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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
1 February 2007 (01.02.2007)

PCT

(10) International Publication Number
WO 2007/012189 A1

(51) International Patent Classification:
F21V 19/02 (2006.01)

(21) International Application Number:
PCT/CA2006/001233

(22) International Filing Date: 27 July 2006 (27.07.2006)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

60/703,838	29 July 2005 (29.07.2005)	US
11/378,595	17 March 2006 (17.03.2006)	US
11/493,043	26 July 2006 (26.07.2006)	US

(71) Applicant *(for all designated States except US)*: **STREETLIGHT INTELLIGENCE, INC.** [CA/CA]; 19-6782 Veyaness Rd., Victoria, British Columbia V8M 2C2 (CA).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **JACKLIN, Gregory, P.** [CA/CA]; 7987 Galbraith Crs, Saanichton, British Columbia V8M 1K7 (CA). **ANDERSON, James, A.** [CA/CA]; 855 Stelly's Cross Road, Brentwood Bay, British Columbia V8M 1J4 (CA).

(74) Agents: **LEDWELL, M., Kent** et al.; Gowling Lafleur Henderson LLP, 160 Elgin Street, Suite 2600, Ottawa, Ontario K1P 1C3 (CA).

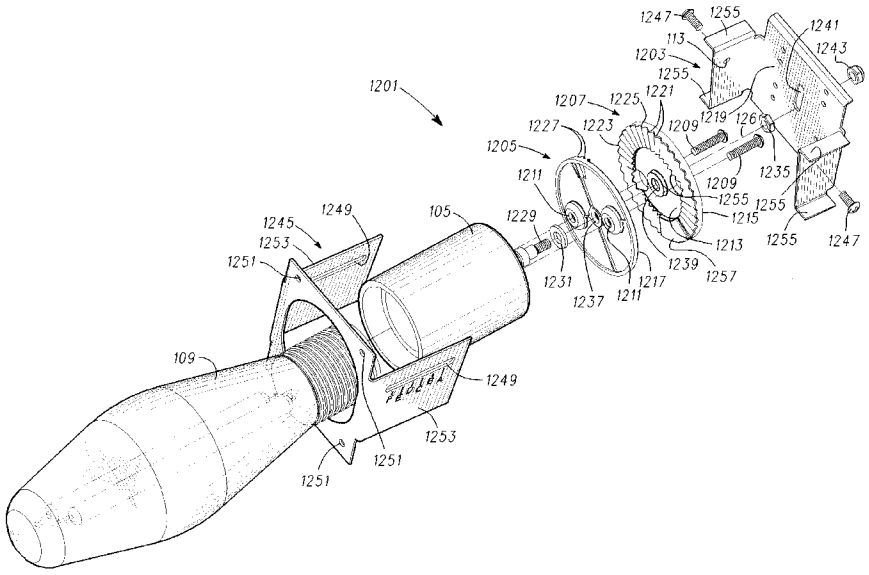
(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SY, 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, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*
— *with amended claims and statement*

[Continued on next page]

(54) **Title:** ADJUSTABLE LAMP SOCKET AND MOUNTING ASSEMBLY



(57) **Abstract:** An adjustable mounting assembly (100, 1201) for a lamp socket (105) comprises a bracket (1203) configured to be mechanically coupled to a luminaire assembly and a mounting plate (1205, 1207) configured to attach to the lamp socket and be mechanically coupled to the bracket and to selectively engage the bracket at one of a plurality of angular positions relative to a lamp socket axis, and at one of a plurality of axis locations relative to the bracket. The mounting plate can include a socket mounting plate and positioning bushing. The positioning bushing has a surface configured with an angular locking member to engage a complimentary locking member on a surface of the socket mounting plate. An opposite surface of the positioning bushing has a complimentary axis locating member configured to engage one of a plurality of axis locating members on the bracket.

WO 2007/012189 A1

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

ADJUSTABLE LAMP SOCKET AND MOUNTING ASSEMBLY

RELATED APPLICATIONS

[0001] This is a continuation-in-part application of U.S. Application No. 11/378,595, filed March 17, 2006 which claims priority from Provisional Application No. 60/703,838, filed on July 29, 2005, which are each hereby incorporated herein in their entirety by reference.

FIELD OF THE INVENTION

[0002] This invention relates in general to lighting fixtures and more specifically to an adjustable lamp socket and mounting assembly, and using the mounting assembly for the rotational alignment of a lamp and socket within a luminaire.

BACKGROUND OF THE INVENTION

[0003] High intensity discharge (HID) lighting is prevalent in our society. It is used for both interior and exterior applications where improved visibility is required. For interior applications, HID luminaries can be found in sports arenas, warehouses, industrial plants, office and other commercial lighting situations. For exterior applications, HID luminaries are used to illuminate roadways, parking areas, sports fields, signs, buildings, and the like. Often, a luminaire containing a HID lamp is placed several meters off the ground, and access for installation and maintenance purposes is via an overhead lift or bucket truck.

[0004] HID lamps and luminaries are manufactured according to IESNA (Illuminating Engineering Society of North America) and ANSI standards which define their photometric characteristics. To meet these standards, the lamps and fixtures are tested under laboratory conditions, and the results are reported as a manufacturer's rated values for lamp lumens, wattage, luminance and luminance performance. However, when comparing laboratory test results with actual field measurements, the results can differ. Such differences can be due to several variables such as manufacturing variations, arc tube alignment, lamp position, and field installation conditions, to name a few.

[0005] Manufacturing variations can directly affect the light output of the lamp. While each

manufacturer develops their own set of tolerances that meet the IESNA and ANSI standards, the specifications themselves permit a certain amount of tolerance which leads to variations in light output and light distribution. Other problems may arise during luminaire assembly. For example, the lateral position of the lamp within the luminaire housing can vary, so that it is not centered within the optical system of the luminaire. Furthermore, the vertical position of the lamp is also critical, and lamps with different physical characteristics (i.e. size, dimension and shape of bulb), and ratings (i.e. wattage), require different vertical positions within the luminaire housing. To address the lateral and/or vertical positioning problem, most of the many different luminaire manufacturers employ some type of support mechanism to effect various lateral and/or vertical adjustment capabilities and methodologies.

[0006] Another factor affecting the photometric output of the lamp is the number of arc tubes within the glass envelope. Typically, HID lamps have either one or two arc tubes. Lamps with a single arc tube, called 'single-arc' lamps, are the most prevalent. The major components of a single-arc lamp include a hermetically single alumina arc tube, a steel frame and its associated dome mount support which fixes the arc tube within a weather resistant glass envelope, a residue gas getter for collecting discharged gases within the vacuum tube; and the brass recording base for inserting the lamp into a socket. In general, single-arc lamps have a lifespan of approximately 20,000 hours of use before they need to be replaced.

[0007] Lamps having two arc tubes, referred to as 'dual-arc' lamps, are also available. A dual-arc lamp has the same components as a single-arc lamp with the exception that it contains two arc tubes are rather than one. For example, FIG. 1 shows, in simple and representative form, the components of a typical dual-arc lamp, including the second arc tube. The advantage of the dual-arc lamp is that the second arc tube results in almost double the lifespan of the single-arc lamp, or approximately 40,000 hours of use before replacement is required. The extended lifespan of the dual-arc lamp makes it preferable for use in luminaries, as it dramatically decreases the need for bulb replacement and maintenance costs over the lifetime of the lighting system in which it is deployed.

