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(54) **MANUAL ELECTROCAUTERY DEVICE**

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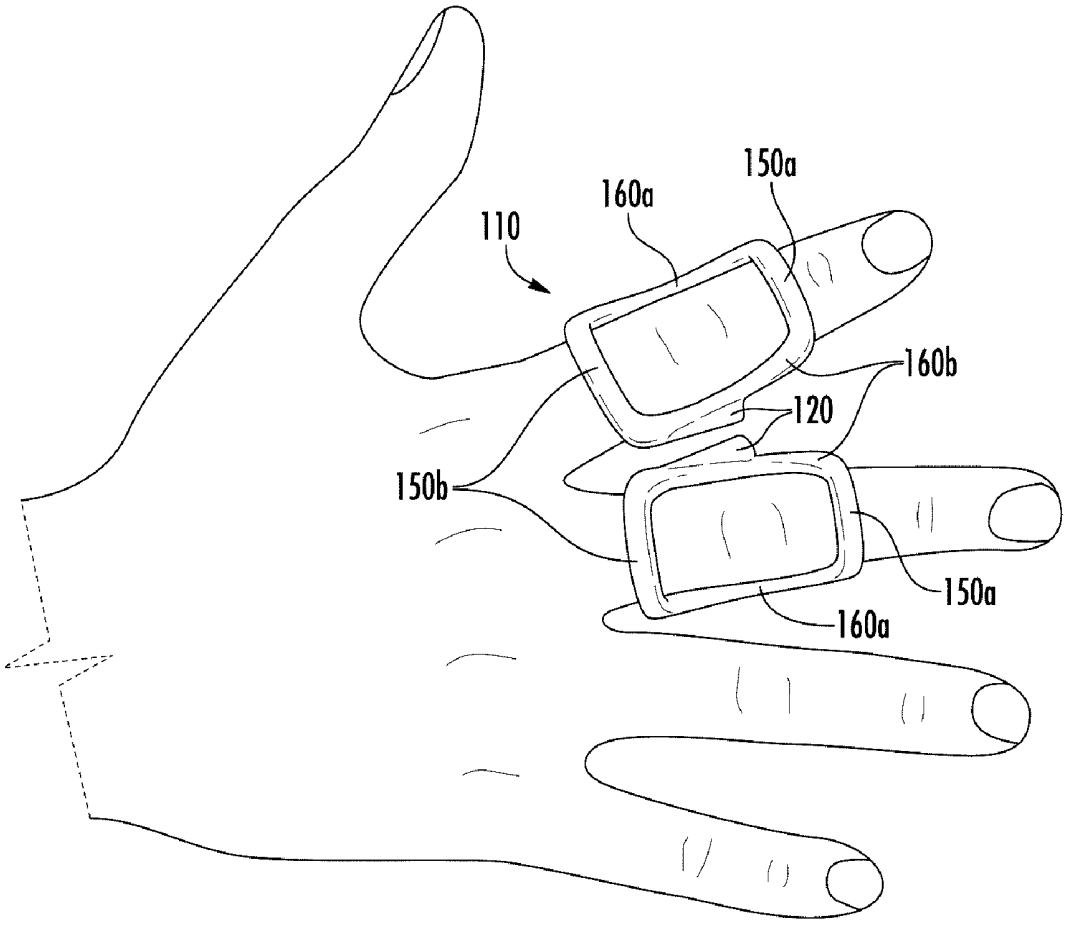
CPC .. ***A61B 18/1402*** (2013.01); *A61B 2018/00595* (2013.01)

(57) **ABSTRACT**

An electrocautery device includes two wearable cauterizers, each wearable cauterizer comprising a front bridge structure positioned above a knuckle on a top side of a hand, a back bridge structure positioned below the knuckle on the top side of the hand, at least one connecting member disposed between the front bridge structure and the back bridge structure, a cutting electrode disposed between the front bridge structure and the back bridge structure, and an insulator disposed between the cutting electrode and a finger, and a power unit.



