(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
28 January 2016 (28.01.2016)

WIPO | PCT

(10) International Publication Number
WO 2016/011553 A1

(51) International Patent Classification:
*F21L 4/00* (2006.01) *F21L 4/04* (2006.01)
*F21K 99/00* (2016.01) *F21V 21/08* (2006.01)

(21) International Application Number:
PCT/CA2015/050685

(22) International Filing Date:
22 July 2015 (22.07.2015)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
62/027,763 22 July 2014 (22.07.2014) US

(71) Applicant: **92893833 QUÉBEC INC.** [CA/CA]; 1996 rue Alfred-Pellan, Longueuil, Québec J4N 1P6 (CA).

(72) Inventors: **LAFLEUR, André**; 26 Jacques Racicot, Boucherville, Québec J4B 4P9 (CA). **DIEC, Hugo**; 865 rue de Maricourt, Longueuil, Québec J4H 2S8 (CA). **FRANCOEUR, Suzanne**; 1996 Alfred-Pellan, Longueuil, Québec J4N 1P6 (CA).

(74) Agent: **BENOIT & CÔTÉ INC.**; 800-1550 Metcalfe, Montreal, Québec H3A 1X6 (CA).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

**Published**:

— *with international search report (Art. 21(3))*

WO 2016/011553 A1

(54) Title: LIGHTING DEVICE AND METHOD OF USING THE SAME

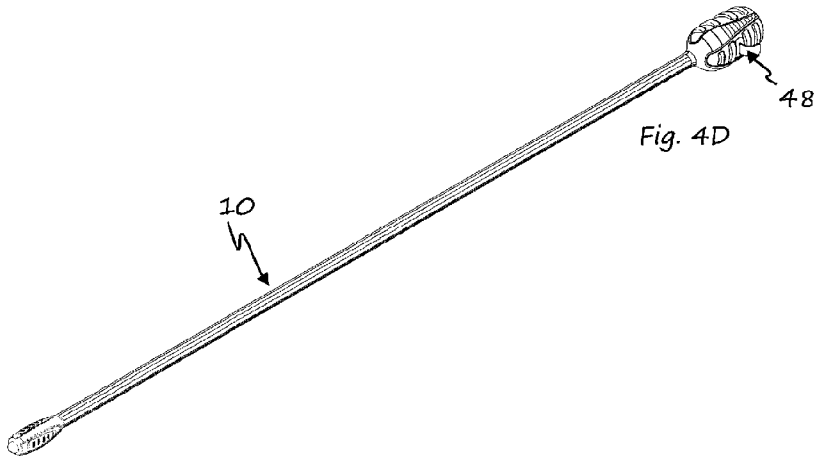



Fig. 4D

(57) Abstract: The present document describes a lighting device comprising: a structure comprising a conformable elongated member being adaptable to a shape of an object for securing the lighting device to the object; a light source attached to the structure thereby defining a connection between the light source and the structure; a power source for providing electrical power to the light source; and a skin overmolded onto the structure, the power source, the connection and part of the light source near the connection. There is also described a method for providing lighting in a confined space where a hand-operated tool is used.

# LIGHTING DEVICE AND METHOD OF USING THE SAME

## CROSS-REFERENCE TO RELATED APPLICATIONS

**[0001]** This application claims priority of US provisional patent application no. 62/027,763, filed on July 22, 2014, the specification of which is hereby incorporated by reference.

## BACKGROUND

(a) Field

**[0002]** The subject matter disclosed generally relates to battery powered lighting devices. More specifically, the subject matter disclosed relates to compact and conformable battery powered lighting devices capable of adopting various shapes in order to orient lighting from the light source in a selected direction.

(b) Related Prior Art

**[0003]** Many types of portable battery powered lighting devices are known in the art, some being usable to assist a worker in performing a task while ambient light does not provide sufficient luminosity over a specific work zone. Some of the lighting devices are provided with attaching means to keep user's hands free, for example, some are attachable to a helmet or headband (i.e., helmet or headband of a fireman, a miner, a doctor, etc.) to follow the direction of sight of the wearer.

**[0004]** In some cases, the working space is very tight and hardly accessible by a light beam emitted from a lighting device at a distance. It may be difficult or impossible to bring the lighting device within the working space and have the light beam appropriately oriented. Such a situation may be experienced for instance by surgeons, performing a surgery in a compact and deep cavity of an animal or human body.

**[0005]** Few devices have been provided in the prior art to help improve lighting in such conditions.

**[0006]** More than often, such lighting devices fail to provide a truly flexible and dependable light source for illuminating different types of deep and restricted locations. For example, some devices are not adapted to attach to other tools or objects to reach different cavities and provide no flexibility for light beam reorientation with respect to the device's body. Some other lighting devices are not attachable and/or comprise parts (i.e., the one or more batteries and/or the light source itself) that may become loose and be lost (about or within the body cavities), and has no provision for adjustment of the light beam orientation.

**[0007]** None of the prior art devices provides, at the same time, easy and conformable wrapping around a medical device, and flexible light beam reorientation by the user without moving the device body or repositioning attachment, without providing parts that can become loose and be lost about or within the body cavities.

**[0008]** There is therefore a need for an improved lighting device that overcomes the drawbacks of the lighting devices of the prior art.

## SUMMARY

**[0009]** According to an embodiment, there is provided a lighting device comprising a structure comprising a conformable elongated member; a light source attached to the structure thereby defining a connection between the light source and the structure; a power source for providing electrical power to the light source; and a skin overmolded onto the structure, the power source, the connection and part of the light source near the connection; wherein the conformable elongated member is capable of adopting various shapes in order to orient lighting from the light source in a selected direction.

**[0010]** According to an aspect, the light source comprises a distal end and further wherein the skin is continuous thereby entirely covering the lighting device with the exception of the distal end of the light source.

**[0011]** According to an aspect, the conformable elongated member comprises a distal end and further wherein the connection is between the light source and the conformable elongated member at the distal end of the conformable elongated member.

**[0012]** According to an aspect, the structure further comprises a power source receiving compartment adapted to receive the power source.

**[0013]** According to an aspect, the conformable elongated member comprises a proximal end opposite the distal end and further wherein the power source receiving compartment extends from the proximal end of the conformable elongated member.

**[0014]** According to an aspect, the conformable elongated member comprises an electrical conductor.

**[0015]** According to an aspect, the electrical conductor comprises a single strand conductor.

**[0016]** According to an aspect, the single strand conductor has a gauge value between 10 and 26.

**[0017]** According to an aspect, the single strand conductor has a gauge value of 14.

**[0018]** According to an aspect, the electrical conductor further comprises a multiple strand conductor.

**[0019]** According to an aspect, the multiple strand conductor has a gauge value between 10 and 26.

**[0020]** According to an aspect, the multiple strand conductor has a gauge value of 26.

**[0021]** According to an aspect, the lighting device further comprises an irreversible one-way switch placed on an electrical path between the power source and the light source, wherein a displacement of the irreversible one-way switch from an original position to an irreversible position allows the electrical power to reach the light source.

**[0022]** According to an aspect, the irreversible one-way switch comprises a dome shaped portion capable of adopting a first opened position and a second closed position, where in the first opened position a space is present between the dome shaped portion and the power source thereby resulting in an open circuit and where in the second closed position the electrical power reaches the light source.