[0008] While the dual-arc lamp clearly has its advantages, it also has disadvantages. One disadvantage with the dual-arc lamp is related to its photometric distribution of the light. The single-arc lamp can be inserted (i.e., twisted, screwed or seated) into a socket with little concern regarding the final rotational or angular orientation of the arc tube relative to an axis of the lamp. That is to say, the single-arc lamp can be rotated about its axis to any position

within the socket, and the same lumen output pattern will result. With a dual-arc lamp, however, the final orientation of the two arc tubes when seated in a socket is very important.

[0009] A dual-arc lamp functions by cycling between the two arc tubes so that when one tube is on, the other is off. In order to make the light distribution pattern the from a dual-arc lamp more even regardless of which arc tube is on or off, the two arc tubes are manufactured so that the arc tubes are parallel, and aligned in the same plane (which can be called an "arc tube plane") within the glass envelope. After installation into the socket, the orientation of the arc tube plane within the luminaire is crucial. When a dual-arc lamp is installed in its socket, it is important that the arc tubes remain aligned where the arc tube plane is parallel to a plane of the luminaire opening for distributing light. When there is deviation from this alignment and orientation constraint, the resulting light distribution pattern will likely have undesirable directional effects or other optical aberrations (e.g. shadows) which negatively affects the overall lumen output.

[0010] Unfortunately, the adjustment of either the lamp or the lamp and socket together in combination is not easily facilitated. At present, the typical process is to manually align the dual-arc tubes by partially unseating (i.e., unscrewing) the lamp from the corresponding socket. This approach, however, can be problematic as the electrical connection between the lamp or lamp base and socket may not be properly maintained, which can create premature failures. Practitioners have not successfully addressed the problem of the rotational or axial alignment or positioning of the lamp within the luminaire housing. Furthermore, it is a significant challenge to design a mechanism for axial adjustment which will interface with and/or couple to the plethora of available support brackets. Thus, while the extended life-span of the dual-arc lamp makes it attractive from a long term maintenance perspective, the alignment and adjustment considerations have hindered widespread adoption.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The accompanying figures where like reference numerals refer to identical or functionally similar elements throughout the separate views and which together with the detailed description below are incorporated in and form part of the specification, serve to further illustrate various embodiments and to explain various principles and advantages all in accordance with the present invention.

[0012] FIG. 1 depicts, in a simplified and representative form, an anterior or frontal exploded and perspective view of a mounting assembly with a lamp and lamp socket that is adjustable in accordance with one or more embodiments;

[0013] FIG. 2 depicts, in a simplified and representative form, a posterior or rear exploded and perspective view of the FIG. 1 mounting assembly with a lamp and lamp socket that is adjustable in accordance with one or more embodiments;

[0014] FIG. 3 in shows a representative cross sectional view of the FIG. 1 mounting assembly and lamp socket as assembled in accordance with one or more embodiments;

[0015] FIG. 4 through FIG. 7 are representative diagrams of adjusting the mounting assembly of FIG. 1 so as to align a lamp in accordance with one or more embodiments;

[0016] FIG. 8 depicts, in a simplified and representative form, an anterior or frontal exploded and perspective view of a mounting assembly with a lamp socket that is adjustable in accordance with one or more alternative embodiments;

[0017] FIG. 9 depicts, in a simplified and representative form, a posterior or rear exploded and perspective view of the FIG. 8 mounting assembly with a lamp socket that is adjustable in accordance with one or more embodiments;

[0018] FIG. 10 and FIG. 11 show representative views of alternative embodiments of a bracket that is a portion of the FIG. 1 (alternatively FIG. 8) mounting assembly in accordance with one or more embodiments;

[0019] FIG. 12 and FIG. 13 depict, in a simplified and representative form, exploded and perspective views of a mounting assembly for a lamp and associated lamp socket that is adjustable both rotationally about a socket axis, and laterally in the placement of the socket

axis in accordance with one or more embodiments;

[0020] FIG. 14 is a more detailed perspective view of a socket mounting plate and a positioning bushing in accordance with one or more embodiments;

[0021] FIG. 15 and FIG. 16 are anterior perspective views of the mounting assembly of FIGS. 12 and 13, which views show adjustment of rotational position of a lamp in accordance with one or more embodiments; and

[0022] FIG. 17 and FIG. 18 are posterior perspective views of the mounting assembly of FIGS. 12 and 13, which views show adjustment of a lateral position of a lamp socket axis in accordance with one or more embodiments.

DETAILED DESCRIPTION

[0023] In overview, the present disclosure concerns mounting assemblies that are adjustable and configured to allow or provide for lamp alignment and placement, e.g., angular or rotational alignment about an axis, and lateral placement of the axis, for a lamp socket and associated lamp, or the like. More specifically various inventive techniques and apparatus for securing and adjusting or rotationally aligning or realigning lamps, and lateral placement or relocation of a lamp or lamp socket axis for lamps that are arranged and constructed for use in various environments, including severe outdoor environments, will be discussed and disclosed.

[0024] The lamps that are of particular interest may vary widely but include dual arc HID (High Intensity Discharge) lamps. Dual arc HID lamps can be subject to extreme environments, including outdoor environments, over long periods of time, which can necessitate relatively exacting adjustments relative to an associated luminaire assembly in order to operate properly. In order to obtain the relatively long life expectancies that such lamps are capable of, these adjustments must be maintained over these life expectancies without otherwise adding new, or contributing to existing, failure modes. Thus, in systems, equipment and devices that employ dual arc HID lamps for illumination of large areas (e.g., street lighting systems, parking lot lighting systems, or indoor lighting systems, where the dual arc HID lamps must be properly rotationally or angularly aligned) the present apparatus and methods can be particularly advantageously utilized, provided they are practiced in accordance with the inventive concepts and principles as taught herein.

[0025] The instant disclosure is provided to further explain in an enabling fashion the best modes, at the time of the application, of making and using various embodiments in accordance with the present invention. The disclosure is further offered to enhance an understanding and appreciation for the inventive principles and advantages thereof, rather than to limit in any manner the invention. The invention is defined solely by the appended claims, including any amendments made during the pendency of this application, and all equivalents of those claims as issued.

[0026] It is further understood that the use of relational terms, if any, such as first and second, top and bottom, and the like are used solely to distinguish one entity or action from

another without necessarily requiring or implying any actual such relationship or order between such entities or actions.

[0027] Much of the inventive functionality and many of the inventive principles are best implemented with mechanical components that may be fashioned using various fabrication technologies, e.g., metal stamping, forming, or various other metal working techniques. It is expected that one of ordinary skill—notwithstanding possibly significant effort and many design choices motivated by, for example, available time, current technology, and economic considerations—when guided by the concepts and principles disclosed herein, will be readily capable of selecting appropriate fabrication technologies and generating or otherwise providing appropriate tooling to generate such components. Therefore, in the interest of brevity and minimizing any risk of obscuring the principles and concepts according to the present invention, further discussion of fabrication of such components, if any, will be limited to the essentials with respect to the principles and concepts of the various embodiments.

