecting tabs of the electrode, and a first slot (20) in the housing disposed between the exterior surface and the interior surface;

(b) means (22) for releasably engaging the tabs at the interior surface;

(c) a reinforcement (54) on the releasably engagement means; and

(d) a second slot (56) on the exterior surface of the housing having a shape matching the reinforcement.

2. The clamp according to Claim 1, wherein the housing is divided into a first cover (16) and a second cover (18).

3. The clamp according to Claim 2, wherein the housing is configured to have the slot at a point on the exterior surface of joinder between first cover and second cover.

4. The clamp according to Claim 3, wherein the releasably engagement means (22) comprises a lever in communication with the interior surface of the housing.

5. The clamp according to Claim 4, wherein the first cover and the second cover are secured by latches (26) received in notches (28) in the housing on the exterior surface not adjacent to the first slot.

6. The clamp according to Claim 5, wherein the lever comprises a handle (30), a pivot portion (32), and pins (34) residing in complimentary grooves on the second cover of the housing.

7. The clamp according to any of Claims 1-6, further comprising two receiving electrical contact strips (38) and (39) on the interior surface of housing.

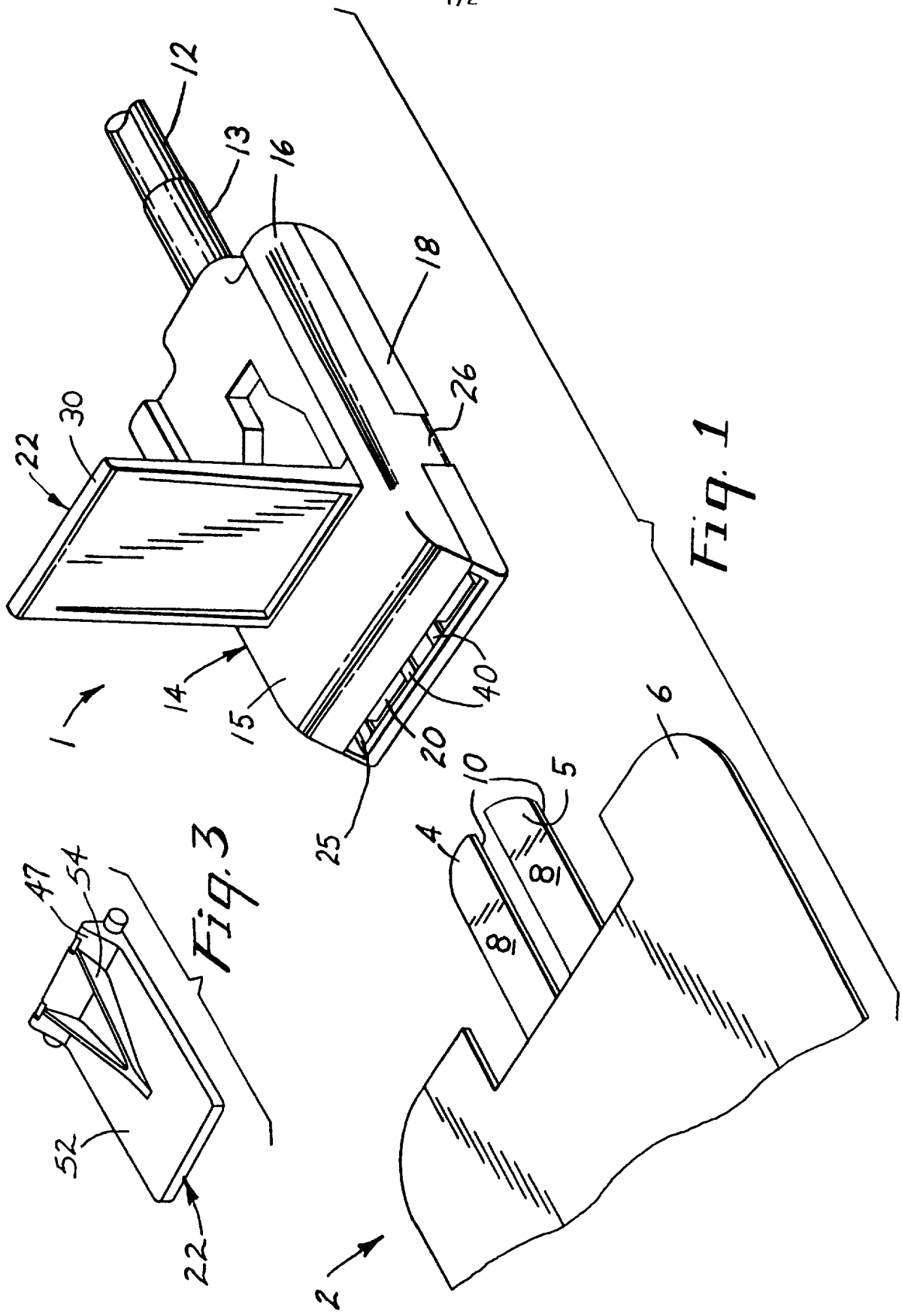

Fig. 1

Fig. 3

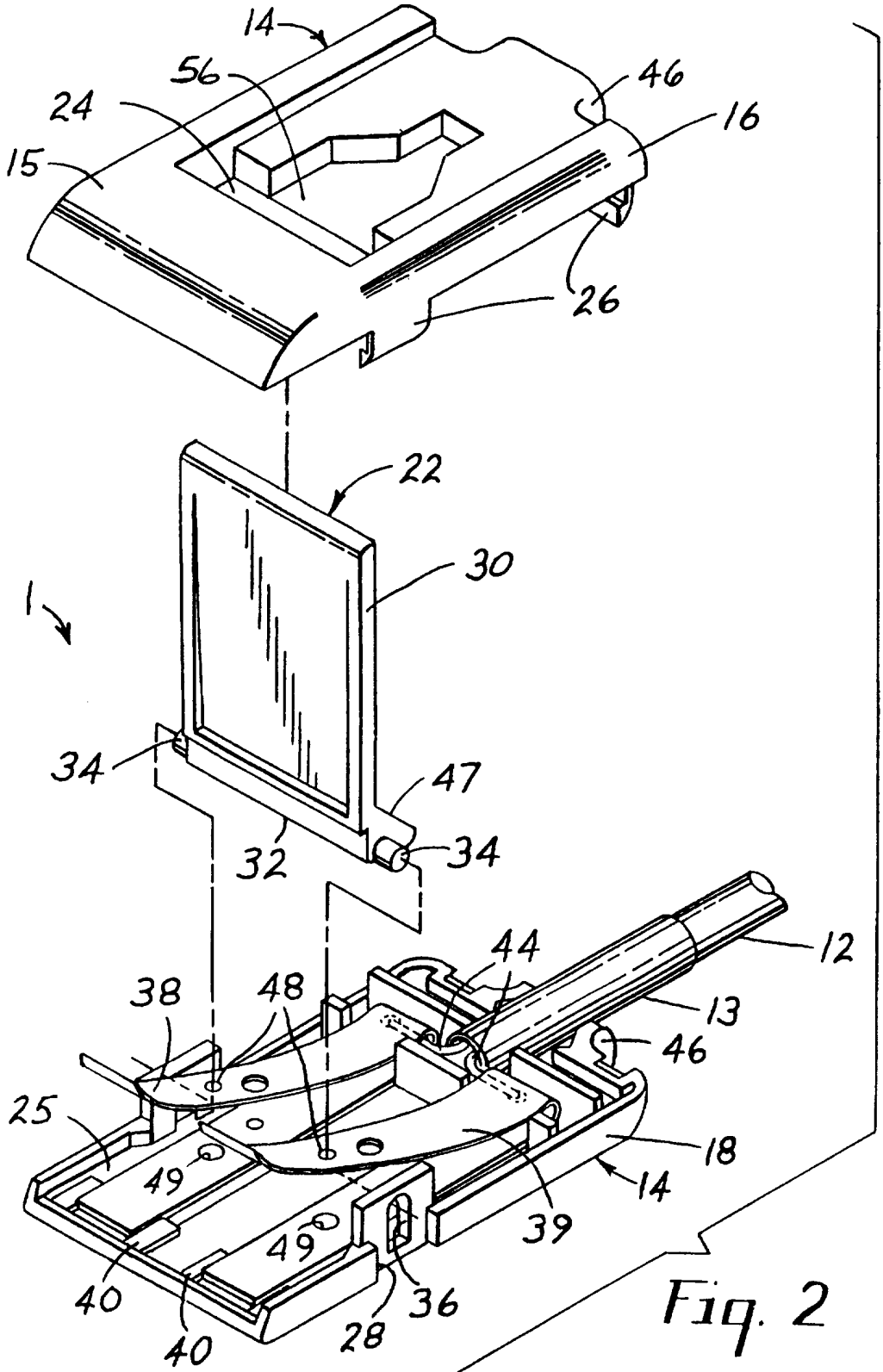
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Fig. 2

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 96/15599

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A61B17/39

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A61B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 768 969 A (BAUER) 6 September 1988 see abstract; figures 1,2 ---	1
A	US 4 952 177 A (DRAKE) 28 August 1990 cited in the application see the whole document -----	1

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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