(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 504 845 B9**

(12) **CORRECTED EUROPEAN PATENT SPECIFICATION**

(15) Correction information:
**Corrected version no 1 (W1 B1)**
**Corrections, see**
**Claims EN 1**

(48) Corrigendum issued on:
**17.08.2016 Bulletin 2016/33**

(45) Date of publication and mention of the grant of the patent:
**02.03.2016 Bulletin 2016/09**

(21) Application number: **10833746.0**

(22) Date of filing: **27.10.2010**

(51) Int Cl.:
***H01B 5/08*** *(2006.01)*

(86) International application number:
**PCT/US2010/054343**

(87) International publication number:
**WO 2011/066054 (03.06.2011 Gazette 2011/22)**

# (54) CONDUCTIVE CABLE SYSTEM FOR SUSPENDING A LOW VOLTAGE LUMINAIRE ASSEMBLY

LEITENDES KABELSYSTEM ZUR AUFHÄNGUNG EINER NIEDERSPANNUNGSBELEUCHTUNGSANORDNUNG

SYSTÈME DE CÂBLES CONDUCTEURS POUR SUSPENDRE UN SYSTÈME DE LUMINAIRE BASSE TENSION

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**

(30) Priority: **25.11.2009 US 626283**

(43) Date of publication of application:
**03.10.2012 Bulletin 2012/40**

(73) Proprietor: **Griplock Systems, LLC**
**Carpinteria, CA 93013 (US)**

(72) Inventors:
- **NAPIER, Hugo**
  **Santa Barbara**
  **CA 93101 (US)**
- **KWAST, Ryan**
  **Santa Barbara**
  **CA 93105 (US)**

(74) Representative: **Swindell & Pearson Limited**
**48 Friar Gate**
**Derby DE1 1GY (GB)**

(56) References cited:
**GB-A- 2 138 199**
**US-A- 1 691 869**
**US-A- 1 691 869**
**US-A- 5 430 256**
**US-A1- 2006 000 634**
**US-A1- 2006 000 634**



EP 2 504 845 B9

## Description

### TECHNICAL FIELD

**[0001]** The presently disclosed subject matter relates to low voltage suspension system particularly for, but not limited to, luminaire assemblies. More particularly, the subject matter relates to a suspension system that includes an uninsulated wire construct for supporting the assembly and for providing the assembly with low voltage power, as well as adjustable cable grippers and non-adjustable cable couplers to attached the wire construct(s) to both supporting structure and luminaire respectively in such a way that the luminaire may be easily adjusted to the desired height.

### BACKGROUND

**[0002]** Many electrically-powered assemblies and devices, such as luminaire assemblies, are hung from ceilings or other supporting structures. In order for a luminaire assembly to be hung, the weight of the luminaire assembly must be supported from the supporting structure. In addition, in order to provide light, the luminaire assembly must be provided with power.

**[0003]** Many kinds of supports have been developed to hang luminaire assemblies and to provide them with power. One form of support is an electrical cable configured to provide both power and support to the luminaire assembly. However, electrical cables composed of highly electrical metallic conductors can only suspend luminaires up to approximately 5 pounds. When an electrical cable needs to support more than 5 pounds, a separate suspension or support cable is required, and the electrical cable will require an insulating jacket of a non-metallic material such as a polymer or elastomer.

**[0004]** The use of non-metallic insulators with metallic conductive cables can cause a number of problems with the use of adjustable cable grippers. Specifically, adjustable cable grippers need to come into direct contact with the metallic cable to be effective. When a cable gripper is used on a non-metallically insulated cable it will slip and tear the insulation, eventually lodging against the metal itself and defeating the purpose of the insulation.

**[0005]** The use of mixed strands of metallic cable for both supporting light assemblies and conducting electricity thereto are known. Several attempts to meet the goal of adequate support and strength in the cable, while still providing adequate conductivity are shown in the prior art. However, these attempts do not cure the problems with the use of adjustable grippers.

**[0006]** Several examples from the prior art disclose cables which use a combination of cooper wires and steel wires. Some of those examples depict steel wires and copper wires exposed on the outer layer of the cable. U.S. Patent No. 2,250,907, issued to Edwards, and U.S. Patent No. 3,339,012, issued to Hutchins, depict some of those cables. While copper has good electrical conductivity, copper also has a low elastic strength. The presence of the copper on the outer later of the cable means that the exterior of the cable lacks the lateral compression strength required for the cable to be gripped with adjustable grippers.

**[0007]** Other examples in the prior art depict the steel wires on the outer layer of a cable, but those cables are not configured to be gripped by adjustable grippers. U.S. Patent No. 2,396,734, issued to Williams, and U.S. Patent Application Publication No. 2001/0000590, applied for by Valadez et al, depict some of those cables.

**[0008]** Other examples in the prior art use alternative metallic materials to provide both conduction and tensile strength. However, those alternative metallic materials lack the lateral compressive strength for use with adjustable grippers. U.S. Patent No. 3,261,908, issued to Roche et al, and U.S. Patent Application Publication No. 2001/0017219, depict some of those cables.

**[0009]** Yet other examples in the prior art require non-metallic insulation which, as discussed above, is destroyed which gripped by an adjustable gripper. U.S. Patent No. 7,462,781, and U.S. Patent Application Publication No. 2005/0109530, applied for by Maeda, depict some of those cables.

**[0010]** US 20060000634 A discloses an assembly according to the preamble of claim 1.

**[0011]** While all of these prior art cables use metallic strands to provide tensile strength for the cable, the prior art cables fail to disclose a cable with sufficient lateral compression strength to be gripped with an adjustable gripper, configured to be gripped by an adjustable gripper, and without the use of a polymer or elastomer insulation. The prior art fails to disclose the outer steel strands as providing protection to the internal conductive strand against the lateral compression forces of an adjustable cable gripping mechanism such as a three-ball compression system.

**[0012]** What is needed in the area of supporting luminaires and other electrical equipment is a conductive cable providing both axial tensile strength and resistance to lateral compression forces that is needed to support a hanging luminaire assembly or other electrical equipment using an adjustable cable gripper.

## SUMMARY

**[0013]** The above problems are solved with the features of claim 1.

**[0014]** The present disclosure relates to a system for an adjustable hanging, particularly a luminaire assembly. The system includes a luminaire fixture assembly or illuminated sign with two or more fixture mounts attached to the luminaire fixture assembly. The system also includes two or more ceiling mounts attached to a ceiling and one or more power sources remote from the luminaire assembly. Two or more of the low voltage cables described above each connect one of the ceiling mounts to one of the fixture mounts in order to hang the luminaire fixture assembly from the ceiling. In addition, the remote power source provides power to a light source inside of the luminaire fixture assembly via low voltage electric feeds directed via the conductive strands of the low voltage cables.