[0028] Referring to FIG. 1 and FIG. 2, exploded and perspective views of a simplified and representative mounting assembly 100 for a lamp 109 and associated lamp socket 105 that is adjustable (alternatively, an adjustable lamp socket assembly) in accordance with one or more embodiments will be briefly discussed and described. Once the lamp 109 is properly seated in the lamp socket 105, the mounting assembly 100 can be utilized to advantageously orient the lamp to an angular position that provides proper rotational orientation of the arc tube plane 141 with respect to a luminaire light opening (not shown) for illumination of a target surface. FIG. 1 is an anterior or frontal view and FIG. 2 is a posterior or rear view of the mounting assembly 100. The mounting assembly of FIG. 1 and FIG. 2 includes a bracket 101 or positioning bracket and a mounting plate 103. The bracket 101 is configured (arranged and constructed) to be mechanically coupled to a generally known luminaire assembly (not shown). The mounting plate 103 is configured to mechanically couple, e.g., attach, to a lamp socket 105 and to be mechanically coupled to the bracket 101 and to selectively engage the bracket at one of a plurality or multiplicity of angular rotations or rotational positions about socket axis 126, wherein such angular rotations or rotational positions are generally depicted by arrow 107. The bracket 101 and mounting plate 103, in various exemplary embodiments, are formed via known metal stamping, cutting, or forming techniques, from, for example, 0.050" steel plate stock. Normally, after forming, these elements are plated (e.g., zinc plated or the like) to provide a corrosion resistant finish.

[0029] The lamp socket is a standard generally known lamp socket which is adapted to secure, via a threaded interface 106 (i.e., threads on the base of lamp mate with threads in the lamp socket), a lamp 109, e.g., dual arc HID lamp as shown. Note that in FIG. 1 and FIG. 2 some elements, e.g., the lamp 109 and lamp socket 105, are not necessarily to scale. Also, as is known (and generally shown at 202 in FIG. 2) the lamp socket in practice will have two electrical power leads attached to a surface, e.g., the rear or the side surface via screw and electrical terminal interfaces.

[0030] A dual arc HID lamp is a lamp with, as the name suggests and as depicted, two arc tubes 108, 110. This lamp typically has a life expectancy that is approximately double a single arc HID lamp. This additional life expectancy is due to the fact that in operation only one of the arc tubes 108, 110 will be illuminated or activated at any one time. One reason that dual arc lamps are not more broadly adopted is the fact that the two tubes must be aligned so that they are both in a plane, e.g., the arc tube plane, that is essentially parallel with the plane of what ever surface is being illuminated so that lamp 109 will provide reasonably uniform illumination, regardless of which tube is presently activated. Technicians often loosen the lamp in the lamp socket by un-screwing or un-seating the lamp 109 from the lamp socket 105 enough to rotationally position or align the lamp so that the arc tube plane is relatively parallel with the plane of the surface of illumination. This unfortunately can contribute to poor connections between the lamp 109 and the lamp socket 105, and thereby contribute to reduced life expectancy or additional maintenance costs for the luminaire assembly.

[0031] Typically the bracket 101 will be secured or attached to a mounting arrangement (not specifically shown) (e.g., one or more metal elements) that provides a mechanical interface (direct or indirect) to a luminaire assembly. Ordinarily the lamp 109 will be adjusted laterally (e.g., vertically higher or lower with respect to the reflector of the luminaire assembly, or alternatively with respect to the luminaire light opening) or longitudinally (e.g., forward or backward) along socket axis 126. For example in various embodiments, the mounting arrangement (not specifically shown) is attached to the luminaire for positioning lamp 109 in a reflector cavity so that light is reflected, focused, distributed, and emitted from a luminaire light opening (not shown).

[0032] After appropriate adjustment, the bracket 101 and mounting arrangement are secured together by tightening the screws. The mounting arrangements and reflectors are generally known but vary widely with varying luminaire assemblies as provided by different

manufacturers of such assemblies. Accordingly, it is expected that the attachment members 111 of the bracket 101 will also vary in form according to the luminaire assembly. Additionally, the luminaire opening for light or lens, which is usually opposite a reflector, can be round, oval, square, or other shape that generally has a perimeter that defines a plane of the light opening.

[0033] The mounting plate 103 in one or more embodiments is generally circular as shown with a first flange 123 and a second flange 125 and is further configured to rotate (relative to the bracket) together with the lamp socket 105 and lamp 109, about an axis 126. The mounting plate 103 in one or more embodiments, includes one or more socket tabs 115 that are configured to be coupled or attached to the lamp socket 105 using, for example, threaded screws 117 or other similar fasteners that pass through openings 119 (which can be 0.22" diameter openings with centers spaced at 1.38") in the socket tabs 115 and which are engaged or secured via threaded openings 201 (see FIG. 2) in a rear surface of the lamp socket 105. The socket tabs 115 are formed to be offset or recessed away from a front surface 121 of the mounting plate 103 and toward the lamp socket 105 by an amount that insures that the heads on the screws 117 do not extend beyond the mounting plate 103 or rear surface 203 thereof, thereby insuring that the mounting plate 103 can be mechanically coupled to the bracket 101 without any interference.

[0034] The bracket 101 further comprises a locking member 127 and the mounting plate 103 further comprises a complementary locking member 129, where the locking member 127 and complementary locking member 129 are configured to engage the mounting plate 103 and the bracket 101 at one of a multiplicity of angular rotations or positions when the bracket is disposed adjacent to the mounting plate, i.e., when the rear surface 203 is adjacent to a bracket surface 131, e.g., a front surface 131 of the bracket 101.

[0035] In some embodiments, the locking member 127 comprises a multiplicity of cavities (pockets, dimples, or the like) 133 disposed in the bracket 101 and the complementary locking member 129 further comprises one or more projecting members (bumps in the rear surface – not specifically shown) that are configured for disposal in, or in engaging contact with, one or more of the multiplicity of cavities 133 to thereby engage the mounting plate 103 and the bracket 101 to restrict or prevent the rotation of mounting plate 103 about socket axis 126 with respect to bracket 101 in order to orient the arc tube plane parallel to the luminaire light opening plane.

[0036] In other embodiments, the locking member 127 comprises a multiplicity of perforations (openings, apertures) 205 in or through the bracket 101 and the complementary locking member 129 further comprises a projecting member 207 that is configured for disposal within or through one of the multiplicity of perforations 205 to engage the mounting plate 103 and the bracket 101. It is noted that the pockets or perforations could be disposed in the mounting plate 103 with the complementary features (e.g., bumps, pins, etc.) disposed in the bracket 101. The multiplicity of perforations 205 in or through the bracket 101 in some embodiments further comprise a multiplicity of circular perforations (e.g., 0.175" diameter circular openings) in the bracket and the projecting member 207 is a pin, e.g., circular or other cross sectional shaped pin, projecting from the mounting plate or rear surface 203 of the plate and configured for disposal within any one of the multiplicity of circular perforations 205. Note that the pin may be fashioned from separate stock of appropriate dimensions and the pin body can then be brazed or riveted or press fit to the mounting plate 101. The pin also may be formed from the same sheet stock that is used for the mounting plate by cutting out an appropriately located tab and then bending this tab to project from the rear surface 203 in one or more metal stamping operations. The pin formed by stamping operations is likely to have a rectangular cross section and in this case the multiplicity of perforations 205 would not necessarily need to be circular in form, although various practicalities may suggest a circular perforation.

[0037] The multiplicity of cavities 133 or perforations 205 in the bracket 101 can be disposed in at least a portion of an arc 209 (e.g., circular arc with a 1.0" radius, with each angularly spaced at nominally 12.8 degrees from an adjacent perforation) as shown. The portion of the arc 209 generally needs to encompass a sufficient portion to account for the range of angular rotations or rotational positions that may be required in order to properly orient the arc tube plane of a dual arc lamp. In the embodiment depicted, this portion of an arc comprises a substantially full circle although other embodiments utilize substantially a half circle or slightly more than a half circle (see FIG. 8 and FIG. 9). Note that if the portion of the arc is or slightly exceeds 90 degrees, sufficient adjustment is provided to account for a worst case initial position of the arc tube plane, i.e., it is desirable to have the two tubes 108, 110 of the lamp in the arc tube plane lying where the arc tube plane is parallel to the surface to be illuminated (or parallel to the plane of the luminaire light opening) and the worst case initial position for these tubes is where the arc tube plane is perpendicular (90 degrees relative) to the desired plane.

