

[54] **DISPOSABLE PROBE TIP FOR ELECTRO-SURGICAL DEVICE**

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[51] Int. Cl. **A61b 17/36, A61n 3/00, H05b 3/40**

[58] Field of Search **128/303.13, 303.14, 303.15, 128/303.16, 303.17, 404, 405, 406; 219/229, 233, 234, 235, 236, 238, 239**

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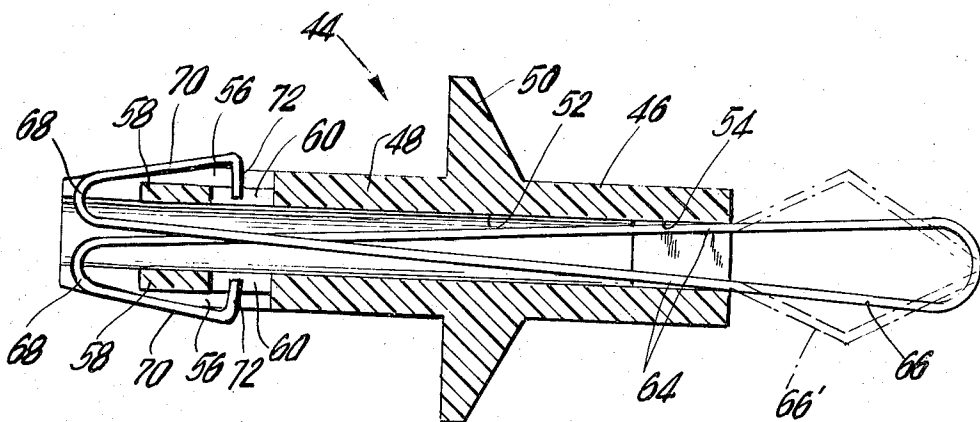
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[57] **ABSTRACT**

In a hand-held electro-surgical unit having a tubular housing and an electrical connector mounted thereon to which electrical energy can be applied, a nose piece is provided having one end configured to be mounted on the tubular housing. A conductive sleeve extends through the nose piece which is in electrical contact with the electrical connector when the nose piece is mounted on the tubular housing. A disposable probe tip is provided which is interchangeably receivable in the nose piece within the conductive sleeve. The probe tip includes an elongate tubular member having a central bore and a probe tip wire extending through the bore. A first portion of the wire extends beyond one end of the tubular member to an operative position suitable for contacting the human body for treatment thereof. A second portion of the wire is anchored to the tubular member and projects in a transverse direction relative to the latter to engage the conductive sleeve when the probe tip is received in the latter.