**[0023]** According to an aspect, the lighting device further comprises a removable electrical insulator placed on an electrical path between the power source and the light source to prevent temporarily the electrical power from reaching the light source.

**[0024]** According to an aspect, the light source is a LED.

**[0025]** According to an aspect, the LED emits a white light.

**[0026]** According to an aspect, the LED has a color temperature of about 6500 K.

**[0027]** According to an aspect, the skin comprises an adherent material.

**[0028]** According to an aspect, the skin comprises a flexible elastomeric material.

**[0029]** According to an embodiment, there is provided a method for providing lighting in a confined space where a hand-operated object is used, the method comprising: providing a conformable lighting device having a conformable elongated member and a light source at a distal end of the conformable lighting device; wrapping the conformable elongated member around the hand-operated object; and orienting the distal end of the conformable lighting device in a selected direction such that lighting is projected toward the confined space when the hand-operated object is used.

**[0030]** According to an aspect, the wrapping comprises wrapping the conformable elongated member around a handling portion of the hand-operated tool resulting in a wrapping which does not substantially interfere with an intended use of the hand-operated tool.

**[0031]** Features and advantages of the subject matter hereof will become more apparent in light of the following detailed description of selected embodiments, as illustrated in the accompanying figures. As will be realized, the subject matter disclosed and claimed is capable of modifications in various respects, all without departing from the scope of the claims. Accordingly, the drawings and the description are to be regarded as illustrative in nature, and not as restrictive and the full scope of the subject matter is set forth in the claims.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0032]** Further features and advantages of the present disclosure will become apparent from the following detailed description, taken in combination with the appended drawings, in which:

**[0033]** Fig. 1 is a top perspective view of a lighting device in accordance with an embodiment, the lighting device being shown in a standalone fashion;

**[0034]** Fig. 2 is a top perspective view of a lighting device in accordance with an embodiment, the lighting device being shown wrapped around a medical device held by a user;

**[0035]** Fig. 3a is a top side isometric view of an embodiment of a lighting device shown in a relaxed attitude;

**[0036]** Fig. 3b is a top side isometric view of the lighting device of Figure 3a shown prior to final assembly and moulding of the outer elastomeric skin layer;

**[0037]** Fig. 4A is a side elevation view of a lighting device according to an embodiment comprising a removable electrical insulator;

**[0038]** Fig. 4B is a bottom plan view of the lighting device of Fig. 4A;

**[0039]** Fig. 4C is a side cut out view of the lighting device of Fig. 4A;

**[0040]** Fig. 4D is a top side isometric view of the lighting device of Figure 4A;

**[0041]** Fig. 4E is a close-up side cut out view of the battery compartment section of the lighting device of Fig. 4A;

**[0042]** Fig. 5A is a side elevation view of a lighting device according to an embodiment comprising an irreversible one-way switch;

**[0043]** Fig. 5B is a bottom plan view of the lighting device of Fig. 5A;

**[0044]** Fig. 5C is a side cut out view of the lighting device of Fig. 5A;

**[0045]** Fig. 5D is a top side isometric view of the lighting device of Figure 5A;

**[0046]** Fig. 5E is a close-up side cut out view of the battery compartment section of the lighting device of Fig. 5A;

**[0047]** Fig. 6 is a side elevation close up view of light source end of a lighting device according to an embodiment comprising a pin-type battery shown in transparency near the light source (i.e., the distal end);

**[0048]** Fig. 7 is a side elevation view of a lighting device according to an embodiment comprising a pin-type battery shown in transparency at the proximal end (i.e., opposite the light source);

**[0049]** Fig. 8 is a side elevation view of a lighting device according to an embodiment comprising a button-type battery shown in transparency at the proximal end (i.e., opposite the light source);

**[0050]** Fig. 9 is a side elevation close up view of light source end of a lighting device according to an embodiment comprising a button-type battery shown in transparency near the light source (i.e., the distal end); and

**[0051]** Fig. 10 is a side elevation close up view of a lighting device according to an embodiment comprising a flexible battery shown in transparency at the proximal end (i.e., opposite the light source).

**[0052]** It will be noted that throughout the appended drawings, like features are identified by like reference numerals.

## DETAILED DESCRIPTION

**[0053]** In embodiments, there are disclosed lighting devices for securing to medical devices and methods of using the same.

**[0054]** Referring now to the drawings and more particularly to Figs. 1, 2, 3A and 3B, there is shown a lighting device **10** for securing to a medical device **12**. The lighting device **10** includes a structure **14**. The structure **14** includes a conformable elongated member **16** which is adaptable to a shape of the medical device **12** for securing the lighting device **10** to the medical device **12**. The lighting device **10** further includes a light source **18** which is attached to the structure **14**, thereby defining a connection **20** between the light source **18** and the structure **14**. The lighting

device **10** also includes a power source **22** for providing electrical power to the light source **18** and a skin **24** which is overmolded onto (i.e., directly onto) the structure **14**, the power source **22**, the connection **20** and part of the light source **18** near the connection **20**.

**[0055]** As shown, thanks to the mechanical properties of its conformable elongated member **16**, the lighting device **10** may adopt an infinite range of configurations between its initial (e.g., substantially straight) position (Fig. 3A) and its wrapped position (Figs. 1 and 2) to adapt itself for attaching to or wrapping around a variety of supporting objects, such as medical devices, for supporting the lighting device **10** and orienting a light beam produced thereby in a desired direction. The lighting device **10** can also be used in a standalone fashion such as shown in Fig. 1.

**[0056]** Fig. 2 shows an exemplary use where the lighting device **10** is wrapped around a medical device **12** of a surgery hand tool (i.e., electrocutter) and oriented to provide local lighting in an area in the immediate vicinity of the tool's tip **50** to bring top up light just in a selected work zone.

**[0057]** Still referring to Figs. 1, 2, 3A and 3B, there is shown that the light source **18** defines a distal end **26** and that the skin **24** is continuous (and gapless), thereby entirely covering the lighting device **10** with the exception of the distal end **26** of the light source **18**. It is important to mention that the skin **24** may comprise an adherent material such as to easily wrap around the shape of the medical device **12** for securing the lighting device **10** to the medical device **12**. The conformable elongated member **16** defines a distal end **28**. The connection **20** is between the light source **18** and the conformable elongated member **16** at distal end **28**. The structure **14** further includes a power source receiving compartment **30** which is adapted to receive the power source **22**.

**[0058]** According to an embodiment, the light source **18** is permanently connected to the conformable elongated member **16** (i.e., the structure **14**), via connection **20**, so that there is no chance that the light source **18** falls or is replaced.

**[0059]** The conformable elongated member **16** further defines a proximal end **32** which is opposite the distal end **28**. As shown, the power source receiving compartment **30** extends from the proximal end **32** of the conformable elongated member **16**.

**[0060]** Even if the power source receiving compartment **30** is shown on Figs. 1, 2, 3A and 3B to be at the extremity of the light source **18** on the structure **14**, it is to be mentioned that the power source receiving compartment **30** may be positioned at any distance from the light source **18** of the structure **14**. For example, according to another embodiment, it would be possible to

have the power source receiving compartment **30** adjacent the light source **18** (see, for example, Fig. 6 and Fig. 9).