[0038] Referring additionally to FIG. 3, which shows a representative vertical cross sectional view of the FIG. 1 and FIG. 2 mounting assembly 100 with lamp socket 105 as assembled in accordance with one or more embodiments, additional features of the mounting assembly will be discussed and described. The mounting assembly further comprises an engaging structure 301 that is configured to secure the bracket 101 and the mounting plate 103 at any of the multiplicity of angular rotations, i.e., at the rotation or position where the projecting member 207 or pin passes through one of the multiplicity of perforations 205 (see FIG. 3). The engaging structure 301 further comprises a resilient member 135 that is configured (arranged, constructed, and disposed) to bias the mounting plate 103 toward the bracket 101.

[0039] The engaging structure in various embodiments also comprises an axial body 211 (flush side shown in FIG. 1 and projecting side shown in FIG. 2) that is disposed and configured to facilitate rotational movement of the mounting plate 103 relative to the bracket 101. The axial body 211 in various embodiments is integral to the mounting plate 103 and the axial body is further configured for disposal through an opening 213 in the bracket 101. The engaging structure 301 can further comprise a spring or other resilient member, disposed about the axial body 211, where the spring is secured to the axial body with the bracket interposed between the spring and the mounting plate as shown. Other approaches for urging the mounting plate 103 toward the bracket 101 include the use of magnetic or electromagnetic structures (not specifically shown). Such structures may include a permanent magnet or electromagnetic body disposed, e.g., on a rear surface of the bracket 101 such that the mounting plate would be urged toward and held against the bracket until a rotational adjustment was indicated. As will be evident to those of ordinary skill, the electromagnetic body can obtain power from the same primary source as the HID lamp.

[0040] In the embodiment depicted, the axial body 211 is a cylindrical body with an opening along an axis 126, where the inner surface of the opening is threaded. The axial body 211 can be separately formed with the appropriate opening machined and threaded with the resultant axial body brazed, press fit, or riveted to the mounting plate 103. A screw 137 is then disposed through a washer 139 and secured to the axial body 211 with the bracket and then the spring disposed about the axial body and secured between the mounting plate and the washer and screw. Thus, as shown in FIG. 3, the mounting plate 103 is urged toward and is adjacent to the bracket 101 (rear surface 203 is adjacent to the bracket surface 131) when the locking member 127 and complementary locking member 129 are appropriately aligned, i.e.,

when the pin 207 is disposed in one of the multiplicity of perforations 205. Note, that a compressible pad with proper dimensions and durometer can be used rather than the spring, provided a material (e.g., elastomer tubing or the like) with appropriate lifetime and thermal or other environmental characteristics is selected.

[0041] Thus, as described and configured, the mounting assembly 100 (the lamp relative to the bracket) can be rotationally adjusted about socket axis 126 since the mounting plate 103 and engaging structure 301, while mechanically coupled to the bracket 101, are configured to disengage the mounting plate 103 and the bracket 101 by applying sufficient pressure to the resilient member 135 (spring) so that the projecting member (pin) 207 is no longer disposed in one of the multiplicity of perforations 205. Then, by merely rotating the mounting plate 103 (with lamp socket 105 and lamp 109) to another of the multiplicity of angular rotations, i.e., where the projecting member (pin) 207 is aligned with another perforation, and engaging the mounting plate 103 and bracket 101 at the other of the multiplicity of angular rotations by releasing the pressure on the projecting member (pin) 207, the pin is thus disposed in the other perforation (re-engage the locking member 127 and complementary locking member 129). This will be further described below with reference to FIG. 4 – FIG. 7.

[0042] In some embodiments, discussed below with reference to FIG. 8 – FIG. 9, the mounting assembly 100 can include a limiting structure that is configured to limit angular rotation of the mounting plate 103 (and lamp socket with lamp) relative to the bracket 101. For example as depicted in FIG. 8 – FIG.9, the mounting assembly can include a limiting structure that further comprises a tab 817 that is integral to the bracket 801 and a flange 813 that is integral to the mounting plate 803, where the flange and tab are disposed to mechanically interfere when the angular rotation of the mounting plate about socket axis 126 relative to the tab exceeds predetermined limits. This limit feature can be useful to avoid undue stress on the power leads 202, which are attached, e.g., to the base of the lamp socket 105, and which could be overstressed if the mounting plate 803 were rotated about the bracket 801 by an excess amount, e.g., beyond 360 or 180 degrees.

[0043] The discussions above, with reference to FIG. 1, FIG. 2, and FIG. 3, have described various embodiments of an adjustable lamp socket assembly 100 that includes a lamp socket 105 that is configured to secure a lamp 109, a mounting plate 103 that can be mechanically coupled to the lamp socket and configured to rotate with the lamp socket about a socket axis 126, and a bracket 101 that is configured to mechanically couple to a luminaire assembly and

further configured to selectively engage the mounting plate 103 at one of a multiplicity of rotational positions with respect to the bracket. The adjustable lamp socket assembly further includes means 301, disposed about the socket axis 126, for holding the mounting plate 103 and the bracket 101 at the one of the multiplicity of rotational positions.

[0044] The means for holding the mounting plate 103 and the bracket 101 can be described alternatively as comprising an annular body, e.g., the axial body 211, and a spring 135 or other resilient structure, disposed about the socket axis 126 and configured to urge the mounting plate toward the bracket, i.e., such that the mounting plate 103 and bracket 101 are disposed adjacent to one another as in FIG. 3. In various embodiments, the mounting plate 103 further comprises an integral annular body 211 disposed about the socket axis 126 and projecting from a surface (rear surface 203) of the mounting plate 103. The bracket further comprises an opening 213 arranged and configured such that the annular body 211 is disposed through the opening when the various elements or components are assembled. When assembled as in the depicted embodiment, the adjustable lamp socket assembly 100 further includes a resilient member, i.e., spring, 135 disposed over the annular body such that the bracket is interposed between the rear surface and the spring, with the spring secured via screw 137 and washer 139 to the annular body and configured to urge the mounting plate 103 toward the bracket 101.

[0045] The bracket in various embodiments further comprises a multiplicity of openings or perforations 205 disposed in a generally circular arc about the socket axis and the mounting plate further comprises a projecting member 207, pin or the like projecting from the mounting plate and configured to be disposed in one of the multiplicity of openings or perforations 205 (see FIG. 3) to secure the mounting plate 103 to the bracket 101 at any one of the multiplicity of rotational positions. As noted above, the bracket 101 further comprises one or more attachment members 111 that are configured to attach to the luminaire assembly (not shown). The bracket can also or optionally include as needed one or more strengthening bodies (folded ribs) 215, 217, 219, 221, etc. that are integral to the bracket and configured to increase rigidity or strength of the bracket. Selection of materials for the bracket with appropriate strength and rigidity characteristics may obviate any need for the folded ribs, etc.