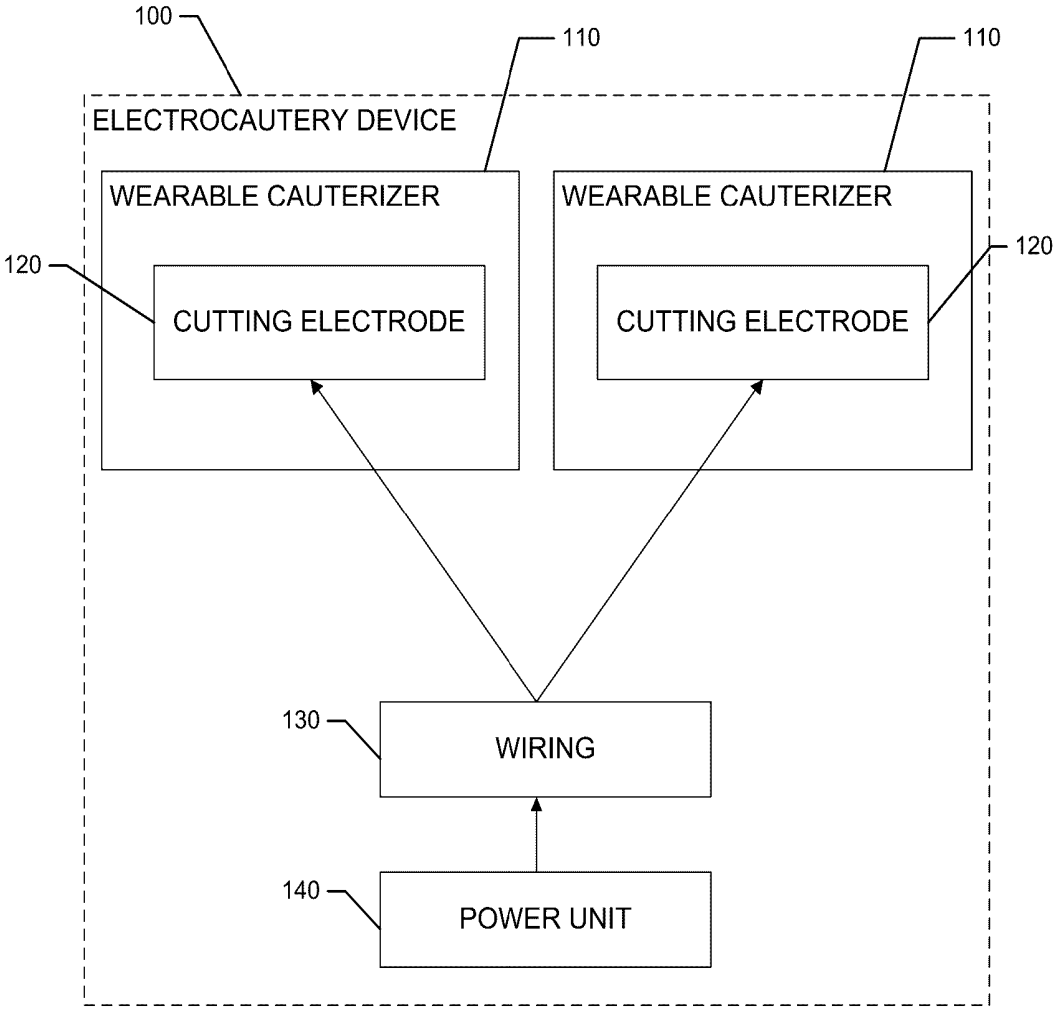

100
110
110
ELECTROCAUTERY DEVICE
WEARABLE CAUTERIZER
WEARABLE CAUTERIZER
120
120
CUTTING ELECTRODE
CUTTING ELECTRODE
130
WIRING
140
POWER UNIT