**[0061]** Still referring to Figs. 1, 2, 3A and 3B, there is shown that the conformable elongated member **16** includes an electrical conductor. The electrical conductor includes a first single strand conductor **36** and a second multiple strand conductor **38**. Both the first single strand conductor **36** and the second multiple brand conductor **38** constitute an electrical path between the power source **22** and the light source **18**, thereby allowing the power, from the power source **22**, to reach the light source **18**. It is to be mentioned that the electrical conductor **34** may, alternatively, include a first single strand conductor and a second single strand conductor (identical or not in gauge to the first single strand conductor), as long as at least one of the two single strand provides conformable properties to the conformable elongated member **16**.

**[0062]** According to an embodiment, the single strand conductor may have a AWG (American Wire Gauge) value between 10 and 26. More particularly, the single strand conductor has a AWG value of 14.

**[0063]** According to an embodiment, the multiple strand conductor may have a AWG value between 10 and 26. More particularly, the multiple strand conductor has a AWG value of 26.

**[0064]** Referring now more specifically to Fig. 3B, the lighting device **10** is shown, prior to installation of the skin **24**, with the conformable elongated member **16** in its straight neutral and relaxed attitude or position.

**[0065]** The total length of the structure **14** may be typically between about 15 and about 30 cm long, which is sufficient to properly attach the lighting device **10** around a wide range of medical devices or any other suitable objects.

**[0066]** As mentioned above, the skin **24** is overmolded onto the power source **22**, the connection **20** and part of the light source **18** near the connection **20**, such as to allow only a portion of the light source **18** to be uncovered by the skin **24**.

**[0067]** As best shown in Fig. 3A, the skin **24** defines a skin head **52** covering part of the light source **18**. The skin head **52** includes projections, such as molded ridges **54**, to facilitate gripping to fold the conformable elongated member **16** to impose a deformation and configuration for attaching, or wrapping, the lighting device **10** or orienting a light beam emitted from the light source **18** in a desired user defined direction. For example, a user may grip the skin head **52** to

fold the distal end **28** to impart a deformation (i.e., reversible permanent deformation) defining a new light beam orientation being passively maintained after the grip is released.

**[0068]** Referring now to Fig. 3A, there is shown that the skin **24** defines a skin tail **56** covering the totality of the power source receiving compartment **30** and the power source **22** itself. Similarly to the skin head **52**, the skin tail **56** includes projections or molded ridges **58** to help manipulate the lighting device **10** especially when it becomes soiled with slippery fluids or matters, such as, without limitation, oil, blood, water, and the like.

**[0069]** To complement the attachment flexibility of the lighting device **10**, the skin tail **56** covering the power source receiving compartment **30** may further include magnetic members, adhesive members and/or hook and loop members for attachment and/or wrapping purposes against the medical device **12**. For example a magnetic attachment element **42** may be mounted inside the structure **14** and underneath skin **24**.

**[0070]** The skin **24** may be made of a flexible elastomeric material applied for covering the structure **14**, the power source **22**, the connection **20** and part of the light source **18**, near the connection **20**, by a molding process, such as injection over-molding or by dipping. As mentioned above, the skin **24** may further include an adherent material, thereby allowing the skin **24** to adequately wrap around the medical device **12** without slipping.

**[0071]** The desirable Shore-A hardness of the material of the skin **24** may range between about 45 and about 85, and more preferably between about 65 and about 75.

**[0072]** Appropriate materials of the skin **24** may include, without limitation, TPR (thermoplastic resilient), TPE, silicone, polyurethane, nitrile, any other suitable polymeric material, and any combination thereof. More preferably, in medical applications, the material may be hypoallergenic and approved for surgical uses.

**[0073]** Referring now to Fig. 3B, there is shown in more detail the internal components of the lighting device **10** as it is assembled prior to application of the skin **24**. A high intensity light emitting diode (LED) forms the light source **18** and comprises the LED chip *per se* embedded in an optical plastic package defining a converging lens to shape the emitted light beam as a generally conical solid shape projecting about 90% of the light power in a disc of approximately 12 cm in diameter at a distance of 20 cm (17° dispersion with respect to the optical centerline @ 50% intensity, sharply decreasing with increasing angle). The light beam emitted by the selected light source **18** has an intensity of 5100 millicandela (mcd) for a power of 66 milliwatts at a rated supply voltage of 3.3 VDC (20 mA). With two common thin alkaline button electrochemical cells **60a**, **60b** (see Fig. 4E) typically providing 90 to 110 mAh @ 3.0 VDC, the working life expectancy

of the lighting device **10** may then easily exceed one hour. It is to be mentioned that the power source receiving compartment **30** may receive one, two or more cells, such as cells **60a**, **60b** (see Fig. 4E), to operate the light source **18**. The power source, operation voltage, amperage, light output power and color may vary according to the availability or specification change of any of these components.

**[0074]** Still referring to Fig. 3B, there is shown that the connection **20** between the light source **18** and the structure **14** includes a pair of electrical terminals **62**, **64** which emerge from the light source **18** and which electrically connect to the electrical conductor (i.e., the first single strand conductor **36** and the second multiple strand conductor **38**). An insulating sheath must cover at least one of the strand conductors **36**, **38** to provide electrical isolation between each other. In the embodiment shown in Fig. 3B, single strand conductor **36** has an insulation sheath layer **66** and multiple strand conductor **38** has an insulating sheath layer **68**.

**[0075]** An aspect of the lighting device **10** is that the mechanical properties of the conformable elongated member **16** that make it compliant and subject to reversible permanent deformation to enable wrapping around an object to support the lighting device **10**, solely relies on the mechanical properties of the electrical conductor **34** (i.e., on the mechanical properties of at least one of first single strand conductor **36** and second multiple strand conductor **38**). Indeed, although a small electrical current is drawn from the cells **60a**, **60b** (see Fig. 4E) to the light source **18** or LED, at least one of the first single strand conductor **36** and second multiple strand conductor **38** is selected in a larger gauge to benefit from the rigidity and formability of the electrical conductor, a copper conductor for instance.

**[0076]** Therefore, one 14 AWG strand conductor (1.6 mm diameter) may be used with a stranded 26 (0.4 mm diameter) AWG strand conductor. Alternatively, a pair of 16 AWG solid strand conductors may be used for similar performance regarding the formability of the conformable elongated member **16**. Obviously, different combinations may be selected to provide the desired compliance and formability, and according to the attachment strength required to properly hold a lighting device **10** of a given weight.

**[0077]** It is to be mentioned that the elastomeric continuous skin **24** coating the structure **14**, the power source **22**, the connection **20** and part of the light source **18** near the connection **20** provides a flexible, reliable and cost effective means for attaching the compact lighting device **10** to provide user orientable top up lighting for a wide of applications, especially in work sites with restricted areas or cavities, such as in medical applications.

**[0078]** Referring now to Figs. 4A to 4E there is shown that the lighting device **10** may alternatively include a removable electrical insulator **48**, which is placed on the electrical path between the power source **22** and the light source **18** such as to prevent temporarily the electrical power from reaching the light source **18**. Once the removable electrical insulator **48** is removed from between the power source **22** and the light source **18**, the electrical power may reach the light source such as to operate the lighting device **10**.

**[0079]** As best seen from Fig. 4E, an electrically conductive compression spring **74** is assembled to electrode plate **70** and two 1.5 VDC button electrochemical cells **60a**, **60b** are mounted in electrical series under compression between the electrically conductive compression spring **74** and the electrode plate **72**. Thereby, electrical power may be drawn from the cells **60a**, **60b** to supply a nominal voltage of 3.0 VDC to the light source **18** or LED through single and multiple strand conductors **36**, **38**.