**[0015]** For low voltage electrical systems, a minimum 24AWG conductive cable is required. For the conductive portion of the cable, in this case copper, to be an equivalent 24AWG size the outer diameter of the cable would then be 1.8mm. The theoretical strength of the 1.8mm cable alone is 645 pounds. No other conductive cable of this size would be able to support this weight.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0016]** The foregoing Summary, as well as the following Detailed Description, is better understood when read in conjunction with the appended drawings. In order to illustrate the present disclosure, various aspects of the disclosure are shown. However, the disclosure is not limited to the specific aspects shown. The following figures are included:

**Figure 1** illustrates a cross section of an example suspension cable;
**Figures 2A and 2B** illustrate a side view of two example suspension cables, with one of the two examples showing a swaged sleeve;
**Figure 3** illustrates an example hanging luminaire assembly;
**Figures 4A and 4B** illustrate an example ceiling-mounted non-adjustable cable coupler.
**Figures 5A and 5B** illustrate an example ceiling-mounted adjustable cable gripper.
**Figures 6A and 6B** illustrate an example fixture-mounted non-adjustable cable coupler;
**Figures 7A and 7B** illustrate a first example fixture-mounted adjustable cable gripper
**Figures 8A and 8B** illustrate a second example fixture mounted adjustable cable gripper.
**Figures 9A and 9B** illustrate an example 3-ball adjustable cable gripper.

## DETAILED DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

**[0017]** Fig. 1 depicts a cross section of an example low voltage suspension cable 101. The cable comprises a conductive strand 102 and strength strands 103. The strength strands 103 are wound around conductive strand 102 so that conductive strand 102 is covered. The conductive strand 102 is capable of conducting low voltage electric power. The strength strands 103 are substantially less conductive than the conductive strand 102, and have suffcient tensile strength to support a hanging luminaire assembly from the ceiling. Sufficient tensile strength may be on the order of 500 lbs gross break weight when used with an adjustable cable gripper and a 3/32" diameter cable. The strength strands 103 also protect the conductive strand 102 from lateral compression forces imposed by the adjustable cable gripper. The low voltage suspension cable 101 can be configured in a number of different embodiments. Furthermore, other electronically-powered equipment that could be powered with low voltage electricity, such as other lights, sensors, microphones, decorations, and the like, can be used with the present suspension system.

**[0018]** In one embodiment of the low voltage suspension cable 101, conductive strand 102 comprises a plurality of conductive wires 104, and each of the plurality of strength strands comprises a plurality of strength wires 105. The embodiment shown in Fig. 1 depicts conductive strand 102 comprising seven conductive wires 104, and depicts strength strands 103 each comprising seven individual strength wires 105. The configuration of the seven-wire strand includes a center wire and six wires surrounding the center wire.

**[0019]** In another embodiment of the low voltage suspension cable 101, conductive strand 102 comprises seven copper wires with a minimum cross sectional equivalent of 24AWG as required for Class 2 systems. Strength strands 103 each comprise seven 304 stainless steel wires.

**[0020]** Fig. 2A depicts a length of low voltage suspension cable 101. As shown, strength strands 103 are wound such that conductive strand 102 is not exposed. The terminals 201 of low voltage suspension cable 101 can be electro-cut, soldered, or finished in any similar manner or unfinished. The length of the low voltage suspension cable 101 can vary depending on the application in which the cable is used.

**[0021]** Fig. 2B depicts a length of low voltage suspension cable 101 which includes a swaged sleeve 202. Swaged sleeve 202 can be used as part of a connector system for connecting the cable to a ceiling or to a luminaire assembly.

**[0022]** Fig. 3 depicts an example luminaire assembly system. This system includes a remote power source 301. The remote power source 301 is connected to two electrical leads 302. Electrical leads 302 are directed to ceiling mounts 303. Ceiling mounts 303 securely attach low voltage suspension cables 101 to ceiling or other structure 304 (not shown). In ceiling mounts 303, electrical leads 302 are connected to the conductive core 102 of low voltage suspension cables 101. Fixture mounts 305 securely attach low voltage suspension cables 101 to luminaire assembly 306. Low voltage suspension cables 101 are connected to ceiling mounts 303 and fixture mounts 305 in such a way as to properly support hanging luminaire assembly 306. Electrical leads 307 are connected to the conductive core 102 of low voltage suspension cables 101. Electrical leads 307 are directed inside of luminaire assembly 306 to a lighting element (not shown) of luminaire assembly 306. As depicted in Fig. 3, low voltage suspension cables 101 can support the weight of hanging luminaire assembly 306 and provide low voltage power to luminaire assembly 306.

**[0023]** The remote power source 301 may be any type of low voltage power source. The remote power source may provide direct current feeds via each of the low voltage suspension cables 101, where one or more of the cables provides a positive feed and the other cables provide a negative feed. In one embodiment, the remote power source provides a positive 24-volt direct or alternating current feed on one of the cables, and a negative 24-volt direct or alternating current feed on the other cable. The remote power source may be any other type of device that has an electrical power output, such as a transformer which can transform a high voltage alternating current source into a low voltage alternating current output. Those skilled in the art will recognize many other types of remote power source that would be suitable for these purposes.

**[0024]** The light source may be any type of light source which requires a low voltage input. As the economic and environmental costs associated with power generation increase, light sources have been developed which have low power requirements. These low power light sources include LED lights, compact fluorescent bulbs, and other similar sources. Because these light sources do not require as much electrical energy, they can be powered by a low voltage power source via low voltage suspension cables.

**[0025]** Figs. 4A and 4B depict an example ceiling-mounted non-adjustable cable coupler 401, in both assembled and exploded views, respectively. Ceiling mount 401 requires a low voltage suspension cable 101 with a swaged sleeve 202. When low voltage suspension cable 101 is inserted through non-adjustable cable coupler 403, swaged sleeve 202 sits inside of non-adjustable cable coupler 403. Insulating sleeve 409 is inserted onto cable 101 above swaged sleeve 202. Non-adjustable cable coupler 403 is inserted through insulating bushing 404 and bracket bar 405 such that the external threads on the body of non-adjustable cable coupler 403 extend below bracket bar 405. Bracket bar 405 is fixed to junction box 402 by screws 406. The portion of non-adjustable cable coupler 403 which extends below bracket 405 is passed through the ceiling (not shown) and through ceiling canopy 407. Coupler cap 408 has internal threads which engage the external threads of non-adjustable cable coupler 403 to secure the ceiling canopy 407 to the ceiling or other structure.