FIG. 1

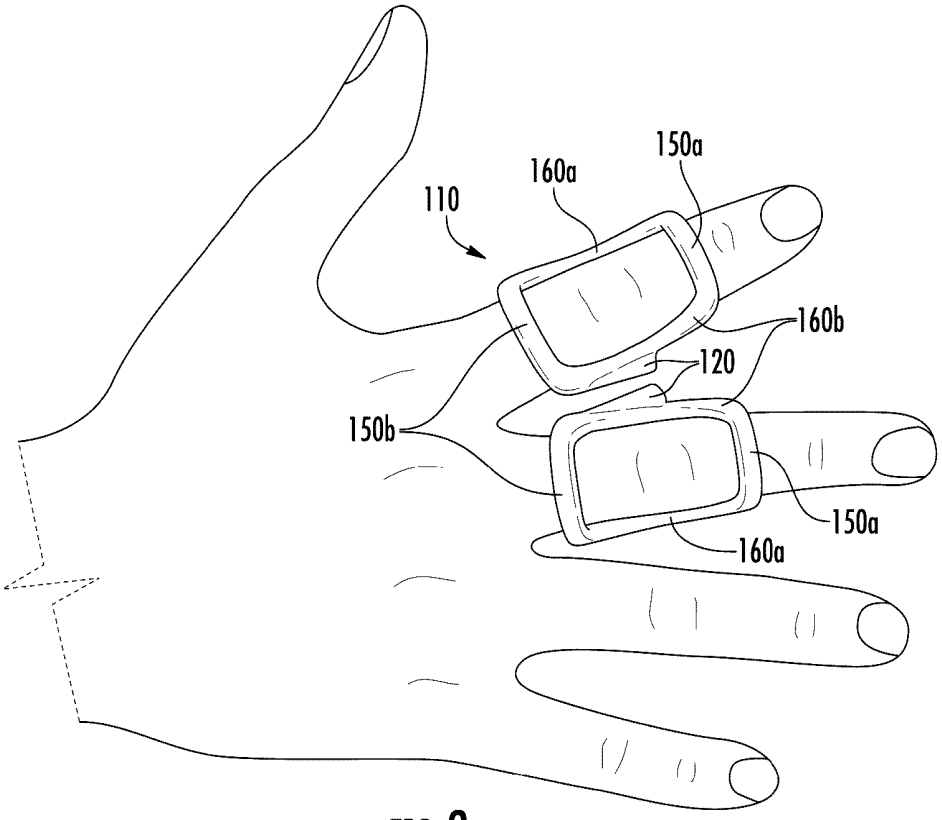

150a
160a
110
160b
120
150b
150a
160a

FIG. 2

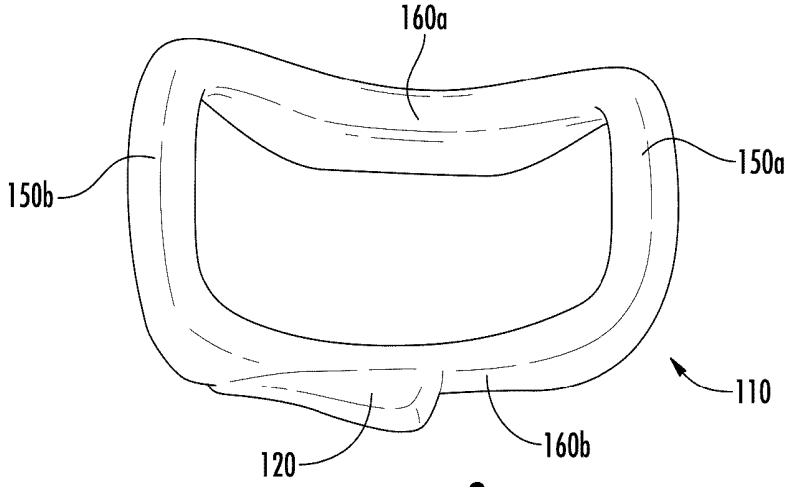

160a
150b
150a
110
120
160b

FIG. 3

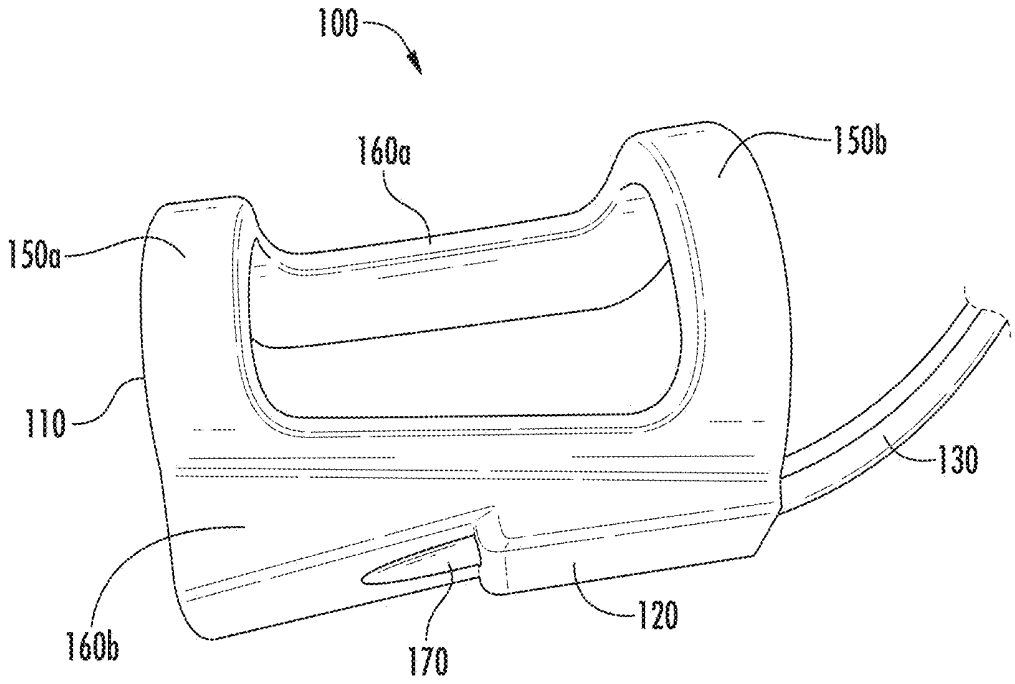


FIG. 4

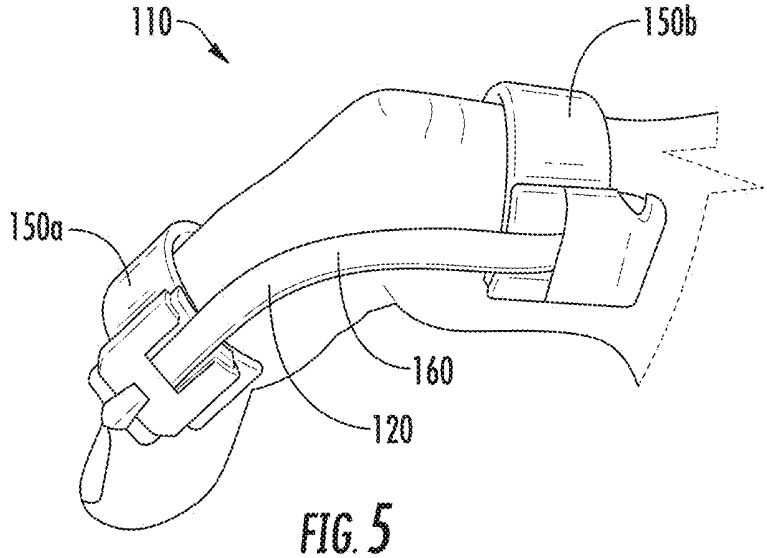