**[0080]** It is to be mentioned that alkaline cells may be preferred for a disposable lighting device for environmental considerations. According to the embodiment shown in Figs. 4A to 4E, in a way to prevent electrical power from flowing through the light source **18** or LED before lighting is required, the removable electrical insulator **48** is inserted between the two cells **60a, 60b** (or between two adjacent cells from a plurality of cells in the case where there are more than two cells).

**[0081]** Referring now to the embodiment of Figs. 4A to 4E, there is shown that a slot **76** is provided in the skin **24** (covering the power source receiving compartment **30**) to access the power source receiving compartment **30**. The slot **76** is provided with a peripheral lip **78**. Skin **24** is applied over the structure **14**, the power source **22**, the connection **20** and part of the light source **18** around the peripheral lip **78**, leaving the slot **76** clear to access the inside of power source receiving compartment **30**, just between and at the interface of the cells **60a**, **60b**. Thereby, the removable electrical insulator **48** may be place in the slot **76** during assembly to prevent cells **60a**, **60b** from contacting each other and thereby prevent electrical current from flowing to energize light source **18** or LED. Once remove, the removable electrical insulator **48** cannot be reinserted in the slot **76**.

**[0082]** According to the embodiment shown in Figs. 4A to 4E, when a user wants to power the lighting device **10**, he merely has to pull out the removable electrical insulator **48**, providing the lighting device **10** to be a single use lighting device **10**, as pulling out the removable electrical insulator **48** from the slot **76** irreversibly powers the light source **18** (until cells **60a**, **60b** stops to provide power after a certain amount of time). Therefore, the lighting device **10** may be

built as a single use lighting device **10** that would remain lit from the time the removable electrical insulator **48** is pulled by a user to the time cells **60a**, **60b** have their energy completely spent through the light source **18** or LED.

**[0083]** Building the lighting device **10** as a single use device is desirable in the context of medical or surgery use to avoid such issues as detachable parts (with the exception of the removable electrical insulator **48** that needs to be removed from slot **76**) and need for sterilization between uses.

**[0084]** Therefore, in a typical embodiment, the lighting device **10** has no moving part except the removable electrical insulator **48** (of the embodiment shown in Figs. 5A to 5E), is sold in a sterile package and is disposable. After opening the package and pulling the removable electrical insulator **48** (or positioning the dome shaped portion **44** in the second closed position, according to the embodiment shown in Figs. 5A to 5E), the lighting device **10** may remain lit for use for about half an hour to about two hours and can be eliminated as other medical supplies or recycled after a single use. Thereby, manufacturing cost as well as manipulation and risks are reduced to a strict minimum.

**[0085]** According to another embodiment, and referring now to Figs. 5A to 5E, there is shown that the lighting device **10** further includes an irreversible one-way switch **40**. The irreversible one-way switch **40** is placed on the electrical path between the power source **22** and the light source **18**. The activation of the irreversible one-way switch **40** allows the electrical power to reach the light source. The irreversible one-way switch **40** includes a dome shaped portion **44** which is capable of adopting a first opened position and a second closed position (not shown). In the first opened position, a space **46** is present between the dome shaped portion **44** and the power source **22**, thereby resulting in an open circuit. On the other hand, in the second closed position, dome shaped portion **44** pushes on the power source **22** and the electrical power reaches the light source **18**.

**[0086]** According to an embodiment, the light source **18** of the lighting device **10** described above is a LED (Light Emitting Diode).

**[0087]** According to an embodiment, the power source comprises one or more commercially available batteries. Some examples of models of such batteries include: LR41 alcaline manganese, LR1120 Silver oxide, BR425 LITHIUM 3V 425 (PIN) by Panasonic®, BR435 LITHIUM 3V 435 (PIN) by Panasonic®, BR322 : 3 V 20 mAh 22.5 x 3mm, BR316 : 3V 13 mAh 16x 3mm, BR327 lithium 3v 425 (PIN) with color LED, R435, JR435, 377-376 Silver Oxide by Energizer®, AC230 Zinc-air by Energizer®, CR1025 manganese by Energizer®, CR11632

lithium, CR1620 3v 140 mAh 16mm x 2mm, BR1225 3v 48mAh 12mm x 2.5mm, Flexible rechargeable 3.7v li-po 451268, Flexible rechargeable 3.7v li-po 351672, Flexible rechargeable 3.7v li-po 401230, Flexible rechargeable 3.7v li-po 201021, sheet batteries, ultra thin batteries, flexible batteries, Blue spark 110-ST1 1.5 V 30mAh 55x 47x 0.75 mm, CP0452345 Li-po 3.0 V 30mAh 0.45x 23x 45 mm, and CR66500 Li-po 3.0V 250 mAh 6.8diam x 51 mm.

**[0088]** The light spectrum emitted by the light source **18** or LED is selected to generally match that of a surgery room light, to provide proper color rendering; e.g., of body tissues in a cavity of an animal or human body. Accordingly, a white light may be considered appropriate. More particularly, a white light with a color temperature of between about 4000K and 7500K may be considered appropriate. Even more particularly, a white light with a color temperature of about 6500K may be considered appropriate.

**[0089]** It is to be mentioned that, although the lighting device **10** is shown and described as referring to applications in the field of medical surgery, it should be deemed usable in a variety of applications requiring an attachable source of local top up lighting.

**[0090]** It is also to be mentioned that, although the lighting device **10** is shown and described as being for a “single-use”, it is possible that in other embodiments a two-way switch would be provided.

**[0091]** While preferred embodiments have been described above and illustrated in the accompanying drawings, it will be evident to those skilled in the art that modifications may be made without departing from this disclosure. Such modifications are considered as possible variants comprised in the scope of the disclosure.

**CLAIMS:**

1. A lighting device comprising:
   - a structure comprising a conformable elongated member;
   - a light source attached to the structure thereby defining a connection between the light source and the structure;
   - a power source for providing electrical power to the light source; and
   - a skin overmolded onto the structure, the power source, the connection and part of the light source near the connection;

   wherein the conformable elongated member is capable of adopting various shapes in order to orient lighting from the light source in a selected direction.

2. The lighting device of claim 1, wherein the light source comprises a distal end and further wherein the skin is continuous thereby entirely covering the lighting device with the exception of the distal end of the light source.

3. The lighting device of claims 1 or 2, wherein the conformable elongated member comprises a distal end and further wherein the connection is between the light source and the conformable elongated member at the distal end of the conformable elongated member.

4. The lighting device of any one of claims 1 to 3, wherein the structure further comprises a power source receiving compartment adapted to receive the power source.

5. The lighting device of claims 3 or 4, wherein the conformable elongated member comprises a proximal end opposite the distal end and further wherein the power source receiving compartment extends from the proximal end of the conformable elongated member.

6. The lighting device of any one of claims 1 to 5, wherein the conformable elongated member comprises an electrical conductor.

7. The lighting device of claim 6, wherein the electrical conductor comprises a single strand conductor.

8. The lighting device of claim 7, wherein the single strand conductor has a gauge value between 10 and 26.

9. The lighting device of claim 8, wherein the single strand conductor has a gauge value of 14.

10. The lighting device of claim 7, wherein the electrical conductor further comprises a multiple strand conductor.

11. The lighting device of claim 10, wherein the multiple strand conductor has a gauge value between 10 and 26.

12. The lighting device of claim 11, wherein the multiple strand conductor has a gauge value of 26.

13. The lighting device of any one of claims 1 to 12, further comprising an irreversible one-way switch placed on an electrical path between the power source and the light source, wherein a displacement of the irreversible one-way switch from an original position to an irreversible position allows the electrical power to reach the light source.