15 Claims, 10 Drawing Figures



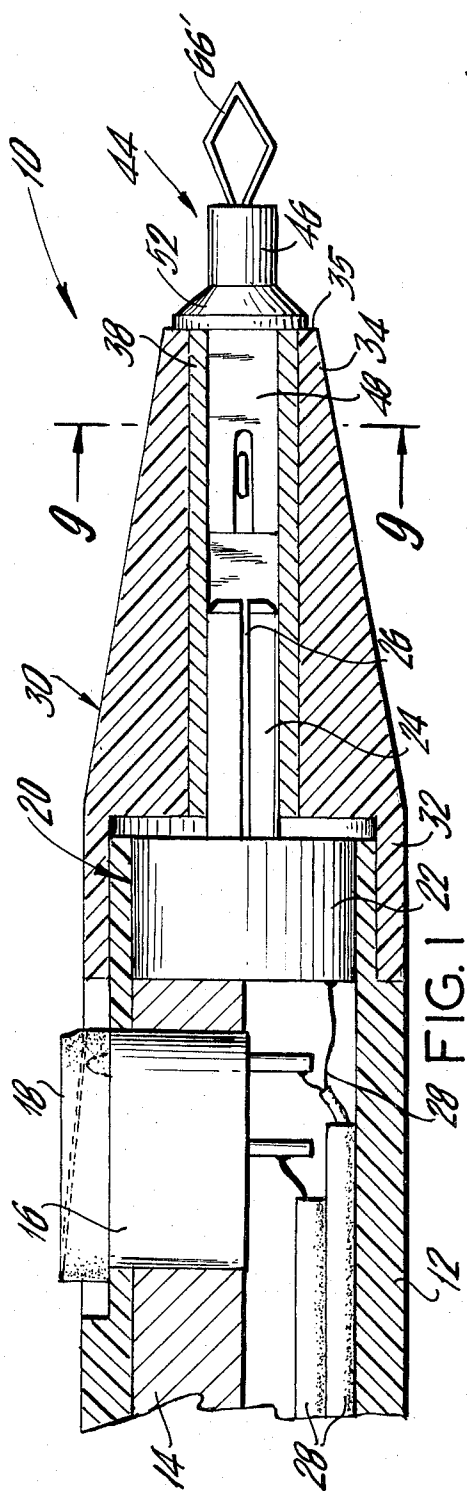


FIG. 9

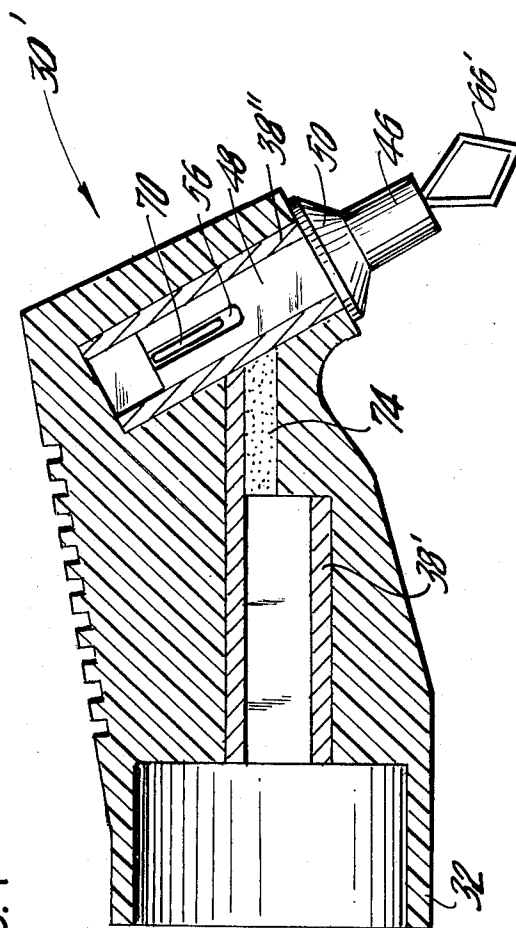


FIG. 10

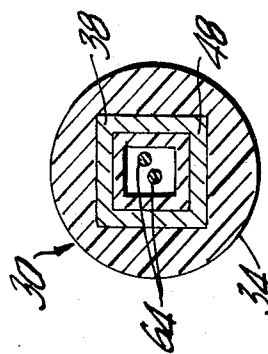


FIG. 9

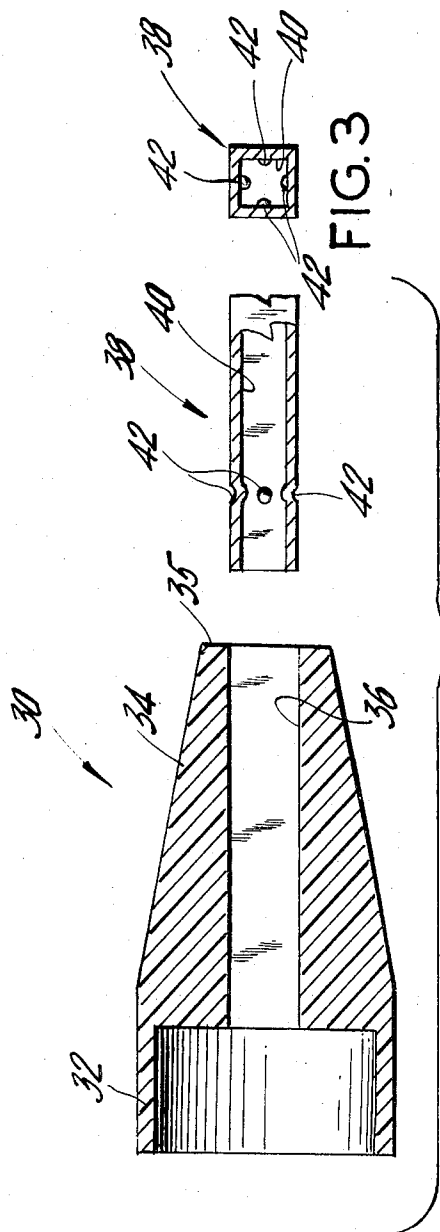


FIG. 2

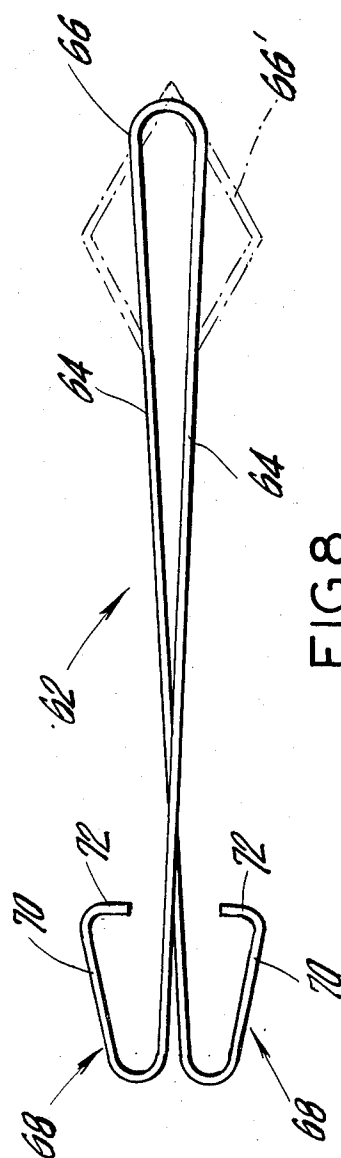


FIG. 8

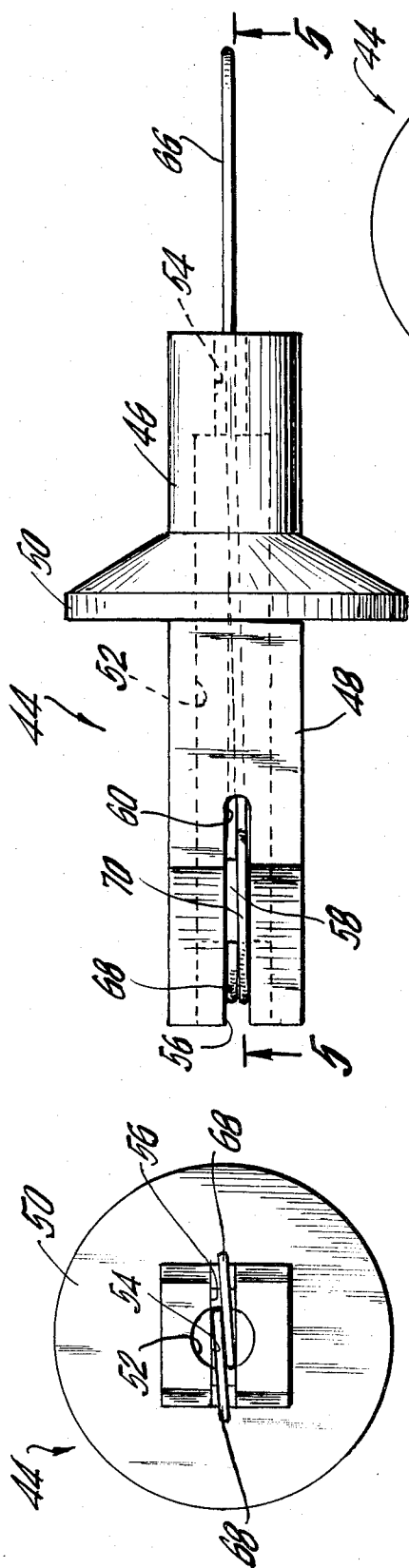


FIG. 4

FIG. 7

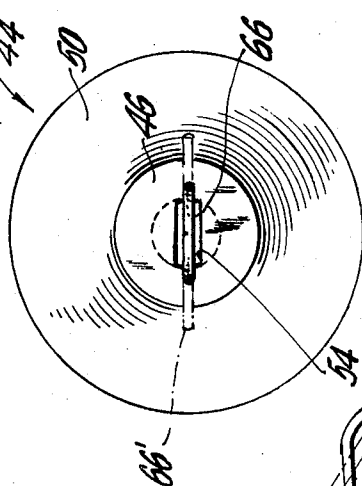


FIG. 6

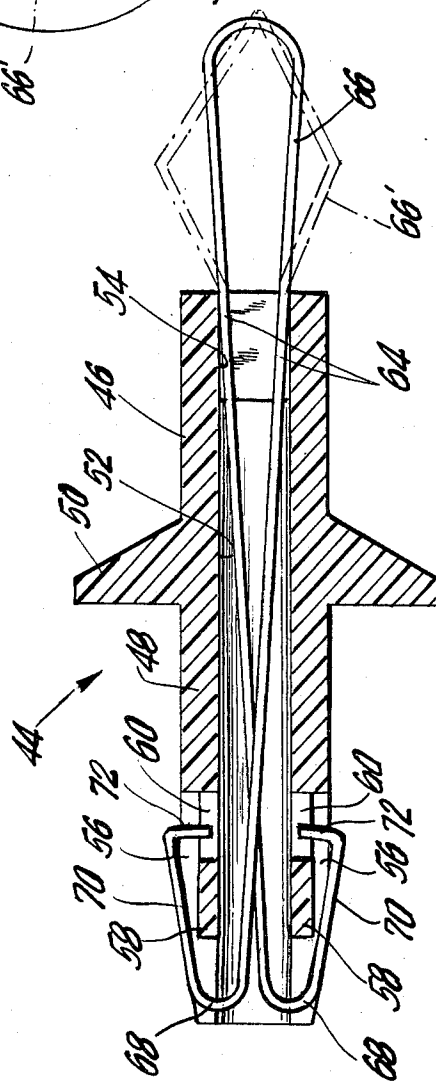


FIG. 5

DISPOSABLE PROBE TIP FOR ELECTRO-SURGICAL DEVICE

BACKGROUND OF THE INVENTION

The present invention generally relates to electro-surgical devices, and more particularly to a disposable probe tip for use therewith.

Various probe tips suitable to be utilized with hand-held electro-surgical units are known. However, most of the known probe tips are permanent accessories of the electro-surgical device and are not intended to be disposable. Accordingly, in the use of the known probe tips, it is normally necessary to sterilize the same prior to use to prevent infection to the patient.