FIG. 5

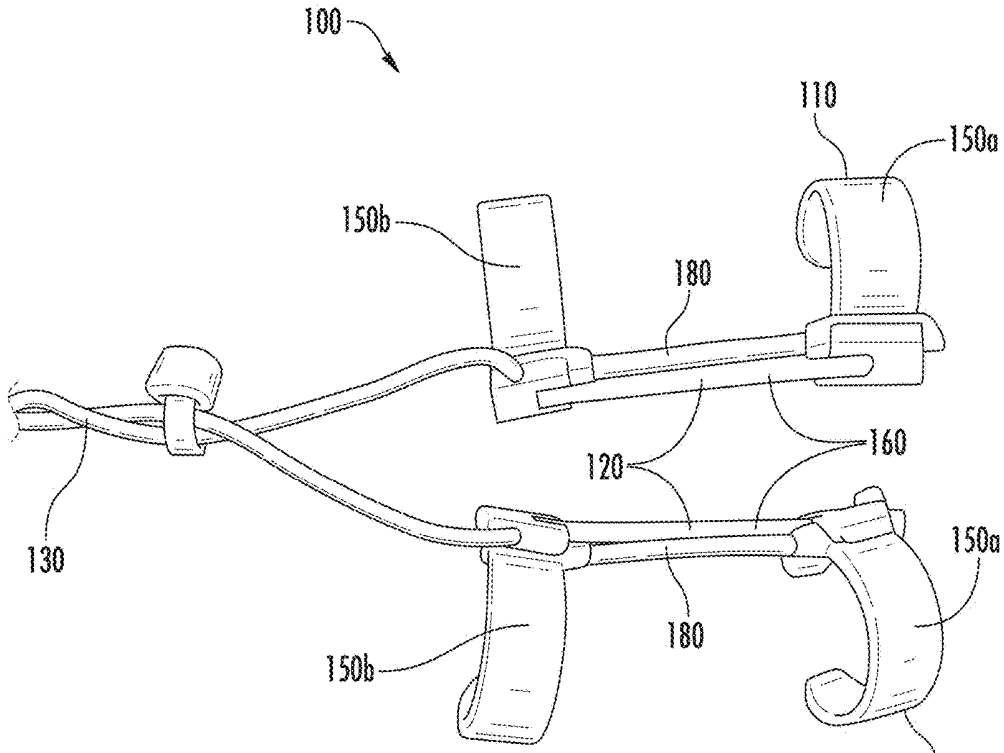


FIG. 6

MANUAL ELECTROCAUTERY DEVICE

TECHNICAL FIELD

[0001] Example embodiments relate generally to manual electrocautery devices for coagulation and cutting of tissue in a wide variety of surgical applications.