14. The lighting device of claim 13, wherein the irreversible one-way switch comprises a dome shaped portion capable of adopting a first opened position and a second closed position, where in the first opened position a space is present between the dome shaped portion and the power source thereby resulting in an open circuit and where in the second closed position the electrical power reaches the light source.

15. The lighting device of any one of claims 1 to 12, further comprising a removable electrical insulator placed on an electrical path between the power source and the light source to prevent temporarily the electrical power from reaching the light source.

16. The lighting device of any one of claims 1 to 15, wherein the light source is a LED.

17. The lighting device of claim 16, wherein the LED emits a white light.

18. The lighting device of claim 17, wherein the LED has a color temperature of about 6500 K.

19. The lighting device of any one of claims 1 to 18, wherein the skin comprises an adherent

material.

20. The lighting device of claim 19, wherein the skin comprises a flexible elastomeric material.

21. A method for providing lighting in a confined space where a hand-operated tool is used, the method comprising:

- providing a conformable lighting device having a conformable elongated member and a light source at a distal end of the conformable lighting device;
- wrapping the conformable elongated member around the hand-operated tool; and
- orienting the distal end of the conformable lighting device in a selected direction such that lighting is projected toward the confined space when the hand-operated tool is used.

22. The method of claim 21, wherein the wrapping comprises wrapping the conformable elongated member around a handling portion of the hand-operated tool resulting in a wrapping which does not substantially interfere with an intended use of the hand-operated tool.