Another disadvantage of known probe tips for surgical purposes, as above suggested, is that the configuration of the tip is normally fixed and cannot be modified to suit particular requirements. For this reason, a wide assortment of probe tips is normally necessary to provide the flexibility sometimes required in surgical procedures utilizing these devices.

SUMMARY OF THE INVENTION

It is, accordingly, a primary object of the present invention to provide a probe tip for an electro-surgical device which is not possessed of the above described disadvantages associated with conventional probe tips.

It is another object of the present invention to provide a probe tip which is simple in construction and economical to manufacture.

It is still another object of the present invention to provide a probe tip which is disposable and which can be discarded after each surgical procedure.

It is yet another object of the present invention to provide a probe tip which includes a wire cutting tip which is deformable and which can be shaped to any desired configuration.

In order to achieve the above objects, as well as others which will become apparent hereafter, a probe tip in accordance with the present invention will be described which is suitable for use with a hand-held electrical electro-surgical unit having a tubular housing, a nose piece configured to be mounted on the tubular housing and a conductive sleeve extending through the nose piece. The disposable probe tip of the present invention is interchangeably received in the nose piece within the conductive sleeve. The probe tip is formed of an elongate tubular member having a central bore. A probe tip wire extends through said bore, a first portion of said wire extending beyond one end of said tubular member to an operative position suitable for contacting the human body for treatment thereof. A second portion of said wire being anchored to said tubular member and projecting in a transverse direction relative to the latter to engage the conductive sleeve when the probe tip is received in the latter.