[0046] Referring to FIG. 4 – FIG. 7, an approach for adjusting or aligning the adjustable lamp socket assembly 100 will be shown and described. Using the mounting assembly or adjustable lamp socket assembly for proper angular adjustment, i.e., to correct a rotational

alignment of the lamp that is incorrect as shown in FIG. 4, includes disengaging (FIG. 5) the mounting plate 103 and the bracket 101 by compressing the resilient member, i.e., spring, 135 and moving or sliding the mounting plate away from the bracket such that the projecting member, i.e., pin 207 is not disposed in one of the multiplicity of perforations 205 or openings, rotating (FIG. 6) the mounting plate to a new and desired position or rotational position, i.e., until the arc tube plane is properly oriented with respect to an area of illumination, and re-engaging (FIG. 7) the mounting plate and the bracket by decompressing the spring and moving or sliding the mounting plate toward the bracket such that the projecting member, i.e., pin, 207 is disposed in a different one of the multiplicity of openings or perforations 205.

[0047] Beginning with FIG. 4, it can be observed that the lamp 109 is not properly aligned, i.e., one of the arc tubes is hidden by the other arc tube. Thus when arc tube 110 is activated, much of the light output can be blocked by arc tube 108. Alternatively, when arc tube 108 is activated much of the light from this tube can be blocked by arc tube 110. When one arc tube is blocking the light output from another it is likely that a target will not be properly illuminated. For this reason or others the level or uniformity of illumination will likely be different depending on which arc tube is illuminated. It will further be observed that the mounting plate 103 is engaged or rotationally fixed to the bracket 101 since the projecting member, i.e., pin, 207 is disposed through one of the perforations and furthermore the engaging structure 301, specifically spring, is in a somewhat relaxed position with possibly some preload. While the mounting plate 103 is not generally visible one of the socket tabs 115 can be seen and this tab has been rotated from the horizontal position depicted in FIG. 1 - FIG. 3.

[0048] Thus a method of aligning (e.g., rotationally or angularly positioning) a lamp to a desired rotational position with respect to a luminaire, includes and begins with disengaging as depicted in FIG. 5, the mounting plate 103 (which is attached to lamp socket 105 with lamp 109 secured within the lamp socket) from the bracket 101 as shown by arrows 501, 503. Note that the mounting plate and the bracket are demountably coupled, e.g., as earlier described, about a common axis of rotation 126. Disengaging the mounting plate 103 and the bracket 101 in various embodiments further comprises compressing (e.g., by appropriately applying pressure) a resilient structure 135, e.g., compressing the spring (compressed as shown) and sliding or moving the mounting plate away from the bracket 101 as indicated by arrows 501 503. The sliding or movement of the mounting plate away from the bracket further comprises

sliding or otherwise moving the mounting plate away from the bracket until projecting member, i.e., pin, 207 which is mechanically coupled or integral to the mounting plate is not disposed in any of a multiplicity of perforations 205 or openings in the bracket 101.

[0049] After disengaging the mounting plate 103 and bracket 101, the method of aligning includes rotating, as reflected in FIG. 6 by arrow 601, the mounting plate 103 about the common axis 126 of rotation to a rotational position corresponding to the desired rotational position of the lamp, i.e., to another one of the multiplicity of perforations 205 or openings in the bracket 101 that corresponds to a desired rotational position of the lamp 109. Note that the arc tubes 108, 110 are both equally visible and thus equally likely to provide nearly identical illumination to a target area. Furthermore the projecting member, i.e., pin, 207 is now located near the top perforation in the bracket 101.

[0050] After properly orienting, i.e., rotating the lamp, and as reflected in FIG. 7, the method of aligning the lamp 109 comprises re-engaging the mounting plate 101 and the bracket 103. Re-engaging the mounting plate and the bracket in various embodiments comprises de-compressing the resilient structure 135, e.g., decompressing the spring, and sliding or moving the mounting plate towards the bracket (see arrows 701, 703). The moving the mounting plate towards the bracket comprises sliding or repositioning the mounting plate towards the bracket until the projecting member, i.e., pin, 207 is disposed in one of the multiplicity of openings or perforations 205 as shown. While the method of aligning or orienting a lamp has been explained in terms of the apparatus of FIG. 1 – FIG. 7, it will be evident to those or ordinary skill that other structures can be used to practice the method providing such structures include capabilities similar to the inventive concepts and principles taught herein.

[0051] Referring to FIG. 8 and FIG. 9, a simplified and representative diagram of an anterior or frontal (FIG. 8) and posterior or rear (FIG. 9) exploded and perspective view of a mounting assembly with a lamp socket 105 that is adjustable in accordance with one or more alternative embodiments will be discussed and described. FIG. 8 and FIG. 9 are, respectively, similar and analogous to FIG. 1 and FIG. 2 with much of the corresponding discussions being applicable to the mounting assembly of FIG. 8 and FIG. 9; however FIG. 8 and FIG. 9 show a bracket 801 and mounting plate 803 that include various unique features as compared to bracket 101 and mounting plate 103. For example, FIG. 8 and 9 show a mounting assembly 800 for a lamp socket 105 that is adjustable, where the mounting assembly includes a bracket

801 that is configured to be mechanically coupled to a luminaire assembly (not shown) and a mounting plate 803 that is configured to attach to the lamp socket and be mechanically coupled to the bracket and to selectively engage the bracket at one of a multiplicity of angular rotations.

[0052] The locking and complementary locking members 805, 807 are similarly configured in varying embodiments and similarly operate as described with reference to FIG. 1, to engage the mounting plate 803 and bracket 801 at any one of a multiplicity of angular rotations or rotational positions. FIG. 8 also shows the locking member comprising a multiplicity of pockets or perforations 809 and the complementary locking member comprising a projecting member (e.g., projecting pin 811) all operational as generally described with reference to FIG. 1, etc. However, the multiplicity of pockets or perforations 809 while disposed in a portion of a circular arc, are limited to a portion of an arc that is less that a full circle, e.g., in one embodiment substantially a half circle and in alternative embodiments (not shown) somewhere between a quarter (90 degrees) and substantially a half circle (180 degrees). One advantage of the embodiment of FIG. 8 and FIG. 9 arises from this limited degree of angular rotation given that electrical power leads in practice are attached to the rear or other surface of the lamp socket 105. By limiting the extent of the rotation or angular adjustment it is expected that excess wear or strain on the power leads can be avoided.

[0053] The mounting plate further comprises an integral first flange 813 and a second flange 815 that in one or more embodiments are disposed in a plane generally defined by the mounting plate. The bracket further comprises a limiting member 817 that is disposed and configured to interfere with the first flange 813, specifically at the outer portions of edges 818, and thus limit the mounting plate to rotational positions within defined limits. The limiting member 817 can be a tab that is formed and folded via metal stamping techniques so as to extend or project away from the bracket 801 and toward the mounting plate 803. In various embodiments at least a portion of the first flange 813 is formed with an outer edge having a larger radius than an outer edge of the second flange 815. With this arrangement and with the selection of proper dimensions and locations, the second flange 815 will clear the limiting member 817 during rotations of the mounting bracket about axis 819 while the first flange 813 (at least the outer portions of the edges 818 of the first flange 813) will interfere with the limiting member, i.e., tab, 817 and thus limit rotational positions about axis 819 of the mounting plate relative to the bracket to predetermined or defined limits, e.g., 180 degrees or other appropriate limitations.

[0054] In one exemplary embodiment the diameter of the first flange is 2.7" while the second flange has an outer edge with a diameter of 2.25." In this instance the location of the limiting member 217 is nominally 1.14" from the axis 819 and this member or tab is approximately 0.5" in width. In one embodiment, the number of perforations is selected as 15 and these are angularly spaced at 12.857 degrees with a first perforation center on a horizontal line through the axis. With this arrangement a lamp can be oriented within +/- 6.5 degrees of an optimum setting. If needed slight further angular adjustment of the lamp can be performed by adjusting the torque used to seat the lamp in the lamp socket.