**[0026]** Figs. 5A and 5B depict an example ceiling mounted adjustable cable gripper 501, in both assembled and exploded views, respectively. Ceiling mount 501 can utilize a low voltage suspension cable 101 without a swaged sleeve 202. Adjustable cable gripper 503 contains an internal 3-ball compression system which grips low voltage suspension cable 101 and locks it in place. With low voltage suspension cable 101 locked into adjustable cable gripper 503, the remaining portions of ceiling mount 501 are similar to those of ceiling mount 401. Adjustable cable gripper 503 in inserted through insulating bushing 504 and bracket bar 505. Bracket bar 505 is secured to junction box 502 using screws 506. The portion of adjustable cable gripper 503 which extends below bracket 505 is passed through the ceiling (not shown) and through ceiling canopy 507. The internal threads of coupler cap 508 engage the external threads of adjustable cable gripper 503 to secure the ceiling canopy 507 to the ceiling or other structure. Insulating sleeve 509 is inserted onto cable 101 above adjustable cable gripper 503

**[0027]** The components of first ceiling mount 401 and second ceiling mount 501 can be composed of a variety of materials. In one embodiment, non-adjustable cable coupler 403, adjustable cable gripper 503, and coupler caps 408 and 508 are composed of nickel plated brass; brackets bars 405 and 505 are composed of zinc plated steel; and, insulating bushings 404 and 504 and ceiling canopies 407 and 507 are composed of nylon 6/6. Insulating sleeves 409 and 509 are composed of PVC. Those of ordinary skill in the art will recognize that a number of other materials can be readily used as substitutes for those described above.

**[0028]** Figs. 6A and 6B depict an example non-adjustable fixture mount 601, in both assembled and exploded views, respectively. First ceiling mount 601 requires a low voltage suspension cable 101 with a swaged sleeve 202. When low voltage suspension cable 101 is inserted through cable coupler 606, swaged sleeve 202 sits inside of cable coupler 606. Insulating sleeve 607 is inserted onto cable 101 below swaged sleeve 202. Cable coupler 606 is inserted through insulating bushing 605, through the top of luminaire assembly 604, and through insulating bushing 603. Cable coupler 606 is secured to fixture assembly 604 with nut 602, where the internal threads of nut 602 engage the external threads of cable coupler 606.

**[0029]** Figs. 7A and 7B depict an example first adjustable fixture mount 701, in both assembled and exploded views, respectively. First adjustable fixture mount 701 can utilize a low voltage suspension cable 101 without a swaged sleeve

202. Adjustable cable gripper 706 contains an internal 3-ball compression system which grips low voltage suspension cable 101 and locks it in place. Low voltage suspension cable 101 is inserted through insulating bushing 705, through luminaire assembly housing 704, and through insulating bushing 703 Adjustable cable gripper 706 is secured to fixture assembly housing 704 with nut 702, where the internal threads of nut 702 engage the external threads of cable gripper 706. Insulating sleeve 707 is inserted onto cable 101 below adjustable cable gripper 706.

**[0030]** Figs. 8A and 8B depict an example second adjustable fixture mount 801, in both assembled and exploded views, respectively. Second adjustable fixture mount 801 can utilize a low voltage suspension cable 101 without a swaged sleeve 202. Adjustable cable gripper 806 grips low voltage suspension cable 101 securely and locks it in place. Adjustable cable gripper 806 differs from adjustable cable gripper 706 in external design only: Adjustable cable gripper 706 is inserted into luminaire assembly housing 704 from below the housing wall and adjustable cable gripper 806 is inserted into luminaire assembly housing 804 from above the housing wall. Low voltage suspension cable 101 is inserted through insulating bushing 803, through luminaire assembly housing 804, and through insulating bushing 805. Cable gripper 806 is secured to fixture assembly housing 804 with nut 802, where the internal threads of nut 802 engage the external threads of cable gripper 806. Insulating sleeve 807 is inserted onto cable 101 below cable gripper 806. Those of ordinary skill in the art will recognize that a number of other adjustable cable gripper designs can be readily used as substitutes for those described above.

**[0031]** The components of non-adjustable fixture mount 601, the first adjustable fixture mount 701, and the second adjustable fixture mount 801 can be composed of a variety of materials. In one embodiment, non-adjustable cable couplers and adjustable cable grippers 606, 706, and 806 are composed of nickel plated brass; and bushings 603, 605, 703, 705, 803, and 805 are composed of nylon 6/6; insulating sleeves 607,707, and 807 are composed of PVC Those of ordinary skill in the art will recognize that a number of other materials can be readily used as substitutes for those described above.

**[0032]** Referring back to the example luminaire assembly system depicted in Fig. 3, the ceiling mounts 303 and the fixture mounts 305 can be any of the above example mounts or similar mounts. Among the possible pairings of ceiling mounts 303 with fixture mounts 305, and the associated low voltage cable required, include those described in Table 1.

**Table 1- Possible pairings of low ceiling and fixture mounts**

| Ceiling Mount | Fixture Mount | Low Voltage Cable |
|---|---|---|
| First ceiling mount 401 | First fixture mount 601 | Swaged sleeve 202 at both ceiling and fixture end |
| First ceiling mount 401 | Second fixture mount 701 | Swaged sleeve 202 at ceiling end |
| First ceiling mount 401 | Third fixture mount 801 | Swaged sleeve 202 at ceiling end |
| Second ceiling mount 501 | First fixture mount 601 | Swaged sleeve 202 at fixture end |
| Second ceiling mount 501 | Second fixture mount 701 | No swaged sleeve 202 required |
| Second ceiling mount 501 | Third fixture mount 801 | No swaged sleeve 202 required |

**[0033]** Figs. 9A and 9B illustrate an example 3-ball adjustable cable gripper 901. In the embodiment shown in Fig. 9A, the adjustable cable gripper 901 has a stop flange 902 and a threaded body 903. When installed, the threaded body 903 is inserted in a through hole of a ceiling, a fixture, or other structure (not shown) until the stop flange 902 comes into contact with the structure. Fig. 9A depicts a sectional view of threaded body 903 with the top half removed. An internal conical cylinder 904 is inside of threaded body 903, and is also depicted in a sectional view with the top half removed. The threaded body 903 surrounds the internal conical cylinder 904 that, in turn, contains three balls 905. If a downward force is exerted on the low voltage suspension cable 101, the cable will transmit the downward force on the internal conical cylinder 904. This downward force on the internal conical cylinder 904 causes the balls 905 to be compressed between the threaded body 903 and the low voltage suspension cable 101. This compression of the balls 905 causes a lateral force to be applied from each ball 905 toward the axis of the low voltage suspension cable 101. These lateral forces prevents the low voltage suspension cable 101 from moving downward, despite the force pulling the low voltage suspension cable 101 downward.

**[0034]** Fig. 9B depicts a sectional view looking down the axis of the low voltage suspension cable 101. As depicted, low voltage suspension cable 101 includes conductive strand 102 and strength strands 103. Also depicted are sectional views of the threaded body 903, the internal conical cylinder 904, and the three balls 905. As can be seen, the balls come into direct contact with the outer edge of the low voltage suspension cable 101. If a polymer or elastomer insulation jacket were used on the outside of low voltage suspension cable 101, the lateral forces applied by the balls would permanently deform the insulation (e.g., tearing or stretching the insulation). Further, a polymer or elastomer insulation jacket does not have the tensile strength required to support a hanging fixture.