In the presently preferred embodiment, the probe tip wire comprises an elongate wire folded substantially at the midpoint thereof to form said first wire portion in the shape of a loop. Said second portion comprises an ear provided at each free end of said of said probe tip wire formed by bending each of the latter into a substantially closed loop. Said ears have substantially opposing inclined wire portions increasingly spaced in the direction of said one end of said tubular member to a

maximum spacing greater than the transverse dimensions of said bore, and inwardly directing transverse wire portions forming extensions of respective inclined wire portions adapted to engage said tubular member to fix said probe tip wire relative to said tubular member. In this manner, insertion of the other end of said tubular member into said conductive sleeve causes the latter to engage said inclined wire portions to thereby resiliently deform said ears and provide frictional engagement and electrical contact between said ears and the conductive sleeve.

BRIEF DESCRIPTION OF THE DRAWINGS

With the above and additional objects and advantages in view, as will hereinafter appear, this invention comprises the devices, combinations and arrangements of parts hereinafter described and illustrated in the accompanying drawings of a preferred embodiment in which:

FIG. 1 is a fragmented longitudinal cross sectional view of a probe unit, showing the manner in which a probe tip in accordance with the present invention is mounted on the nose piece of an electro-surgical unit;

FIG. 2 is an exploded cross sectional view of a nose piece in accordance with the present invention, showing the dimples formed in the conductive sleeve which is receivable within the nose piece;

FIG. 3 is an end view of the conductive sleeve shown in FIG. 2;

FIG. 4 is a front elevational view of the probe tip in accordance with the present invention and shown in FIG. 1;

FIG. 5 is a longitudinal cross section of the probe tip shown in FIG. 4, taken along line 5-5;

FIG. 6 is a front elevational view of the probe tip shown in FIG. 4;

FIG. 7 is a rear elevational view of the probe tip shown in FIG. 4;

FIG. 8 is a top elevational view of the probe tip wire shown in FIG. 5, further showing in outline another possible configuration for the probe tip at the looped end thereof;

FIG. 9 is a cross section of the nose piece with the probe tip mounted therein shown in FIG. 1, taken along line 9-9; and

FIG. 10 is a longitudinal cross sectional view of a second embodiment of a nose piece for an electro-surgical device and the manner in which the probe tip of the present invention is received therein.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings, in which identical or similar parts will be designated by the same reference numerals throughout, and first referring to FIG. 1, a hand-held electro-surgical unit which utilizes the novel disposable probe tip to be described, is generally designated by the reference numeral 10. The electro-surgical unit will only be briefly described insofar as it cooperates with a nose piece for holding the disposable probe tip of the present invention. For a fuller description of the electrosurgical unit, reference is had to pending Application Ser. No. 340,294, filed Mar. 12, 1973, and entitled: PROBE-UNIT FOR ELECTRO-SURGICAL DEVICE. The last-mentioned pending application is hereby incorporated by reference to this ap-

plication. In this manner, the specific descriptions relating to the electro-surgical unit as well as the manner of use thereof need not be repeated at length here.

Generally, the electro-surgical unit 10 includes a tubular housing in the form of a sleeve handle 12. Provided within the tubular housing 12 is a support block 14 which is adapted to support a micro-switch 16 which controls the operation of the unit, and more specifically controls the flow of energy to the probe tip to be described. Optionally, a rubber boot 18 can be provided to provide a protective seal about the opening in the tubular housing 12 through which the micro-switch 16 extends to thereby protect the micro-switch from accumulation of dust and other external pollutants.

Also provided within the tubular housing 12 is an electrical male connector element 20 which includes an enlarged cylindrical portion 22 and an elongate pin portion 24. The pin portion 24 is advantageously provided with a longitudinal slot or slit 26 which permits partial compression of the two resulting pin portions along a direction normal to the plane of the slot or slit 26, for reasons to be described hereafter. A plurality of slits may be provided angularly displaced from one another to enhance the resiliency of the pin portion 24 about its periphery.