[0055] Referring to FIG. 10 and FIG. 11, representative views of alternative embodiments of a bracket 101 that is a portion of the FIG. 1 (alternatively 801 of FIG. 8) mounting assembly in accordance with one or more embodiments, will be discussed and described. As noted above various manufacturers utilize different mechanical interfaces between a lamp assembly and the corresponding reflector or luminaire assembly. In FIG. 10, a bracket 1001 with attachment members 1003 and 1005 is depicted. This bracket may be utilized to provide an adjustable mounting assembly embodying the inventive concepts and principles similar to the bracket 101. The bracket is similar to a bracket that is compatible with a luminaire provided by manufacturer Landmark. The attachment members 1003 and 1005 differ from attachment members 111. Attachment member 1003 is formed via known metal working or stamping techniques and is generally folded from the same material as the bracket 1001 and includes one opening 1007 for securing a screw to. Attachment member 1005 is similarly formed and includes two openings 1009 and 1011 for securing screws to.

[0056] FIG. 11 depicts a rear view of another embodiment of a bracket 1101 that is similar to a bracket that may be used to interface between the mounting assembly of FIG. 1 - FIG. 11 and a luminaire or reflector assembly provided by Cooper. The bracket 1101 includes attachment members 1103, 1105. Attachment member 1103 as depicted includes a member disposed substantially in a plane and extending from a main body of the bracket as depicted. The member includes tabs 1104 that are spaced from the main body of the bracket. These tabs are suitable for disposition in a slotted opening in another mounting member (not shown). The attachment member 1105 includes extended tabs 1107 and a folded body 1109 with an opening 1109 for securing the bracket to the other mounting member of the luminaire assembly.

[0057] With reference now to FIG. 12 and FIG. 13, there is depicted, in a simplified and

representative form, exploded and perspective views of mounting assembly 1201 for a lamp 109 and associated lamp socket 105 that is adjustable both rotationally about socket axis 126 and in the lateral placement of socket axis 126 with respect to bracket 1203 in accordance with one or more embodiments. When lamp 109 is seated within lamp socket 105, mounting assembly 1201 can be used to advantageously orient arc tube plane 141 (see FIG. 1) so that it is parallel to a plane of a luminaire light opening (not shown), which is an opening through which light is directed out of the luminaire toward a target surface to be illuminated. Assembly 1201 can also be used to advantageously laterally move lamp 109, socket 105, and socket axis 126 (see FIG. 1) laterally so that, in one embodiment, lamp 109 can be moved forward into or back out of a reflector (or toward or away from the luminaire light opening). If the luminaire has a reflector, such lateral movement can be used to move lamp 109 into or out of the reflector, which can be used to focus or adjust the pattern of the light that leaves the luminaire. Additionally, assembly 1201 can be used to advantageously longitudinally move lamp 109 along socket axis 126

[0058] Mounting assembly 1201 of FIG. 12 and FIG. 13 includes bracket 1203 or positioning bracket, socket mounting plate 1205, and positioning bushing 1207, which is located between bracket 1203 and socket mounting plate 1205. Bracket 1203 is configured (arranged and constructed) to be mechanically coupled to a generally known luminaire assembly (not shown).

[0059] Mounting assembly 1201 is similar to mounting assembly 100 shown in FIGS. 1 and 2 except that in this embodiment mounting plate 103 can be configured or implemented as two parts (i.e., socket mounting plate 1205 and positioning bushing 1207), which configuration is one embodiment that permits an additional dimension of adjustment (e.g., the lateral positioning of socket axis 126, in addition to the rotational positioning of lamp socket 105 about socket axis 126).

[0060] Socket mounting plate 1205 in one or more embodiments is generally circular as shown and is configured and adapted to attach to lamp socket 105 using screws 1209 or other similar fasteners that pass through, and engage a countersunk lip in, openings 1211. Note that the heads of fasteners 1209 can be countersunk into the thickness of socket mounting plate 1205 so that the heads to do not interfere with the rotation between socket mounting plate 1205 and positioning bushing 1207 about socket axis 126. In one embodiment, openings 1211 for fasteners 1209 can be approximately 0.22" in diameter (with the countersunk portion

having a larger diameter to accommodate the head of fastener 1209), with centers spaced at approximately 1.38". Fasteners 1209 can be screws that engage threads in the back, or bracket side, of lamp socket 105.

[0061] Positioning bushing 1207 has a socket side 1213, which is closer to lamp socket 105, and a bracket side 1215, which is closer to bracket 1203. Both the socket side 1213 and the bracket side 1215 have a shaped, or contoured, or molded surface with a pattern designed for engaging a complimentary pattern on another surface of another component. For example, socket side 1213 is designed to engage bracket side 1217 of socket mounting plate 1205. And bracket side 1215 is designed to engage a socket side 1219 of bracket 1203.

[0062] In order to provide rotational positioning of arc tube plane 141 about socket axis 126, socket side 1213 of positioning bushing 1207 is configured to mechanically interface socket mounting plate 1205 with bracket 1203 by selectively engaging the socket mounting plate at one of a plurality of angular positions. The angular positions in one embodiment are spaced apart by about 10 degrees, and are repeated over an arc of about 300 degrees, or nearly an entire circle.

[0063] The angular positions can be defined by a repeating surface pattern, such as the sinusoidal ridge and trench pattern 1221 shown in FIGS. 12 and 13. In the embodiment shown, pattern 1221 includes a ridge 1223 and trough 1225 pair. Note that pattern 1221 engages a complimentary pattern 1227 on bracket side 1217 of socket mounting plate 1205, which complimentary pattern also has ridges and troughs. Pattern 1221 can be stopped, or discontinued, or changed for a portion of the repeating-pattern arc (see stop 1257) so that a user adjusting the arc tube plane 141 can know by feel to stop turning lamp socket 105 before electrical power leads 202 are twisted, or stressed, or broken. If the lamp is twisted in one direction and the user feels stop 1257, the user can twist the lamp in the other direction to finish orienting arc tube plane 141. In one embodiment, a pitch of surfaces between ridges and troughs can be 45°. In the area of stop 1257 the pitch can change to 90°, which makes a flat portion, which portion can be raised about 0.25 mm higher than the patterned ridges.

[0064] In other embodiments, pattern 1221 can have a different shape or configuration, such as, for example, triangular ridges and troughs having sharp angled peaks, and other similar patterns that can be engaged to hold arc tube plane 141 in a selected orientation while being able to disengage when a reasonable adjusting torque is applied by hand. This is the advantage of the sinusoidal pattern—socket mounting plate 1205 can be rotated about socket

axis 126 when the sinusoidal ridges and troughs smoothly disengage and slide past one another until the next adjacent pattern (or another one beyond that) engages at a desired angular position.

[0065] Note that socket mounting plate 1205 is preferably made of a resilient material that can flex or temporarily deform so that the surface having complimentary pattern 1227 can move away from pattern 1221 as the patterns disengage (i.e., as the ridges in the patterns are contacting one other, pinnacle-to-pinnacle). Such resiliency allows an applied force to rotate arc tube plane 141, and also provides a force to maintain the position of arc tube plane 141.

[0066] Socket mounting plate 1205 and positioning bushing 1207 can be held in contact with one another by a fastener, such as bolt 1229, washer 1231, and nut 1235, wherein bolt 1229 passes through hole 1237 in socket mounting plate 1205 and through hole 1239 in positioning bushing 1207. As shown in FIG. 13, nut 1235 can be countersunk 1301 (see FIG. 13) into bracket side 1215 surface of positioning bushing 1207 so that the surface can lie flat against bracket 1203. A hexagonal hole can be used at 1301 to conform to the size and shape of nut 1235.