BACKGROUND

[0002] Hysterectomies are the second most common surgical procedure in the U.S, with about 600,000 done annually. The four approaches for surgical removal of a uterus are abdominal, vaginal, laparoscopic, and robotic assisted laparoscopic. Objective evidence supports the total vaginal hysterectomy as the "gold standard" due to its low cost and safety. This approach demands technical skill and experience, which limits its application in many practices. The current instrumentation and approach for a vaginal hysterectomy includes metal clamps and suture ligation. The procedure requires the surgeon to manually identify four ligaments bilaterally to be clamped and sutured. The limitations include poor visualization in a small, cluttered working space. The easy part for the surgeon is to identify the basic anatomy with one's pointer and middle finger, enveloping the appropriate ligament and vasculature. Certain difficulty follows with tracing a Heney clamp along the fingers to grasp all of the selected tissue. The clamp's path is often obstructed with undesired vaginal soft tissue and the surgeon's gloves. This must be done to 4 ligaments bilaterally, in addition to extra vaginal tissue supporting the uterus. This is all done with little to no visualization. Once the clamp is placed, the surgeon must then confidently throw a stitch and tie knots to secure the vessels and tissue while simultaneously removing the clamp—again with very minimal visualization. The total number of knots tied by the surgeon can exceed 300 to secure this small space, which encompasses no more than 3-4 inches circumferentially. Inappropriate timing between removal of the clamp and placement of the stitch leads to devastating consequences including hemorrhage and distorted anatomy. The technical skill required limits its clinical application.

[0003] Robotic assist laparoscopic surgery has taken favor among gynecologists due to its technical ease and enhanced visualization and dexterity. Additionally the excitement for a new gadget has created popular demand among patients with disregard to best practice. This fad is not sustainable. A hospital must purchase a $2 million dollar apparatus, surgeons must enroll in hours of training, and an additional $2,200 is spent on each hysterectomy with no improvement in pain control, recovery time, or complications. There is a push among gynecologic surgeons and our pressured healthcare systems to re-embrace the gold standard of care for best practice and cost effectiveness and return to more vaginal surgery.

[0004] Therefore there remains a need in the art for a device designed to combine the assets of robotic surgery with the practicality of vaginal surgery to optimize the surgical experience for both patient and physician.

BRIEF SUMMARY

[0005] One or more embodiments of the invention may address one or more of the aforementioned problems. Certain embodiments according to the present invention provide an electrocautery device suitable for a wide variety of applications. In accordance with certain embodiments, the electrocautery device may comprise two wearable cauterizers, each wearable cauterizer comprising a front bridge structure positioned above a knuckle on a top side of a hand, a back bridge structure positioned below the knuckle on the top side of the hand, at least one connecting member disposed between the front bridge structure and the back bridge structure, a cutting electrode disposed between the front bridge structure and the back bridge structure, and an insulator disposed between the cutting electrode and a finger. The electrocautery device may further comprise a power unit.

BRIEF DESCRIPTION OF THE DRAWING(S)

[0006] The present invention now will be described more fully hereinafter with reference to the accompanying drawings, in which some, but not all embodiments of the invention are shown. Indeed, this invention may be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will satisfy applicable legal requirements. Like numbers refer to like elements throughout.

[0007] FIG. **1** illustrates a block diagram of an electrocautery device according to an example embodiment.

[0008] FIG. **2** illustrates a top view of two wearable cauterizers worn on a hand according to an example embodiment.

[0009] FIG. **3** illustrates a top view of a wearable cauterizer according to an example embodiment.

[0010] FIG. **4** illustrates a partial perspective view of an electrocautery device according to an example embodiment.

[0011] FIG. **5** a side view of a wearable cauterizer worn on a finger according to an example embodiment.

[0012] FIG. **6** illustrates a partial top view of an electrocautery device according to an example embodiment.

DETAILED DESCRIPTION

[0013] Some example embodiments now will be described more fully hereinafter with reference to the accompanying drawings, in which some, but not all embodiments of the inventions are shown. Indeed, this invention may be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will satisfy applicable legal requirements. As used in the specification, and in the appended claims, the singular forms "a", "an", "the", include plural referents unless the context clearly dictates otherwise.

[0014] An example embodiment includes an electrocautery device suitable for a wide variety of applications. In accordance with certain embodiments, the the electrocautery device may comprise two wearable cauterizers, each wearable cauterizer comprising a front bridge structure positioned above a knuckle on a top side of a hand, a back bridge structure positioned below the knuckle on the top side of the hand, at least one connecting member disposed between the front bridge structure and the back bridge structure, a cutting electrode (e.g., a wire, plate or other conductive surface) disposed between the front bridge structure and the back bridge structure, and an insulator disposed between the cutting electrode and a finger. The electrocautery device may further comprise a power unit.