Electrical wires 28 are connected to both the micro-switch 16 as well as to the cylindrical portion 22 of the male connector in any conventional manner (not shown). In use, actuation of the micro-switch 16 causes a high level high frequency voltage to be applied to the male connector element 20. Typically, the tubular housing 12 is made of an insulating material so that the electrical signals are only present, when applied, at the electrical connector.

A tapered nose piece 30 is provided which includes a sleeve portion 32 at one end thereof and a tapered or conical portion 34 gradually decreasing in diameter from the region of the sleeve portion. The sleeve portion 32 is provided with an internal diameter substantially equal to the outer diameter of the tubular housing 12 in the region of the microswitch 16, wherein the nose piece 30 can be slidably mounted on the tubular housing with little clearance therebetween. Optionally, any conventional means may be provided to lock or fix the position of the nose piece 30 on the tubular housing 12 when mounted in the position shown in FIG. 1.

Referring to FIG. 2, the nose piece 30 is provided with an elongate axial square hole 36 which extends from the region of the sleeve portion 32 through the tapered portion 34. The nose piece 30 is advantageously made from an insulating material, such as an elastomeric material.

An elongate nose insert in the form of a square conductive tube or conductive sleeve 38 is provided whose external transverse dimensions correspond to the internal transverse dimensions of the square hole 36, wherein the nose insert can be matingly received within the elongate square hole. Advantageously, the nose piece 30 is molded around the conductive sleeve 38 to insure that the latter is securely fixed within the nose piece.

The conductive sleeve 38 is provided with a square hole 40 which extends along the length thereof. Referring to FIGS. 2 and 3, it will be noted that dimples 42 are formed in each of the faces or sides of the conductive sleeve in the region of one end thereof which is proximate to the sleeve portion 32 when mounted

within the nose piece. The dimples 42 project into the interior of the conductive sleeve 38, as best shown in FIG. 3. The split elongate pin portion 24, which is substantially matingly received within the square hole 40, is compressed by the dimples 42 when the pin portion 24 is urged into the conductive sleeve 38. This abutting engagement of the dimples 42 and the pin portion 24 assures good electrical contact between the connector element 20 and the conductive sleeve as well as promote a good connection between the nose piece 30 and the tubular housing 12.

By providing a square hole 36 and a square conductive sleeve 38 which matingly fits within the square hole 36, it is assured that the conductive sleeve does not rotatably move about its elongate axis relative to the nose piece 30.

An important feature of the present invention is the provision of a disposable probe tip which includes a tubular member or wire retainer 44 including a cylindrical cross section front end portion 46 and a square cross section rear end portion 48. In the presently preferred embodiment, the tubular member 44 is integrally constructed and advantageously made of an inexpensive elastomeric material such as any suitable plastic.

Separating the cylindrical front end 46 and the square rear end 48 is a stop in the form of an annular flange 50 which projects in a transverse direction relative to the axis generally defined by the tubular member 44. The diameter of the annular flange 50 is greater than the maximum transverse dimensions of the square hole 40 of the conductive sleeve 38 to thereby prevent excessive insertion of the probe tip within the nose piece. Accordingly, the square rear end portion 48 is insertable within the square hole 40 of the conductive sleeve to a point where the annular flange or stop 50 abuts against the nose piece 30 as shown in FIG. 1. The cylindrical front end portion 46 remains exposed and projects forwardly of the nose piece.

A central hole or bore 52 is provided within the wire retainer or tubular member 44 which extends along substantially the entire length thereof. For reasons to be described hereafter, a portion of the bore 52 within the cylindrical front end portion 46 is in the form of a slot 54 having a rectangular cross section.

Referring to FIGS. 4 and 5, a slot 56 is provided at the free end of the rear square portion 48. Spaced on opposite sides of the bore or hole 52 within the slot 56 are two spaced walls 58 which are each provided with an aperture 60. The apertures 60 are transversely disposed within the walls 58 and are substantially in opposition to one another.

In FIG. 8, a probe tip wire is shown and generally designated by the reference numeral 62. The probe tip wire 62 comprises an elongate wire folded substantially about the midpoint thereof to form two legs or elongate wire sections 64. The two legs 64 are made of any suitable conductive flexible wire commonly used for this purpose.