**[0035]** The foregoing description has set forth various embodiments of the system and components via the use of

diagrams and examples. While the present disclosure has been described in connection with the preferred embodiments of the various figures, it is to be understood that other similar embodiments may be used or modifications and additions may be made to the described embodiment for performing the same function of the present disclosure without deviating there from. Therefore, the present disclosure should not be limited to any single embodiment, but rather construed in breadth and scope in accordance with the appended claims. Additional features of this disclosure are set forth in the following claims.

## Claims

**1.** A hanging electrically-powered assembly system, comprising:

an electrically-powered assembly (306);
at least two fixture mounts (305) attached to the electrically-powered assembly;
at least two structure mounts (303) attached to a structure;
a power source (301) remote from the electrically-powered assembly;
at least two conductive cables (101) each connected to one structure mount and to one fixture mount,
wherein at least a first one of the conductive cables (101) is connected to a first fixture mount (305) or a first structure mount (303) that includes a non-adjustable cable coupler (403) without the use of insulation between the structure mount and the fixture mount, and

wherein each conductive cable (101) comprises:

a conductive strand (102) composed of a first metallic material, the conductive strand connecting the power source (301) to the electrically-powered assembly (306), and
a plurality of strength strands (103) wound around the conductive strand, the plurality of strength strands composed of a second metallic material?

**characterized in that** said first conductive cable includes a swaged sleeve (202) sitting in the cable coupler (403), and **in that** the conductive cables are uninsulated.

**2.** The system of claim 1, wherein the hanging electrically-powered assembly (306) is a luminaire fixture assembly comprising a light source.

**3.** The system of claim 2, wherein the light source comprises at least one low voltage, low power light.

**4.** The system of claim 1, wherein the first structure mount (303) comprises the non-adjustable cable coupler (403), wherein the first fixture mount (305) comprises an adjustable cable gripper (503), and wherein the end of the first cable (101) further from the swaged sleeve (202) is attached to the adjustable cable gripper of the first fixture mount.

**5.** The system of claim 1, wherein the first fixture mount (305) comprises the non-adjustable cable coupler (403), wherein the first structure mount (303) comprises an adjustable cable gripper (503), and wherein the end of the first cable (101) further from the swaged sleeve (202) is attached to the cable gripper of said first structure mount.

**6.** The system of claim 1, wherein the remote power source (301) is configured to provide a positive 30-volt or less direct current feed via a first conductive cable (101), and to provide a negative 30-volt or less direct current feed via a second conductive cable (101).

**7.** The system of claim 1, wherein the first metallic material is one of the following: copper, a copper alloy or a non-cuprous, highly conductive material; and wherein the second metallic material is one of the following: steel, stainless steel or other high tensile strength, high lateral compressive strength material.

**8.** The system of claim 1, wherein the conductive strand (102) of each conductive cable (101) comprises a plurality of conductive wires.

**9.** The system of claim 1, wherein at least one of the plurality of strength strands (103) of each conductive cable comprises a plurality of strength wires.

## Patentansprüche

1. System für eine hängende elektrisch betriebene Baugruppe, das Folgendes umfasst:

   eine elektrisch betriebene Baugruppe (306),
   wenigstens zwei Vorrichtungshalterungen (305), die an der elektrisch betriebenen Baugruppe befestigt sind,
   wenigstens zwei Strukturhalterungen (303), die an einer Struktur befestigt sind,
   eine Energiequelle (301) fern von der elektrisch betriebenen Baugruppe,
   wenigstens zwei leitfähige Kabel (101), die jeweils mit einer Strukturhalterung und mit einer Vorrichtungshalterung verbunden sind,
   wobei wenigstens ein erstes der leitfähigen Kabel (101) mit einer ersten Vorrichtungshalterung (305) oder einer ersten Strukturhalterung (303), die eine nichteinstellbare Kabelkupplung (403) einschließt, ohne die Verwendung von Isolierung zwischen der Strukturhalterung und der Vorrichtungshalterung verbunden ist, und

   wobei jedes leitfähige Kabel (101) Folgendes umfasst:

   einen leitfähigen Strang (102), der aus einem ersten metallischen Material besteht, wobei der leitfähige Strang die Energiequelle (301) mit der elektrisch betriebenen Baugruppe (306) verbindet, und
   mehrere Festigkeitsstränge (103), die um den leitfähigen Strang gewickelt sind, wobei die mehreren Festigkeitsstränge aus einem zweiten metallischen Material bestehen,
   **dadurch gekennzeichnet, dass** das erste leitfähige Kabel eine aufgepresste Hülse (202) einschließt, die in der Kabelkupplung (403) sitzt, und dadurch, dass die leitfähigen Kabel nicht isoliert sind.

2. System nach Anspruch 1, wobei die hängende elektrisch betriebene Baugruppe eine Beleuchtungsvorrichtungsbaugruppe (306) ist, die eine Lichtquelle umfasst.

3. System nach Anspruch 2, wobei die Lichtquelle wenigstens ein Niederspannungslicht mit niedriger Leistung umfasst.

4. System nach Anspruch 1, wobei die erste Strukturhalterung (303) die nichteinstellbare Kabelkupplung (403) umfasst, wobei die erste Vorrichtungshalterung (305) einen einstellbaren Kabelgreifer (503) umfasst und wobei das weiter von der aufgepressten Hülse (202) entfernte Ende des ersten Kabels (101) an dem einstellbaren Kabelgreifer der ersten Vorrichtungshalterung befestigt ist.

5. System nach Anspruch 1, wobei die erste Vorrichtungshalterung (305) die nichteinstellbare Kabelkupplung (403) umfasst, wobei die erste Strukturhalterung (303) einen einstellbaren Kabelgreifer (503) umfasst und wobei das weiter von der aufgepressten Hülse (202) entfernte Ende des ersten Kabels (101) an dem einstellbaren Kabelgreifer der ersten Strukturhalterung befestigt ist.

6. System nach Anspruch 1, wobei die entfernte Energiequelle (301) dafür konfiguriert ist, eine positive Gleichstromzufuhr von 30 Volt oder weniger über ein erstes leitfähiges Kabel (101) bereitzustellen und eine negative Gleichstromzufuhr von 30 Volt oder weniger über ein zweites leitfähiges Kabel (101) bereitzustellen.

7. System nach Anspruch 1, wobei das erste metallische Material eines der folgenden ist: Kupfer, eine Kupferlegierung oder ein nicht-kupferhaltiges stark leitfähiges Material, und wobei das zweite metallische Material eines der folgenden ist: Stahl, rostfreier Stahl oder ein anderes Material mit hoher Zugfestigkeit, hoher seitlicher Druckfestigkeit.

8. System nach Anspruch 1, wobei der leitfähige Strang (102) jedes leitfähigen Kabels (101) mehrere leitfähige Drähte umfasst.