[0015] FIG. **1**, for example, illustrates a block diagram of an electrocautery device according to an example embodiment. As shown in FIG. **1**, the electrocautery device **100** includes two wearable cauterizers **110** having a cutting electrode **120** connected to a power unit **140** via wiring **130**. The power unit **140** may be activated by a foot pedal or any other suitable activation means to enable the cutting electrode **120** to surgically coagulate, ligate, and/or cut tissue. The cutting electrode **120** may surgically coagulate, ligate, and/or cut tissue via bipolar cautery, ultrasonographic vibrations, or any other suitable means of coagulating, ligating, and/or cutting tissue.

[0016] FIG. **2**, for example, illustrates a top view of two wearable cauterizers worn on a hand according to an example embodiment. As shown in FIG. **2**, each wearable cauterizer includes a cutting electrode **120**, a front bridge structure **150***a*, a back bridge structure **150***b*, an external connecting member **160***a*, and an internal connecting member **160***b*. The wearable cauterizers **110** are worn on the index and middle finger of the hand. Each wearable cauterizer **110** is worn on a finger such that the external connecting member **160***a* and the internal connecting member **160***b* extend along opposite sides of the finger.

[0017] The wearable cauterizers **110** are positioned on the index and middle fingers respectively such that the cutting electrodes **120** of the wearable cauterizers **110** face each other in the space between the index finger and the middle finger. As such, an electrical current generated by the cutting electrodes **120** is passed between a surgeon's insulated hands. The surgeon's hand may be insulated via at least one of the connecting members **160***a*, **160***b*, the surgeon's glove, or a separate insulator. The insulator may selectively line the wiring **130** or may envelop the entire finger depending on the thermal spread generated by the cutting electrodes **120**. Additionally, in some embodiments, the wearable cauterizers **100** may include a thermal spread sensor and/or a stopping mechanism to ensure surgeon safety when using the electrocautery device.

[0018] FIG. **3**, for example, illustrates a top view of a wearable cauterizer according to an example embodiment. As shown in FIG. **3**, the wearable cauterizer **110** includes a cutting electrode **120**, a front bridge structure **150***a*, a back bridge structure **150***b*, an external connecting member **160***a*, and an internal connecting member **160***b*. In some embodiments, for example, the front bridge structure **150***a* and/or the back bridge structure **150***b* may be a plastic (e.g., lightweight plastic), metal, and/or fabric based on the surgical application for which the electrocautery device **100** will be used and the level of comfort required by the surgeon. If a fabric is used, the fabric may be a neoprene sleeve or any other fabric that has a high thermoinsulative capacity. The external connecting member **160***a* and/or the internal connecting member **160***b* may also be plastic, metal, fabric, rubber, or any other suitable material for connecting the front bridge structure **150***a* and the back bridge structure **150***b*. In certain embodiments, for instance, the internal connecting member **160***b* may be the insulator and, as such, is made of an insulating material. In other embodiments, for example, a connecting member may be the cutting electrode, as discussed below in further detail.

[0019] FIG. **4**, for example, illustrates a partial perspective view of an electrocautery device according to an example embodiment. As shown in FIG. **4**, the electrocautery device **100** includes two wearable cauterizers **110** (second wearable cauterizer not shown). The wearable cauterizer **110** includes a cutting electrode **120**, a front bridge structure **150***a*, a back bridge structure **150***b*, an external connecting member **160***a*, an internal connecting member **160***b*, and a passthrough orifice **170**. The passthrough orifice **170** extends through an insulator (the internal connecting member **160***b* in some embodiments) to the cutting electrode **120**. As such, the wiring **130** may be built in to the electrocautery device **100**, but a user's hand is protected from the wiring **130** due to the passthrough orifice **170** in the insulator. The wearable cauterizer **100** is connected to a power unit (not shown) via wiring **130**. The wiring **130** may be secured within a surgeon's glove and gown and also may be grounded to the patient.

[0020] FIG. **5**, for example, a side view of a wearable cauterizer worn on a finger according to an example embodiment. As shown in FIG. **5**, the wearable cauterizer **110** includes a front bridge structure **150***a*, a back bridge structure **150***b*, a cutting electrode **120**, and a connecting member **160**, such that the cutting electrode **120** is the connecting member **160**. The front bridge structure **150***a* and the back bridge structure **150***b* extend along both sides of a finger and terminate prior to the palm side of the finger. As such, the palm remains open while using the electrocautery device **100**. Additionally, the front bridge structure **150***a* and the back bridge structure **150***b* are positioned on the finger so as to allow full joint motion.