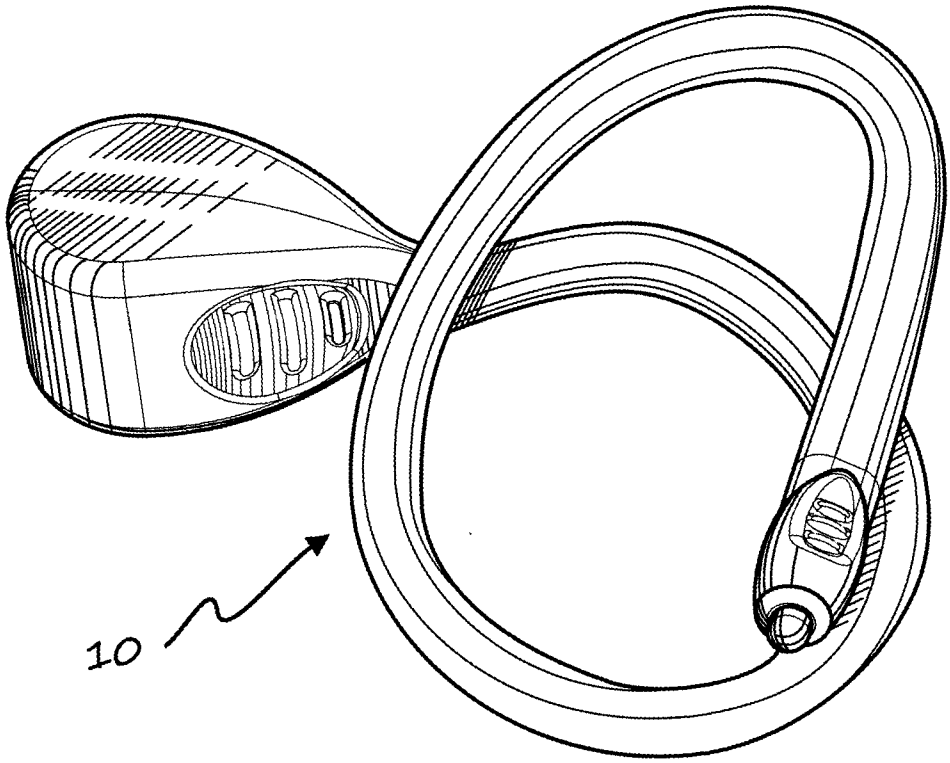



Fig. 1

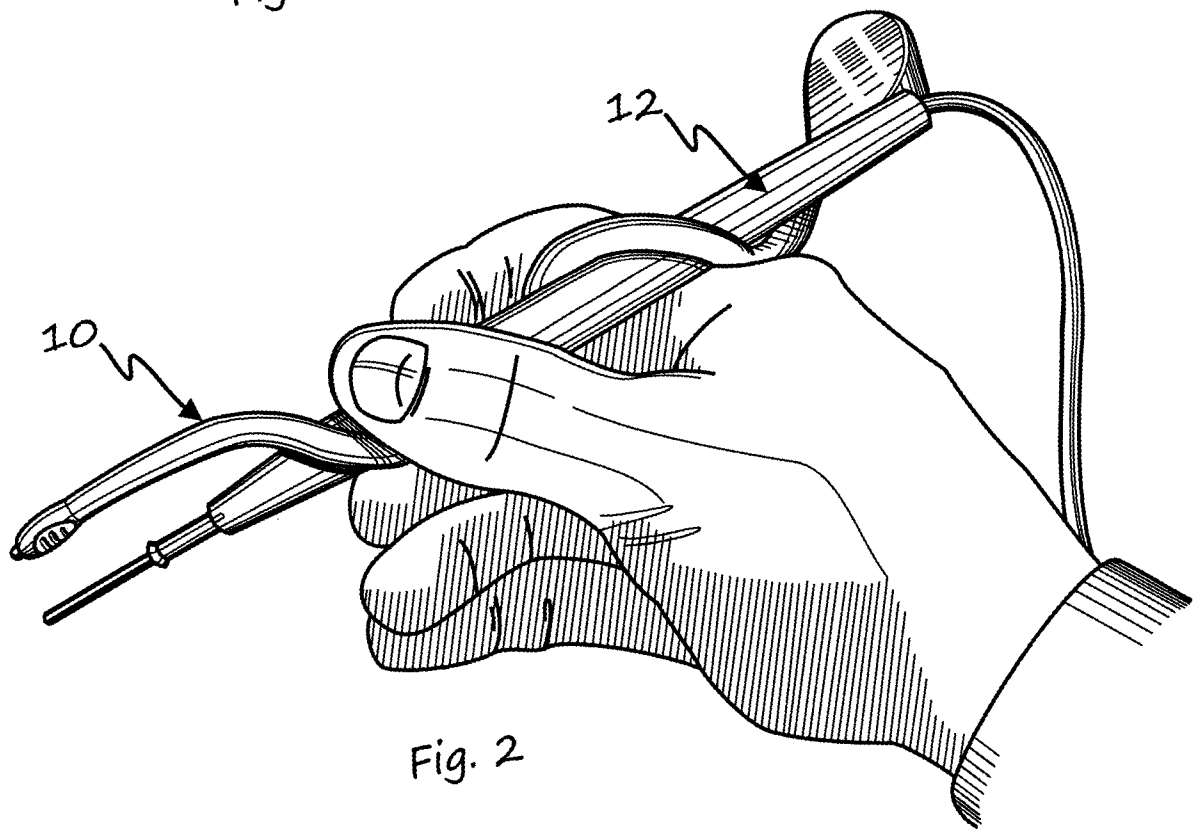



Fig. 2

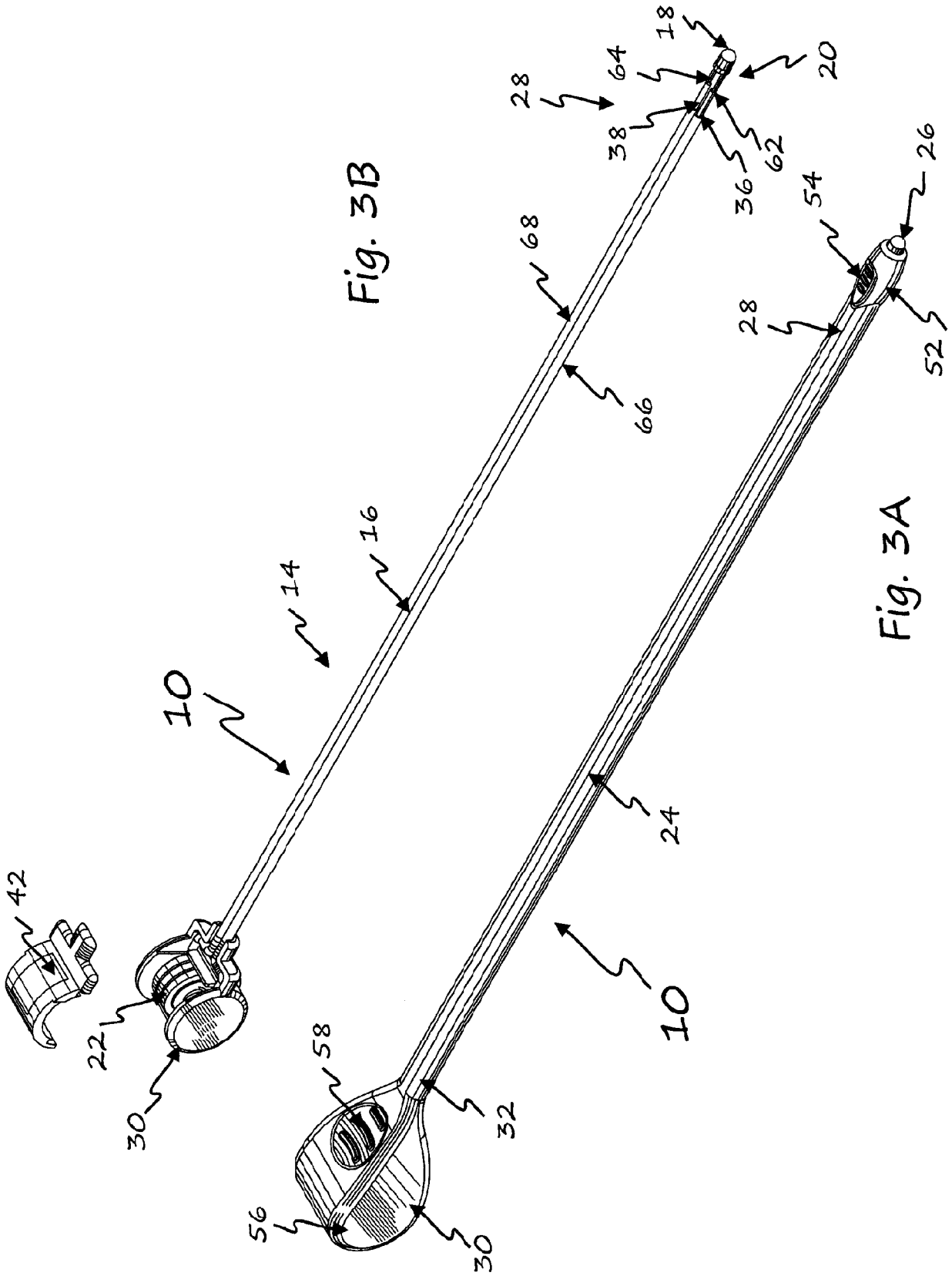



Fig. 3A

Fig. 3B