[0067] With regard to laterally locating socket axis 126, bracket 1203 has two or more axis locating members (e.g., holes 1305, or other cavities or engaging members) for selectively engaging positioning bushing 1207 in one of a plurality of axis locations. Since lamp 109 can be located between a reflector (not shown) (or in the area of a reflector focal point) and a luminaire light opening (e.g., a lens opening, which is not shown), the lateral adjustment of socket axis 126 can be used to move lamp 109 either closer to, or further away from, either the lens or the light opening in order to locate the lamp in the luminaire in accordance with a lamp manufacturer's recommendation. The location of the lamp in the luminaire is important for focusing and distributing the light from the lamp.

[0068] Turning now to the bracket side 1215 of positioning bushing 1207, there is a complimentary axis locating member (e.g., pin 1303, or other protrusions or engaging members that compliment the axis locating member on bracket 1203) for engaging a selected axis locating member on bracket 1203 to position socket axis 126 in a selected one of a plurality of axis locations (wherein such axis locations represent a plurality of points where socket axis 126 intersects bracket 1203). In one embodiment, the axis locating member is a protrusion or a pin 1303, were in the protrusion is complementary to a plurality of axis locating members corresponding to each of the plurality of axis locations. In the embodiment

shown in FIG 13, the axis locating members are cavities, or holes 1305.

[0069] Socket 105, socket mounting plate 1205, and positioning bushing 1207 are all amounted to bracket 1203 by bolt 1229 passing through slotted opening 1241 and nut 1243, which nut is preferably a locking nut. Slotted opening 1241 allows bolt 1229 to slide laterally from one axis location to another when the axis locating members are not engaged (e.g., a pin is not a hole). The length of slotted opening 1241, together with the location of axis locating members (e.g., holes 1305), determines the extent of the lateral adjustment of socket axis 126. In a preferred embodiment, socket access 126 can be moved approximately 0.75 inches in 0.25 inch steps. This is enough movement to locate lamp 109 in the luminaire in accordance with the lamp manufacturer's instructions regarding lamp placement relative to the reflector or luminaire light opening. In many streetlights, where the luminaire is mounted horizontally over a street, this lateral movement moves lamp 109 up and down, closer to, or further away from the reflector. In alternative embodiments, slotted opening 1241 can be oriented in a horizontal direction (i.e., 90° from the angle shown), or in a direction at another angle.

[0070] Bracket 1245 is used to longitudinally adjust lamp 109 to a position along socket axis 126. Bracket 1245 connects to bracket 1203 using screws 1247 that pass through longitudinal adjustment slots 1249 in tabs 1253 where they are then threaded into holes 113. Longitudinal positions are indicated by the letters, or adjustment indexes, on the sides of tabs 1253. Tabs 1253 slide into flanges 1255 on bracket 1203 where the flanges help support and maintain the alignment of bracket 1203. Holes 1251 can be used to mount bracket 1245 to an opening that opens into a reflector cavity in a luminaire (not shown) in order to position lamp 109 properly in the reflector and properly in the luminaire light opening.

[0071] With reference now to FIG. 14, there is depicted a more detailed perspective view of socket mounting plate 1205 and positioning bushing 1207 in accordance with one or more embodiments. As described above, pattern 1221 engages with complimentary pattern 1227 in order to hold socket mounting plate 1205 and positioning bushing 1207 in a selected rotational angle with respect to each other. As these patterns engage and disengage, socket mounting plate 1205 and positioning bushing 1207 are maintained at an appropriate distance apart by rotatable contact between flange 1255 (see FIG. 12) and flange 1401 (see FIG. 14).

[0072] On the bracket side 1215 of positioning bushing 1207, complementary axis positioning members (e.g., pins 1303) are more clearly visible in FIG. 14.

[0073] With reference now to FIGS. 15 and 16, there are depicted anterior perspective views of a mounting assembly having lamp 109 installed with arc tube plane 141 at two different angles in accordance with one or more embodiments. In FIG. 15, lamp 109 may have been initially installed and snugly seated within socket 105, which is left arc tube plane 141 in an undesired position wherein light from one arc tube (e.g., arc tube 108) would shine through the other arc tube (e.g., arc tube 110) before illuminating a target. To adjust the lamp to the proper orientation, a relatively small twisting force can be applied to either lamp 109 or lamp socket 105 to reorient arc tube plane 141 to the proper position shown in FIG. 16.

[0074] Referring now to FIGS. 17 and 18, there are depicted posterior perspective views of the adjustable mounting assembly of FIGS. 12 and 13, wherein the views show lamp socket axis 126 in two different positions in accordance with one or more embodiments. In FIG. 17, lamp socket axis 126 is in a position designated "1" on a pair of holes 1305 (e.g., axis locating members for lateral position number 1). Pins 1303 on the bracket side 1215 of positioning bushing 1207 are disposed in holes 1305 that are marked with "1." In FIG. 18, lamp socket axis 126 is in a position designated "4," and pins 1303 are disposed in holes 1305 that are marked with "4."

[0075] The mounting assemblies, mounting systems and methods, discussed above, and the inventive principles thereof are intended to and can alleviate various problems associated with the deployment of a luminaire that are inherent in prior art techniques. This is particularly so for a luminaire that utilizes a dual arc HID lamp or the like, where angular or rotational positioning is important for proper illumination. By providing a bracket that is suitable for mounting to a luminaire assembly and a separate mounting plate that is rotationally adjustable with respect to the bracket and thus luminaire, a lamp can be appropriately adjusted without running the risk of a lower quality, higher maintenance electrical connection between the lamp and the lamp socket that may result when the lamp is backed out of the lamp socket. Thus it is expected that the convenient methods of adjusting the angular position of a dual arc HID lamp or the like as discussed and described herein will result in broader acceptance of such lamps as well as higher quality installations of these lamps with lower failure rates and more uniform illumination characteristics. These improvements should result in longer life expectancy and lower maintenance costs (lower overall costs) for many illumination systems.

[0076] This disclosure is intended to explain how to fashion and use various embodiments in accordance with the invention rather than to limit the true, intended, and fair scope and

spirit thereof. The foregoing description is not intended to be exhaustive or to limit the invention to the precise form disclosed. Modifications or variations are possible in light of the above teachings. The embodiment(s) was chosen and described to provide the best illustration of the principles of the invention and its practical application, and to enable one of ordinary skill in the art to utilize the invention in various embodiments and with various modifications as are suited to the particular use contemplated. All such modifications and variations are within the scope of the invention as determined by the appended claims, as may be amended during the pendency of this application for patent, and all equivalents thereof, when interpreted in accordance with the breadth to which they are fairly, legally, and equitably entitled.

CLAIMS

What is claimed is:

1. An adjustable mounting assembly for a lamp socket, the mounting assembly comprising:

a bracket configured to be mechanically coupled to a luminaire assembly; and

a mounting plate configured to attach to the lamp socket and be mechanically coupled to the bracket and to selectively engage the bracket at one of a plurality of angular positions relative to a lamp socket axis, and at one of a plurality of axis locations relative to the bracket.

2. The adjustable mounting assembly of claim 1 where the mounting plate further comprises:

a socket mounting plate configured to attach to the lamp socket; and

a positioning bushing, wherein the positioning bushing is configured to mechanically interface the socket mounting plate with the bracket by selectively engaging the socket mounting plate at one of the plurality of angular positions, and selectively engaging the bracket at one of the plurality of axis locations.