9. System nach Anspruch 1, wobei wenigstens einer der mehreren Festigkeitsstränge (103) jedes leitfähigen Kabels mehrere Festigkeitsdrähte umfasst.

## Revendications

1. Système d'assemblage de suspension à alimentation électrique, comprenant :

   un assemblage à alimentation électrique (306) ;

au moins deux supports de fixation (305) fixés sur l'assemblage à alimentation électrique ;
au moins deux supports de structure (303) fixés sur une structure ;
une source d'énergie (301), éloignée de l'assemblage à alimentation électrique ;
au moins deux câbles conducteurs (101), connectés chacun à un support de structure et à un support de fixation ;
dans lequel au moins un premier câble des câbles conducteurs (101) est connecté à un premier support de fixation (305) ou à un premier support de structure (303) englobant un coupleur de câbles (403) non ajustable, sans utilisation d'une isolation entre le support de structure et le support de fixation ; et

dans lequel chaque câble conducteur (101) comprend :

un brin conducteur (102), composé d'un premier matériau métallique, le brin conducteur connectant la source d'énergie (301) à l'assemblage à alimentation électrique (306) ; et
plusieurs brins de résistance (103) enroulés autour du brin conducteur, les plusieurs brins de résistance étant composés d'un deuxième matériau métallique ;
**caractérisé en ce que** ledit premier câble conducteur englobe une douille pressée (202) agencée dans le coupleur de câbles (403) et **en ce que** les câbles conducteurs ne sont pas isolés.

**2.** Système selon la revendication 1, dans lequel l'assemblage de suspension à alimentation électrique (306) est un assemblage de fixation d'un luminaire comprenant une source de lumière.

**3.** Système selon la revendication 2, dans lequel la source de lumière comprend au moins une lumière basse tension, à faible puissance.

**4.** Système selon la revendication 1, dans lequel le premier support de structure (303) comprend le coupleur de câbles non ajustable (403), le premier support de fixation (305) comprenant une pince de câble ajustable (503), et dans lequel l'extrémité du premier câble (101) plus éloignée de la douille pressée (202) est fixée sur la pince de câble ajustable du premier support de fixation.

**5.** Système selon la revendication 1, dans lequel le premier support de fixation (305) comprend le coupleur de câbles non ajustable (403), le premier support de structure (303) comprenant une pince de câble ajustable (503), et dans lequel l'extrémité du premier câble (101) plus éloignée de la douille pressée (202) est fixée sur la pince de câble dudit premier support de structure.

**6.** Système selon la revendication 1, dans lequel la source d'énergie éloignée (301) est configurée de sorte à fournir une alimentation en courant continu positif de 30 Volts ou moins via un premier câble conducteur (101) et à fournir une alimentation en courant continu négatif de 30 Volts ou moins via un deuxième câble conducteur (101).

**7.** Système selon la revendication 1, dans lequel le premier matériau métallique est l'un des matériaux ci-dessous : du cuivre ; un alliage de cuivre ou un matériau non cuivreux, hautement conducteur ; et dans lequel le deuxième matériau métallique est l'un des matériaux ci-dessous : de l'acier, de l'acier inoxydable ou un autre matériau à résistance élevée à la traction et à résistance élevée à la compression latérale.

**8.** Système selon la revendication 1, dans lequel le brin conducteur (102) de chaque câble conducteur (101) comprend plusieurs fils conducteurs.

**9.** Système selon la revendication 1, dans lequel au moins un des plusieurs brins de résistance (103) de chaque câble conducteur comprend plusieurs fils de résistance.