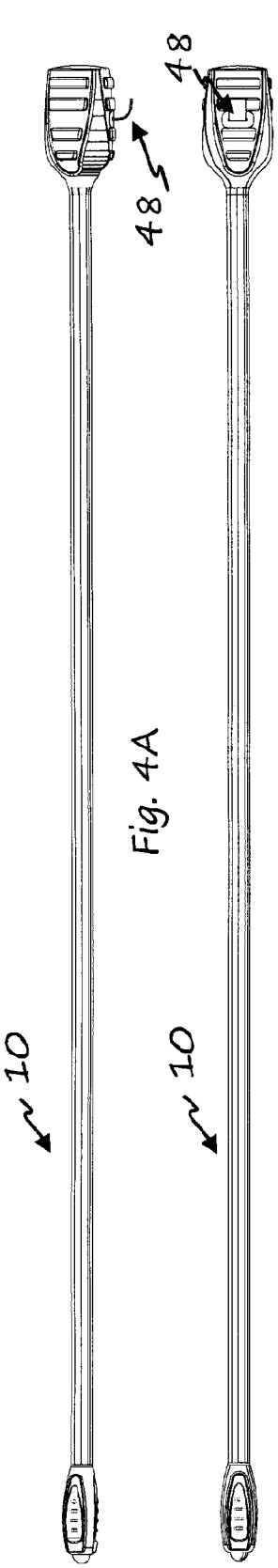



Fig. 4A

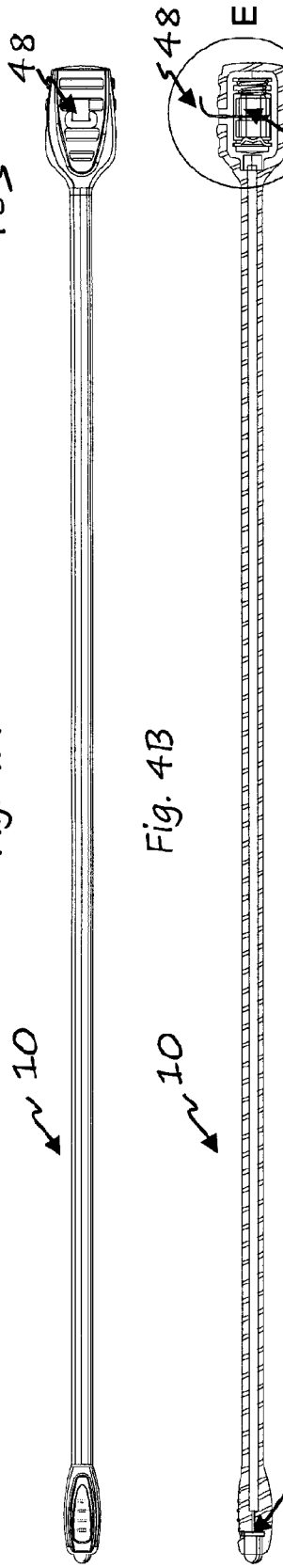



Fig. 4B




Fig. 4C

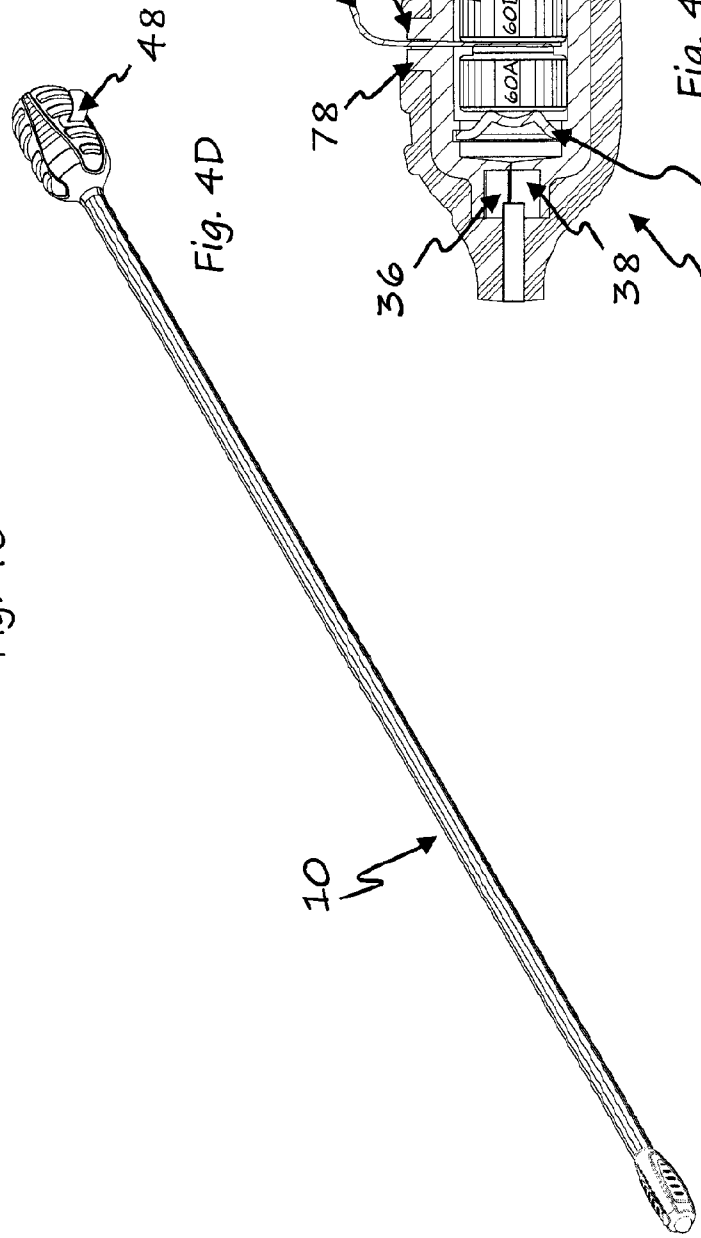
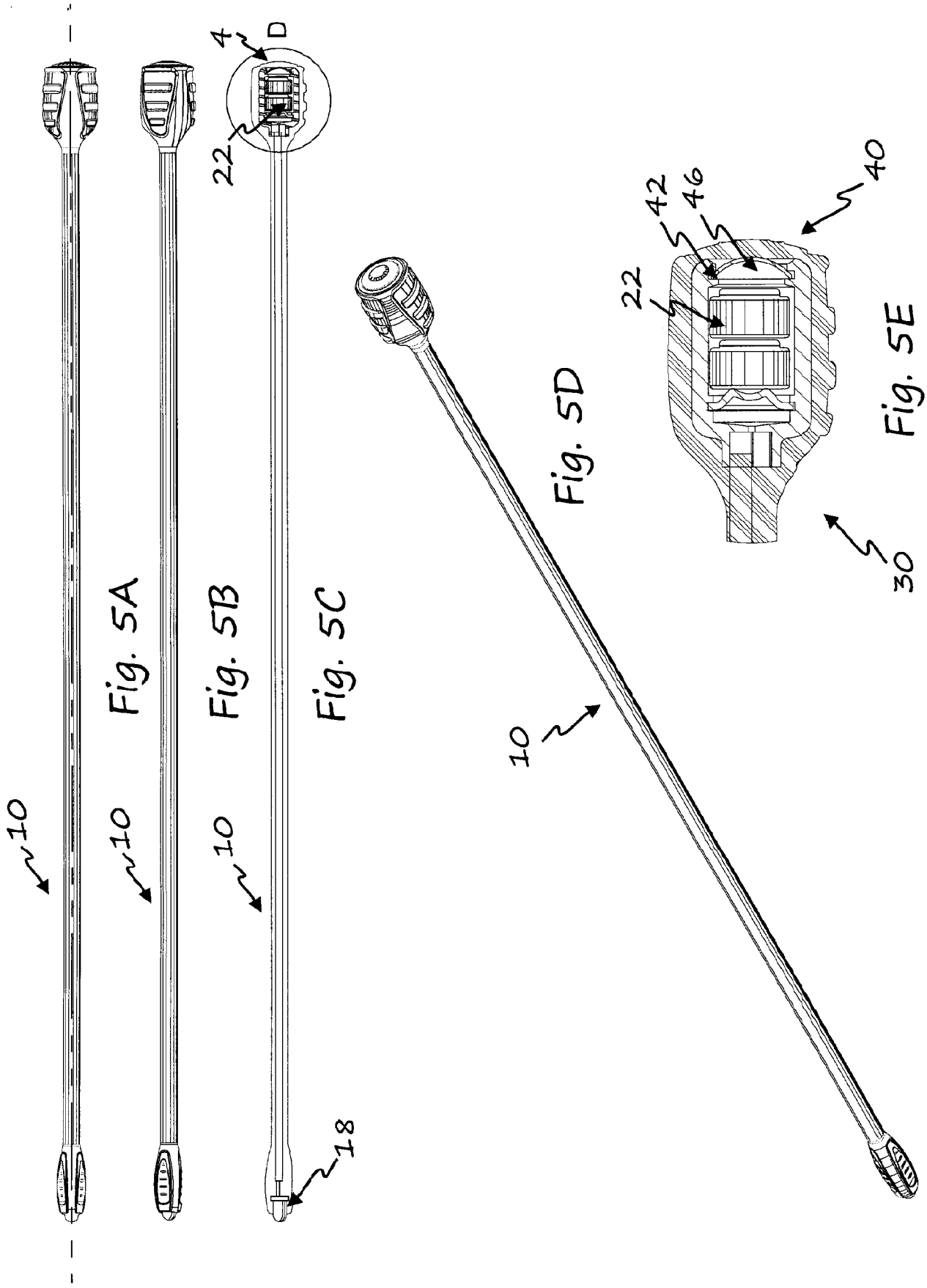