[0021] FIG. **6**, for example, illustrates a partial top view of an electrocautery device according to an example embodiment. As shown in FIG. **6**, the electrocautery device **100** includes two wearable cauterizers **110**. Each wearable cauterizer **100** includes a front bridge structure **150***a*, a back bridge structure **150***b*, a rubber strip **180** (i.e. insulator), a cutting electrode **120**, and a connecting member **160**, such that the cutting electrode **120** is the connecting member **160**. The two wearable cauterizers **110** are connected to a power unit (not shown) via wiring **130**.

[0022] The rubber strip **180** may be replaced by another insulator including plastic, a glove, or any combination thereof. Alternatively, the insulator may be any other suitable insulating material. In FIG. **6**, the rubber strip **180** extends between the front bridge structure **150***a* and the back bridge structure **150***b*. Additionally, the connecting member **160** includes the cutting electrode **120** and the rubber strip **180**. (i.e. insulator). In some embodiments and as shown in FIG. **6**, the cutting electrode **120** extends from the front bridge structure **150***a* to the back bridge structure **150***b* and may be entirely disposed between the front bridge structure **150***a* and the back bridge structure **150***b*. The cutting electrode **120** may be attached to the front bridge structure **150***a* and the back bridge structure **150***b* via a locking mechanism. The locking mechanism may be any suitable means of attaching the cutting electrode **120** to the front and back bridge structures **150***a*, **150***b*.

Exemplary Embodiments

[0023] Having described various aspects and embodiments of the invention herein, further specific embodiments of the invention include those set forth in the following paragraphs.

[0024] In some example embodiments, an electrocautery device is provided. In general, the electrocautery device, according to certain example embodiments, includes two wearable cauterizers and a power unit. In some cases, each

wearable cauterizer comprises a front bridge structure positioned above a knuckle on a top side of a hand, a back bridge structure positioned below the knuckle on the top side of the hand, at least one connecting member disposed between the front bridge structure and the back bridge structure, a cutting electrode disposed between the front bridge structure and the back bridge structure, and an insulator disposed between the cutting electrode and a finger. However, in other example embodiments, only one wearable cauterizer may include both the front and rear bridge structures, and the other may include only one such bridge structure with an electrode attached thereto.

[0025] In accordance with certain example embodiments, the front bridge structure and the back bridge structure extend along both sides of the finger and terminate prior to a palm side of the finger. In some example embodiments, a first wearable cauterizer is disposed on an index finger and a second wearable cauterizer is disposed on a middle finger. In such embodiments, the cutting electrode of the first wearable cauterizer faces the cutting electrode of the second wearable cauterizer between the index finger and the middle finger.

[0026] In accordance with certain example embodiments, a foot pedal activates the power unit to enable the cutting electrode to surgically coagulate and cut tissue. In certain example embodiments, the cutting electrode surgically coagulates and cuts tissue via bipolar cautery. In other example embodiments, the cutting electrode surgically coagulates and cuts tissue via ultrasonographic vibrations.

[0027] In accordance with certain example embodiments, the insulator comprises at least one of a rubber strip, plastic, a glove, or any combination thereof. In certain exemplary embodiments, the insulator comprises a rubber strip extending between the front bridge structure and the back bridge structure. In some example embodiments, the at least one connecting member is the insulator.

[0028] In accordance with certain example embodiments, the front bridge structure and the back bridge structure comprise plastic. In other example embodiments, the front bridge structure and the back bridge structure comprise metal. In further example embodiments, the front bridge structure and the back bridge structure comprise fabric. In some example embodiments, the at least one connecting member comprises plastic.

[0029] In accordance with certain example embodiments, each wearable cauterizer comprises one connecting member. In such embodiments, the connecting member comprises the cutting electrode and a rubber strip disposed between the cutting electrode and the finger. In some example embodiments having one connecting member, the cutting electrode extends from the front bridge structure to the back bridge structure. In certain example embodiments, the cutting electrode is entirely disposed between the front bridge structure and the back bridge structure.

[0030] In other example embodiments, each wearable cauterizer comprises two connecting members. In such embodiments, each wearable cauterizer comprises an internal connecting member and an external connecting member, and the internal connecting member and the external connecting member extend along opposite sides of the finger. In some example embodiments, each wearable cauterizer can be modified to further comprise a passthrough orifice extending through the insulator to the cutting electrode.

[0031] These and other modifications and variations to the present invention may be practiced by those of ordinary skill in the art without departing from the spirit and scope of the present invention, which is more particularly set forth in the appended claims. In addition, it should be understood that aspects of the various embodiments may be interchanged in whole or in part. Furthermore, those of ordinary skill in the art will appreciate that the foregoing description is by way of example only, and it is not intended to limit the invention as further described in such appended claims. Therefore, the spirit and scope of the appended claims should not be limited to the exemplary description of the versions contained herein.