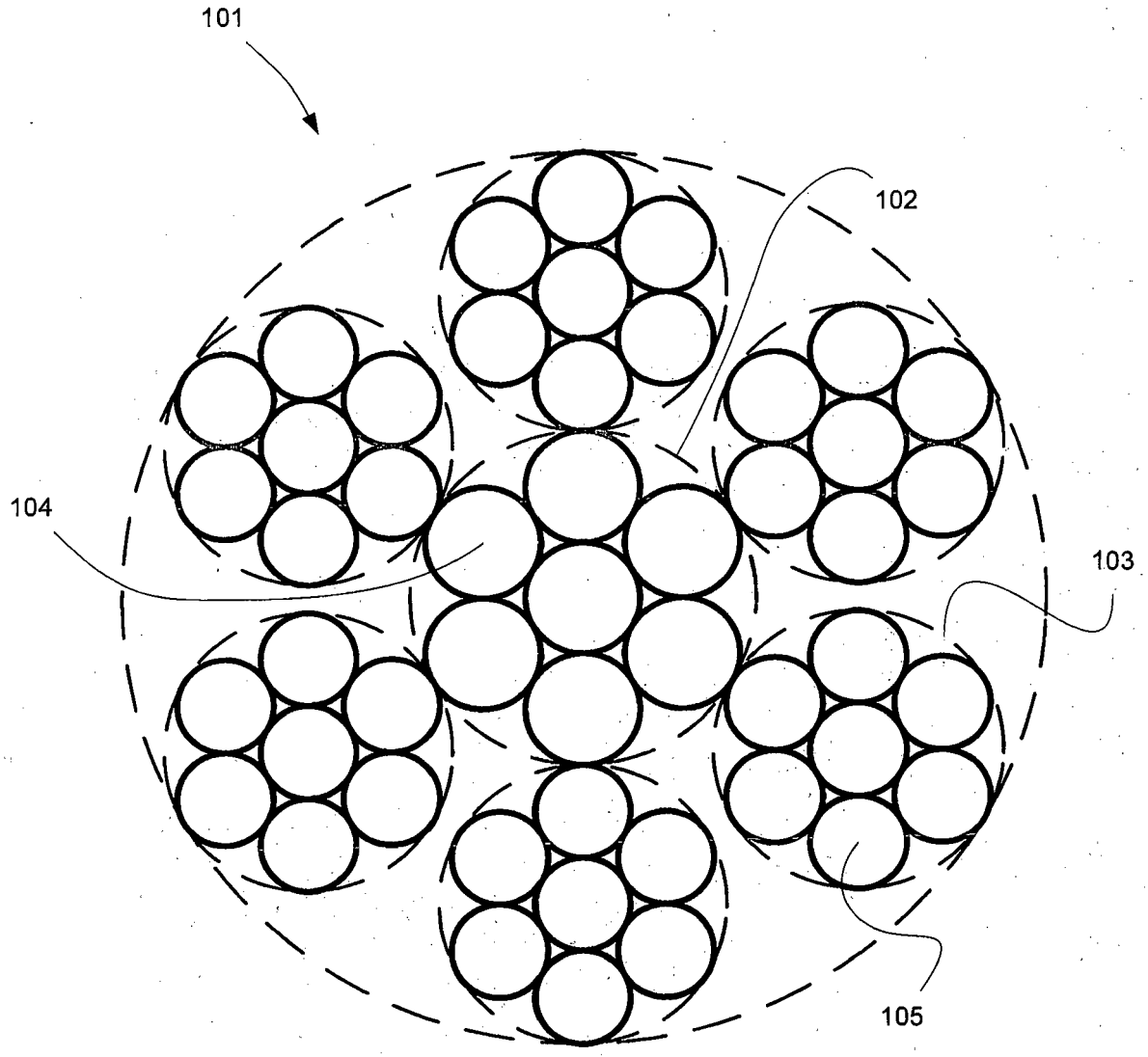


FIGURE 1

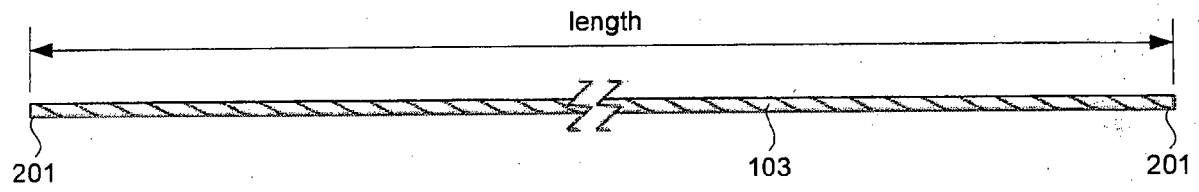


FIGURE 2A

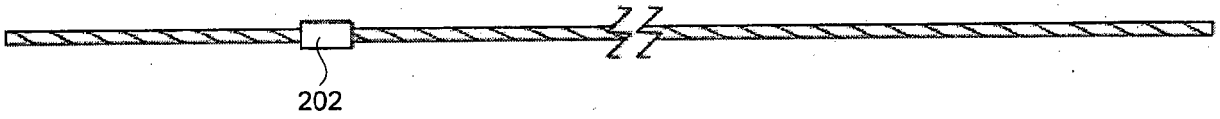


FIGURE 2B

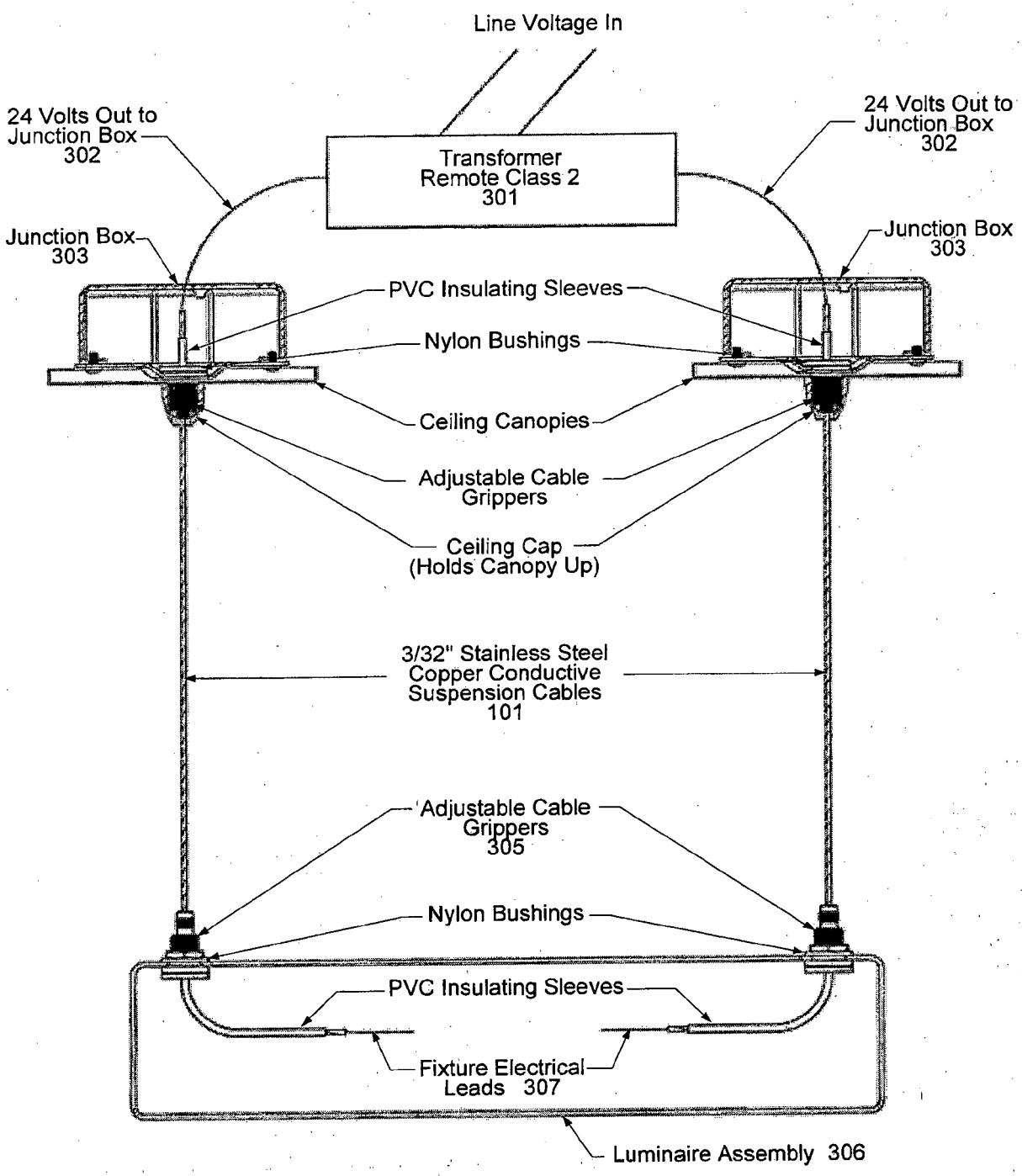
Line Voltage In
24 Volts Out to Junction Box 302
Transformer Remote Class 2 301
24 Volts Out to Junction Box 302
Junction Box 303
Junction Box 303
PVC Insulating Sleeves
Nylon Bushings
Ceiling Canopies
Adjustable Cable Grippers
Ceiling Cap (Holds Canopy Up)
3/32" Stainless Steel Copper Conductive Suspension Cables 101
Adjustable Cable Grippers 305
Nylon Bushings
PVC Insulating Sleeves
Fixture Electrical Leads 307
Luminaire Assembly 306