Fig. 4D




Fig. 4E


10
Fig. 5A
10
Fig. 5B
4
D
22
10
18
Fig. 5C
10
Fig. 5D
40
42
46
22
30
Fig. 5E

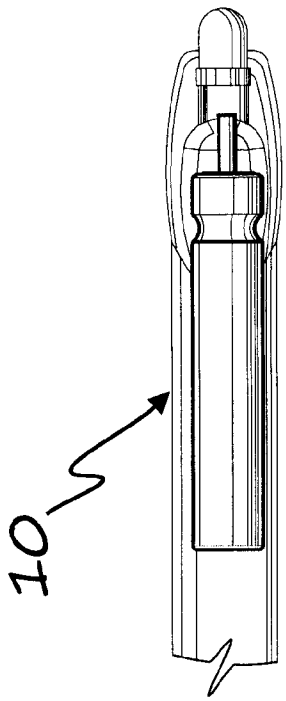



Fig. 6

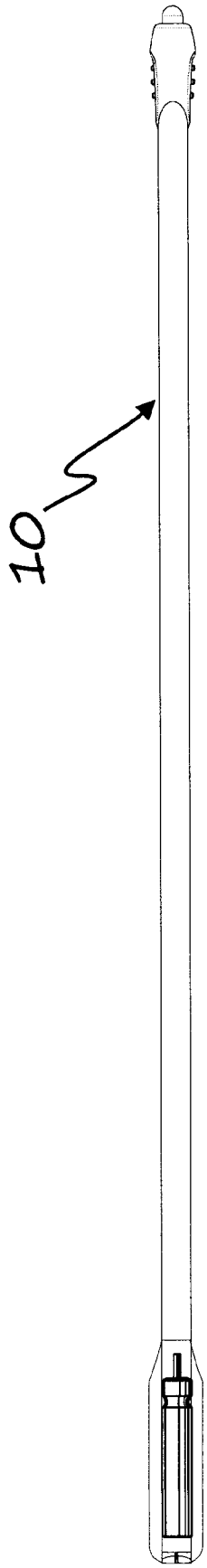



Fig. 7

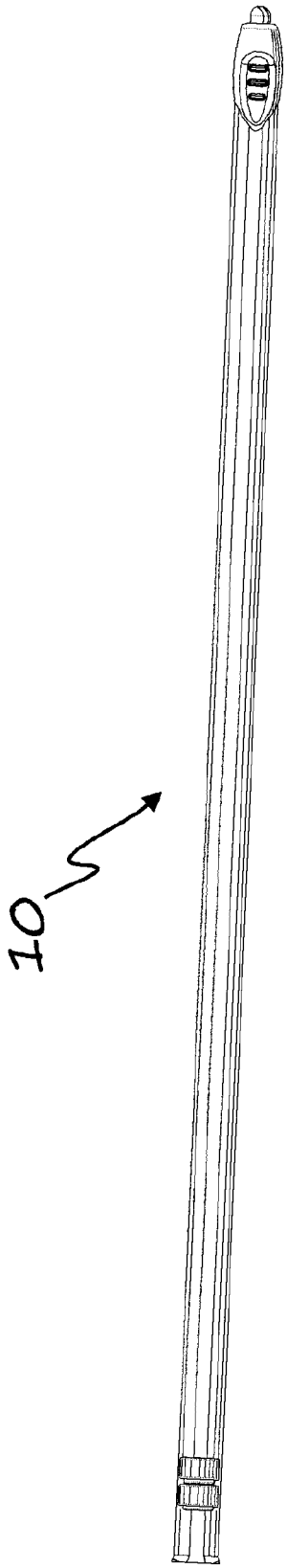



Fig. 8

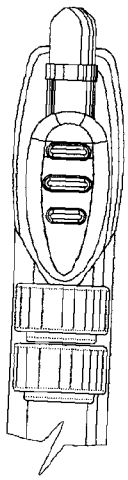



Fig. 9

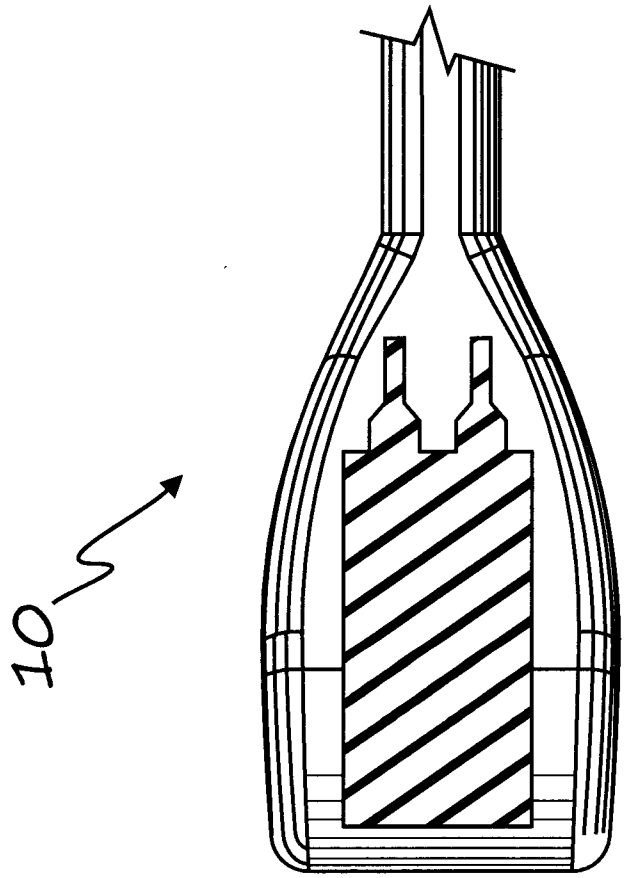



Fig. 10

**INTERNATIONAL SEARCH REPORT**

International application No.
**PCT/CA2015/050685**

A. CLASSIFICATION OF SUBJECT MATTER
IPC: ***F21L 4/00*** (2006.01), ***F21K 99/00*** (2010.01), ***F21L 4/04*** (2006.01), ***F21V 21/08*** (2006.01)

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: F21L 4/00, F21K 99/00, F21L 4/04, F21V 21/08
USPC: 362/198

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

Electronic database(s) consulted during the international search (name of database(s) and, where practicable, search terms used)
Questel-Orbit, Espacenet
Keywords: Light, shape, conform, flexible, elongate, connect, wrap, battery, power source, medical, surgical, disposable.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X<br>Y | US8162517 B2 (LEE, S.) 24 April 2012 (24-04-2012) *the whole document* | 1-6, 15-20<br>7-12 |
| Y<br>A | US2467954 A (BECKER, R.) 19 April 1949 (19-04-1949) *the whole document* | 7-12<br>1-6, 13-22 |
| X<br>A | US6379296 B1 (BAGGETT, R.) 30 April 2002 (30-04-2002) *the whole document* | 21, 22<br>1-20 |

☐ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

| | | | |
|---|---|---|---|
| * | Special categories of cited documents: | "T" | later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention |
| "A" | document defining the general state of the art which is not considered to be of particular relevance | "X" | document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone |
| "E" | earlier application or patent but published on or after the international filing date | "Y" | document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art |
| "L" | document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) | "&" | document member of the same patent family |
| "O" | document referring to an oral disclosure, use, exhibition or other means | | |
| "P" | document published prior to the international filing date but later than the priority date claimed | | |

| | |
|---|---|
| Date of the actual completion of the international search<br>22 September 2015 (22-09-2015) | Date of mailing of the international search report<br>22 September 2015 (22-09-2015) |
| Name and mailing address of the ISA/CA<br>Canadian Intellectual Property Office<br>Place du Portage I, C114 - 1st Floor, Box PCT<br>50 Victoria Street<br>Gatineau, Quebec K1A 0C9<br>Facsimile No.: 001-819-953-2476 | Authorized officer<br>Jeremy Garnet (819) 956-8721 |

**INTERNATIONAL SEARCH REPORT**
Information on patent family members

International application No.
**PCT/CA2015/050685**

| Patent Document Cited in Search Report | Publication Date | Patent Family Member(s) | Publication Date |
|---|---|---|---|
| US8162517B2 | 24 April 2012 (24-04-2012) | US2009237921A1 | 24 September 2009 (24-09-2009) |
| US2467954A | 19 April 1949 (19-04-1949) | None | |
| US6379296B1 | 30 April 2002 (30-04-2002) | None | |