That which is claimed:

1. An electrocautery device, comprising:

two wearable cauterizers, at least one of the wearable cauterizers comprising a front bridge structure positioned above a knuckle on a top side of a hand, a back bridge structure positioned below the knuckle on the top side of the hand, at least one connecting member disposed between the front bridge structure and the back bridge structure, a cutting electrode disposed between the front bridge structure and the back bridge structure, and an insulator disposed between the cutting electrode and a finger; and

a power unit.

2. The electrocautery device according to claim **1**, wherein the front bridge structure and the back bridge structure extend along both sides of the finger and terminate prior to a palm side of the finger.

3. The electrocautery device according to claim **1**, wherein a first wearable cauterizer is disposed on an index finger and a second wearable cauterizer is disposed on a middle finger, wherein the cutting electrode of the first wearable cauterizer faces the cutting electrode of the second wearable cauterizer between the index finger and the middle finger.

4. The electrocautery device according to claim **1**, wherein a foot pedal activates the power unit to enable the cutting electrode to surgically coagulate and cut tissue.

5. The electrocautery device according to claim **1**, wherein the cutting electrode surgically coagulates and cuts tissue via bipolar cautery.

6. The electrocautery device according to claim **1**, wherein the cutting electrode surgically coagulates and cuts tissue via ultrasonographic vibrations.

7. The electrocautery device according to claim **1**, wherein the insulator comprises at least one of a rubber strip, plastic, a glove, or any combination thereof

8. The electrocautery device according to claim **1**, wherein the insulator comprises a rubber strip extending between the front bridge structure and the back bridge structure.

9. The electrocautery device according to claim **1**, wherein the at least one connecting member is the insulator.

10. The electrocautery device according to claim **1**, wherein the front bridge structure and the back bridge structure comprise plastic.

11. The electrocautery device according to claim **1**, wherein the front bridge structure and the back bridge structure comprise metal.

12. The electrocautery device according to claim **1**, wherein the front bridge structure and the back bridge structure comprise fabric.

13. The electrocautery device according to claim **1**, wherein the at least one connecting member comprises plastic.

14. The electrocautery device according to claim **1**, wherein each wearable cauterizer comprises one connecting member, and the connecting member comprises the cutting electrode and a rubber strip disposed between the cutting electrode and the finger.

15. The electrocautery device according to claim **14**, wherein the cutting electrode extends from the front bridge structure to the back bridge structure.

16. The electrocautery device according to claim **14**, wherein the cutting electrode is entirely disposed between the front bridge structure and the back bridge structure.

17. The electrocautery device according to claim **1**, wherein each wearable cauterizer comprises an internal connecting member and an external connecting member, and the internal connecting member and the external connecting member extend along opposite sides of the finger.

18. The electrocautery device according to claim **17**, wherein each wearable cauterizer further comprises a passthrough orifice extending through the insulator to the cutting electrode.

19. The electrocautery device according to claim **1**, wherein both of the wearable cauterizers comprise respective instances of the front bridge structure and back bridge structure.

20. The electrocautery device according to claim **1**, wherein only one of the wearable cauterizers includes both the front bridge structure and the back bridge structure, and the other wearable cauterizer includes only a single bridge structure and an electrode extending therefrom.

* * * * *

专利名称(译)	手动电烙器		
公开(公告)号	US20170007315A1	公开(公告)日	2017-01-12
申请号	US14/792812	申请日	2015-07-07
[标]申请(专利权)人(译)	RAYMED有限责任公司		
申请(专利权)人(译)	RAYMED有限责任公司		
当前申请(专利权)人(译)	RAYMED有限责任公司		
[标]发明人	BENDER RACHEL MARY		
发明人	BENDER, RACHEL MARY		
IPC分类号	A61B18/14		
CPC分类号	A61B2018/126 A61B2018/00994 A61B2018/00083 A61B2017/00973 A61B2018/00595 A61B2018/00601 A61B2017/00438 A61B18/1402 A61B2017/320069 A61B2017/320082 A61B2018/00589		
外部链接	Espacenet USPTO		

摘要(译)

一种电烙器装置包括两个可佩戴的烧灼器，每个可佩戴烧灼器包括位于手的顶侧上的转向节上方的前桥结构，位于手的顶侧上的转向节下方的后桥结构，至少一个连接构件设置在前桥结构和后桥结构之间的切割电极，以及设置在切割电极和手指之间的绝缘体，以及动力单元。