**FIGURE 3**

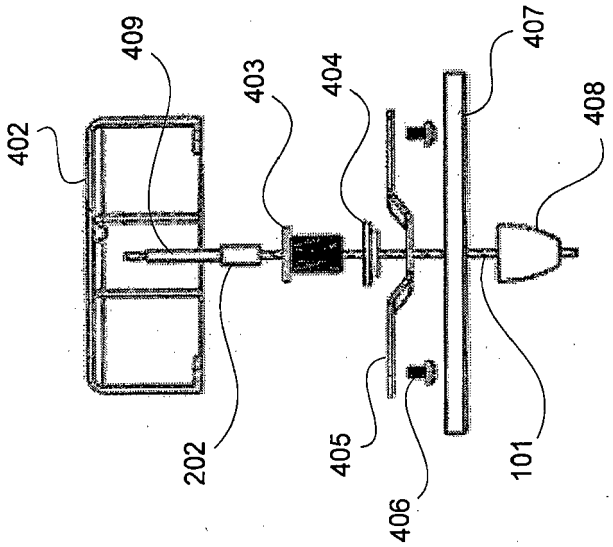


FIGURE 4B

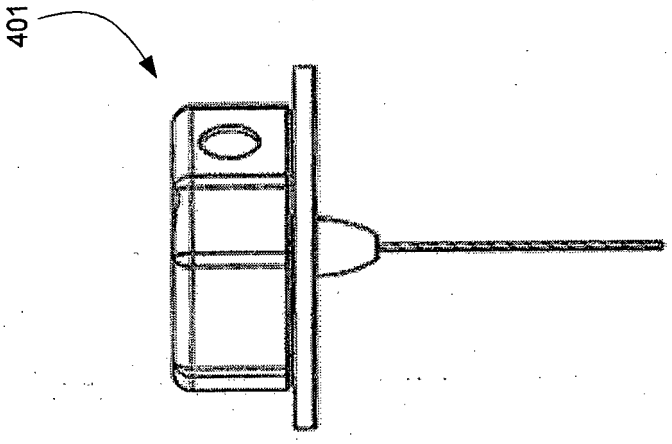


FIGURE 4A

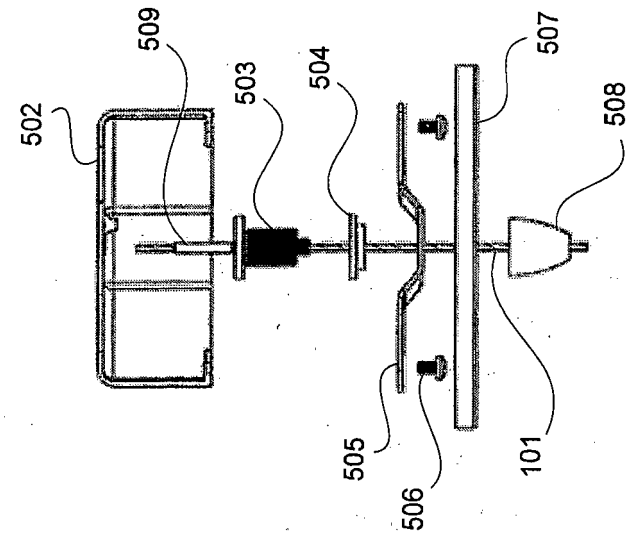


FIGURE 5B

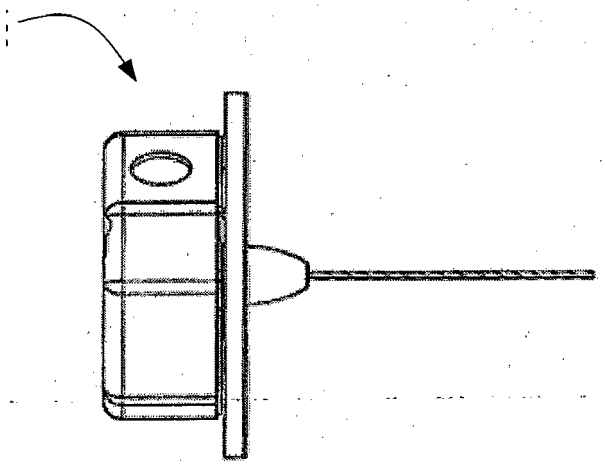

FIGURE 5A

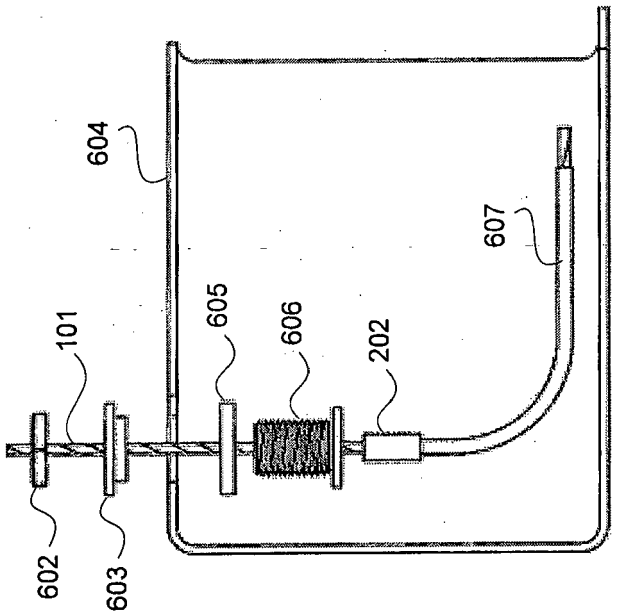


FIGURE 6B

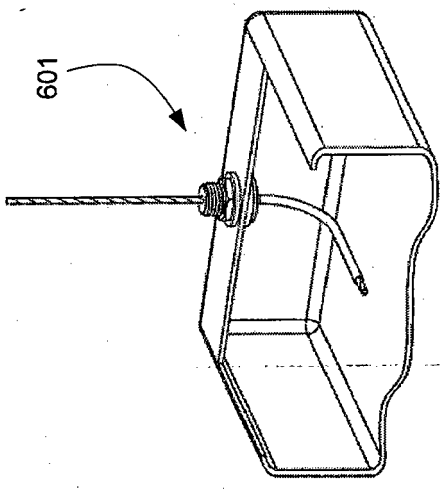


FIGURE 6A

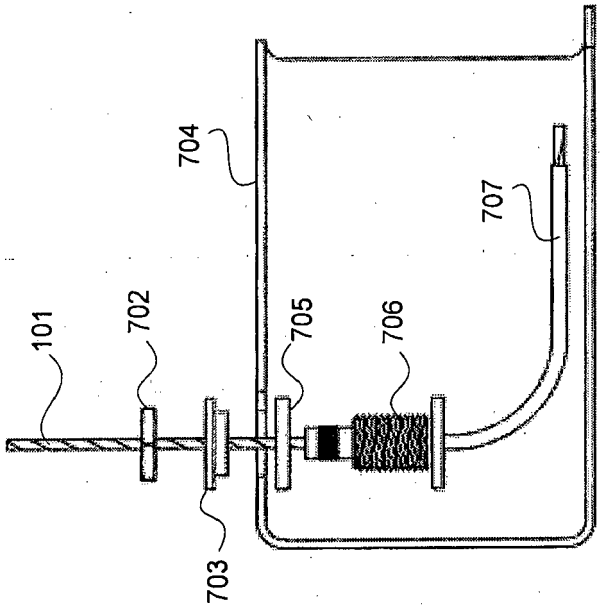


FIGURE 7B

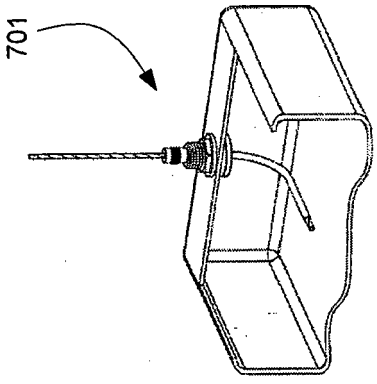


FIGURE 7A

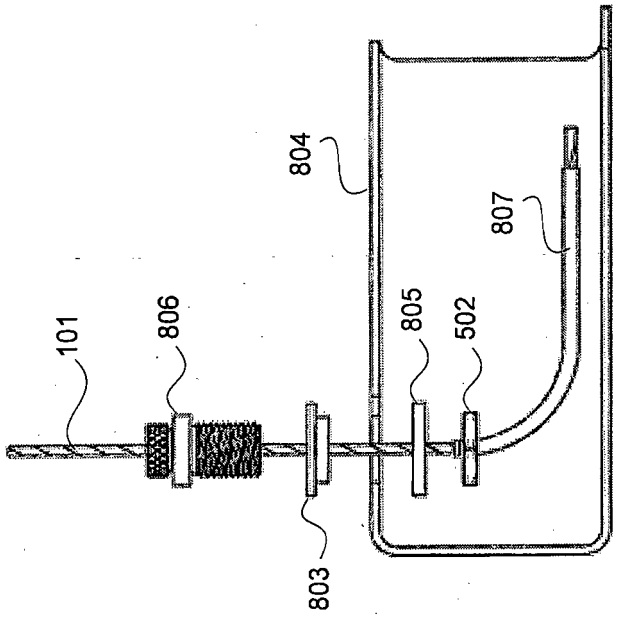


FIGURE 8B

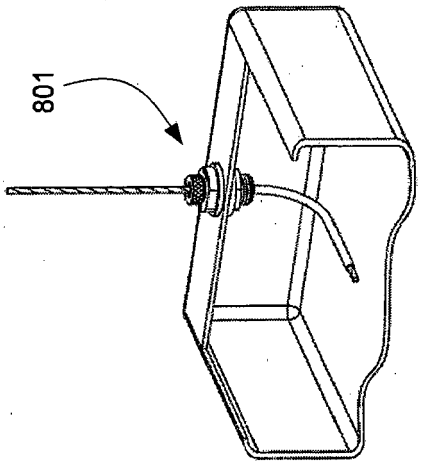


FIGURE 8A