The probe tip wire 62 is folded to form a rounded loop 66 at one end of the probe tip wire which is suitable for contacting the human body for treatment thereof in a conventional manner. The loop 66, as well as the legs 64 define a plane, the planar nature of the loop 66 being utilized to prevent undesirable movements of the cutting tip or rounded loop 66 in a manner to be described hereafter.

At the end remote from the rounded loop 66, the free ends of the probe tip wire are bent to form ears 68, which have substantially opposed inclined wire portions 70 increasingly spaced in the direction of the rounded loop 66 to a maximum spacing greater than the transverse dimensions of the hole 52. Inwardly directed transverse wire portions 72 are provided which form extensions of the respective inclined wire portions 70. The folded probe tip wire 52 extends through the hole or bore 52, as shown in FIG. 5, with the looped end 66 projecting beyond the tubular member 44. The ears 68 extend beyond the walls 58 within the slot 56 and loop in a reverse direction towards the rounded loop 66 for positioning the transverse radial portions 72 within respective ones of the transverse holes 60 to substantially fix the probe tip wire 62 relative to the tubular member 44 to prevent longitudinal movement thereof. In this manner, insertion of one end of the tubular member 44 into the conductive sleeve 38 causes the latter to engage the inclined wire portions 70 to thereby resiliently deform the ears 68 and provide frictional engagement and electrical contact between the ears 68 and the conductive sleeve 38.

As suggested above, the probe tip wire 62 is made from a resilient and deformable conductive wire. When first bent, a rounded loop 66 is formed which can be urged and passed through the bore or hole 52. Once the probe tip wire 62 is locked in position, by the entry of the transverse radial portions 72 into the apertures 60, the rounded wire loop 66 can be deformed or bent to any desired configuration. A diamond-shaped loop 66' is shown in dashed outline as exemplary of a useful shape which can be formed.

It should be noted that the planar geometry of the probe tip wire 52, as suggested in FIG. 8, is adapted to be received within the slot 54. When so received, rotary movement of the loop relative to the tubular member 44 is prevented. Further, as suggested above, the ears 68 similarly prevent rotary as well as longitudinal movement of the probe tip wire. Thus, while the probe tip wire 62 is fixed within the tubular member 44, the tubular member can be rotated within the conductive sleeve 38 to thereby orient the loop within any desirable or useful plane. The frictional engagement between the inclined wire portions 70 and the internal or interior surface of the conductive sleeve 38 is sufficient to maintain the disposable probe tip in a preselected position.

The disposable probe tip above described is simple in construction and economical to manufacture and permits the tip to be discarded after each use, whereby sterilization procedures for previously used tips is avoided. Also, as mentioned above, the resilient deformable nature of the wire allows the cutting or probe tip to be deformed to any desired configuration as necessitated by surgical procedures.

Numerous alterations of the structure herein disclosed will suggest themselves to those skilled in the art. However, it is to be understood that the present disclosure relates to a preferred embodiment of the invention which is for purposes of illustration only and is not to be construed as a limitation of the invention.

What is claimed is:

1. In a hand-held electro-surgical unit having a tubular housing, a nose piece configured to be mounted on the tubular housing, and a conductive sleeve extending through the nose piece, the improvement compris-

ing a disposable probe tip interchangeably received in the nose piece within the conductive sleeve, said probe tip being formed of an elongate tubular member having a central bore; and a probe tip wire extending through said bore, a first portion of said wire extending beyond one end of said tubular member to an operative position suitable for contacting the human body for treatment thereof, and a second portion of said wire being anchored to said tubular member and projecting in a transverse direction relative to the latter to engage the conductive sleeve when the probe tip is received in the latter.

2. A disposable probe tip as defined in claim 1, wherein said probe tip wire comprises an elongate wire folded substantially at the midpoint thereof to form said first wire portion in the shape of a loop.

3. A disposable probe tip as defined in claim 2, wherein said first wire portion is in the form of a diamond-shaped loop.

4. A disposable probe tip as defined in claim 2, wherein said second portion comprises an ear provided at each free end of said probe tip wire formed by bending each of the latter into a substantially closed loop.