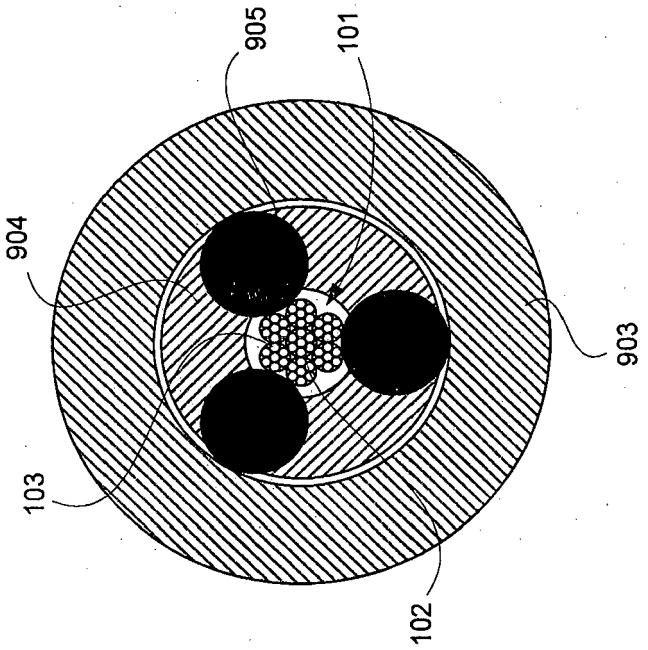


FIGURE 9B

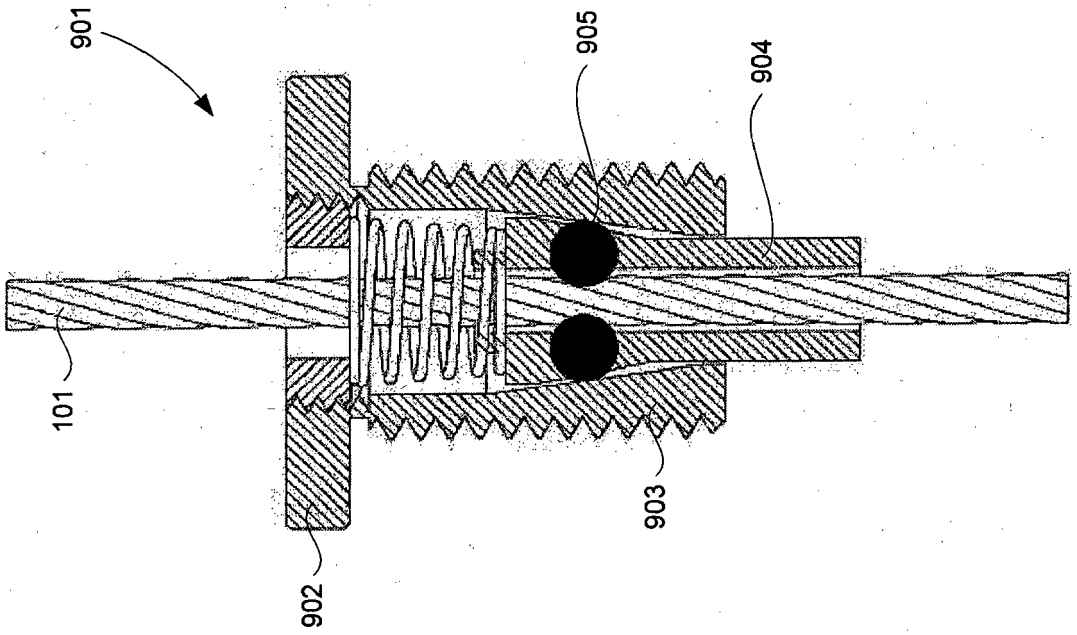


FIGURE 9A

## REFERENCES CITED IN THE DESCRIPTION

*This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.*

### Patent documents cited in the description


- US 2250907 A, Edwards **[0006]**
- US 3339012 A, Hutchins **[0006]**
- US 2396734 A, Williams **[0007]**
- US 20010000590 A, Valadez **[0007]**
- US 3261908 A, Roche **[0008]**
- US 20010017219 A **[0008]**
- US 7462781 B **[0009]**
- US 20050109530 A **[0009]**
- US 20060000634 A **[0010]**