5. A disposable probe tip as defined in claim 4, wherein said ears have substantially opposing inclined wire portions increasingly spaced in the direction of said one end of said tubular member to a maximum spacing greater than the transverse dimensions of said bore, and inwardly directed transverse wire portions forming extensions of respective inclined wire portions adapted to engage said tubular member to fix said probe tip wire relative to said tubular member, whereby insertion of the other end of said tubular member into said conductive sleeve causes the latter to engage said inclined wire portions to thereby resiliently deform said ears and provide frictional engagement and electrical contact between said ears and the conductive sleeve.

6. A disposable probe tip as defined in claim 1, further comprising stop means provided on said tubular member for limiting the extent of insertion of the latter into the conductive sleeve.

7. A disposable probe tip as defined in claim 6, wherein said stop means comprises an annular flange about said tubular member intermediate the ends thereof, said annular flange having a diameter greater than the transverse dimensions of the conductive sleeve, whereby said annular flange abuts against the conductive sleeve when said probe tip is fully inserted within the conductive sleeve.

8. A disposable probe tip as defined in claim 1, wherein said probe tip wire is folded to form two legs which together define a plane, said central bore at said one end of said tubular member being in the form of a rectangular opening parallel to said plane, whereby said rectangular opening prevents rotary movements of said probe tip wire relative to said tubular member about the longitudinal length of said probe tip wire.

9. A disposable probe tip as defined in claim 1, wherein said tubular member is made of an elastomeric material.

10. A disposable probe tip as defined in claim 1, wherein said probe tip wire is made from a conductive, deformable material.

11. A disposable probe tip insertable into a conductive sleeve of an electro-surgical device, the probe tip

comprising a tubular member having a central bore and a pair of diametrically opposed transverse holes in the wall of said tubular member at one end thereof which is adapted to be receivable within the conductive sleeve; and a folded conductive probe tip wire folded substantially at the midpoint thereof to form a looped end suitable for contacting the human body for treatment thereof, the free ends of said folded wire being bent to form ears having substantially opposed inclined wire portions increasingly spaced in the direction of the other end of said tubular member to a maximum spacing greater than the transverse dimensions of said bore, and inwardly directed transverse wire portions forming extensions of the respective inclined wire portions, said folded wire extending through said bore with said looped end projecting beyond the other end of said tubular member, said ears extending beyond said one end of said tubular member and looping in a reverse direction for positioning said transverse wire portions within respective ones of said transverse holes to substantially fix said probe wire relative to said tubular member to prevent longitudinal movement thereof, whereby insertion of said one end of said tubular member into the conductive sleeve causes the latter to engage said inclined wire portions to thereby resiliently deform said ears and provide frictional engagement and electrical contact between said ears and the conductive sleeve.

12. A disposable probe tip as defined in claim 11, wherein said one end of said tubular member is provided with a longitudinal slot in which said ears are disposed, and further comprising two spaced apertured walls provided in said slot on opposite sides of said bore for receiving said transverse wire portions.

13. In a hand-held electro-surgical unit having a tubular housing and an electrical connector mounted thereon to which electrical energy can be applied, the improvement comprising a nose piece having one end configured to be mounted on the tubular housing; a conductive sleeve extending through the nose piece and in electrical contact with the electrical connector when said nose piece is mounted on said tubular housing; and a disposable probe tip interchangeably received in the nose piece within the conductive sleeve, said probe tip including a probe tip wire in electrical contact with said conductive sleeve when mounted within the nose piece and having a portion thereof suitable for contacting the human body for treatment thereof.

14. In a hand-held unit as defined in claim 13, wherein said nose piece is provided with a hole having a rectangular cross section; said conductive sleeve being in the form of a tube of rectangular cross section receivable in said rectangular hole, the probe tip portion receivable in said conductive sleeve having a rectangular cross section and being matingly receivable in said rectangular tube, whereby rotary movement of said probe tip relative to said nose piece is prevented.

15. In a hand-held unit as defined in claim 13, wherein said conductive sleeve is provided with internally projecting dimples on the portion thereof which makes connection with the electrical connector, whereby said dimples abut against the electrical connector in pressure relation to provide good electrical contact.

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