3. The adjustable mounting assembly of claim 2 wherein the socket mounting plate further comprises a first angular locking member, wherein the positioning bushing has a second angular locking member on a socket side of the positioning bushing, wherein the first and second angular locking members are configured to engage one another to position the socket mounting plate in one of the plurality of angular positions with respect to the positioning bushing.

4. The adjustable mounting assembly of claim **2** wherein the bracket further comprises two or more axis locating members, wherein the positioning bushing has a complimentary axis locating member on a bracket side of the positioning bushing, wherein the complimentary axis locating member is configured to engage a selected one of the axis locating members to position the lamp socket axis in one of the plurality of axis locations.

5. The adjustable mounting assembly of claim **3** wherein the first angular locking member comprises a first shaped surface having a pattern in one or more of the plurality of angular positions, and wherein the socket side of the positioning bushing has a second shaped surface that is complementary to the first shaped surface for engaging the first shaped surface in one of the plurality of angular positions with respect to the positioning bushing.

6 The adjustable mounting assembly of claim **5** wherein the first shaped surface has a first ridge and trough pattern wherein a ridge and a trough extend along radii from the socket axis corresponding to one or more of the plurality of angular positions, and wherein the second shaped surface has a second ridge and trough pattern that is complementary to the first ridge and trough pattern for engaging the first ridge and trough pattern in one of the plurality of angular positions.

7 The adjustable mounting assembly of claim **6** wherein the first shaped surface has a first sinusoidal ridge and trough pattern, and wherein the second shaped surface has a second sinusoidal ridge and trough pattern that is complementary to the first ridge and trough pattern for engaging the first ridge and trough pattern in one of the plurality of angular positions.

8. The adjustable mounting assembly of claim **4** wherein the two or more axis locating members comprise cavities corresponding to each of the plurality of axis locations, and wherein the complimentary axis locating member comprises a projecting member that is complementary to the cavities for engaging a selected cavity corresponding to one of the plurality of axis locations.

9. The adjustable mounting assembly of claim **8** wherein the cavities comprise a plurality of holes, each corresponding to one of the plurality of axis locations, and wherein the projecting member comprises a pin configured for disposal in a selected one of the holes to engage the positioning bushing and the bracket to locate the lamp socket axis in one of the plurality of axis locations.

10. The adjustable mounting assembly of claim **9** wherein the pin comprises two pins in a pin pattern on the bracket side of the positioning bushing, and wherein the plurality of holes comprises a plurality of pairs of holes, each in a pattern complimentary to the pin pattern.

11. The adjustable mounting assembly of claim **2** further comprising:

a slot in the bracket;

a fastener located in the slot and along the lamp socket axis, wherein the fastener is for coupling the socket mounting plate to the positioning bushing at one of the plurality of angular positions, and for coupling the positioning bushing to the bracket at one of the plurality of axis locations, wherein the slot is configured to allow the fastener to slide in the slot from any one of the plurality of axis locations to any other one of the plurality of axis locations.

12. A bushing in a mounting assembly for positioning a lamp in a luminaire comprising:

a first surface configuration on a first side of the bushing for rotationally engaging a first mounting device in one of a plurality of angular positions; and

a second surface configuration on a second side of the bushing for engaging a second mounting device in one of a plurality of axis locations on the second mounting device.

13. The bushing according to claim **12** wherein the first mounting device is a socket mounting plate adapted for mounting to a lamp socket.

14. The bushing according to claim **12** wherein the second mounting device is a bracket in the luminaire for carrying the lamp socket.

15. The bushing according to claim **12** wherein the first surface configuration is a ridge and trough configuration for engaging a complimentary ridge and trough configuration on a surface of the first mounting device.

16. The bushing according to claim **12** wherein the second surface configuration is a protruding member for engaging a complimentary member on a surface of the second mounting device.

17. The bushing according to claim **16** wherein the protruding member is a pin.

18. An adjustable lamp socket assembly comprising:

a lamp socket configured to secure a lamp, where in the lamp socket has a lamp socket axis;

a bracket configured to mechanically couple to a luminaire assembly; and

a mounting assembly coupled to the lamp socket and configured to laterally locate the lamp socket axis and selectively engage the bracket at one of a plurality of axis locations.

19. The adjustable lamp socket assembly according to claim 18 wherein the bracket comprises a plurality of axis locating members, and wherein the mounting assembly comprises a complementary axis locating member for engaging a selected one of the plurality of axis locating members.

20. The adjustable lamp socket assembly according to claim 19 wherein the plurality of axis locating members comprise cavities, and wherein the complementary axis locating member comprises a projection.

21. The adjustable lamp socket assembly according to claim 20 wherein the cavities comprise holes, and wherein the projection comprises a pin configured for disposal in a selected one of the holes.

AMENDED CLAIMS
received by the International Bureau on 03 January 2007 (03.01.2007)
+ STATEMENT

1. An adjustable mounting assembly for a lamp socket, the mounting assembly comprising:

a bracket configured to be mechanically coupled to a luminaire assembly; and

a mounting plate configured to attach to the lamp socket and be mechanically coupled to the bracket and to selectively engage the bracket at one of a plurality of angular positions relative to a lamp socket axis that is generally perpendicular to and passes through a rear surface of the lamp socket, and at one of a plurality of axis locations relative to the bracket.

2. The adjustable mounting assembly of claim 1 where the mounting plate further comprises:

a socket mounting plate configured to attach to the lamp socket; and

a positioning bushing, wherein the positioning bushing is configured to mechanically interface the socket mounting plate with the bracket by selectively engaging the socket mounting plate at one of the plurality of angular positions, and selectively engaging the bracket at one of the plurality of axis locations.

3. The adjustable mounting assembly of claim 2 wherein the socket mounting plate further comprises a first angular locking member, wherein the positioning bushing has a second angular locking member on a socket side of the positioning bushing, wherein the first and second angular locking members are configured to engage one another to position the socket mounting plate in one of the plurality of angular positions with respect to the positioning bushing.

4. The adjustable mounting assembly of claim **2** wherein the bracket further comprises two or more axis locating members, wherein the positioning bushing has a complimentary axis locating member on a bracket side of the positioning bushing, wherein the complimentary axis locating member is configured to engage a selected one of the axis locating members to position the lamp socket axis in one of the plurality of axis locations.

5. The adjustable mounting assembly of claim **3** wherein the first angular locking member comprises a first shaped surface having a pattern in one or more of the plurality of angular positions, and wherein the socket side of the positioning bushing has a second shaped surface that is complementary to the first shaped surface for engaging the first shaped surface in one of the plurality of angular positions with respect to the positioning bushing.

6. The adjustable mounting assembly of claim **5** wherein the first shaped surface has a first ridge and trough pattern wherein a ridge and a trough extend along radii from the socket axis corresponding to one or more of the plurality of angular positions, and wherein the second shaped surface has a second ridge and trough pattern that is complementary to the first ridge and trough pattern for engaging the first ridge and trough pattern in one of the plurality of angular positions.

7. The adjustable mounting assembly of claim **6** wherein the first shaped surface has a first sinusoidal ridge and trough pattern, and wherein the second shaped surface has a second sinusoidal ridge and trough pattern that is complementary to the first ridge and trough pattern for engaging the first ridge and trough pattern in one of the plurality of angular positions.

8. The adjustable mounting assembly of claim **4** wherein the two or more axis locating members comprise cavities corresponding to each of the plurality of axis locations, and wherein the complimentary axis locating member comprises a projecting member that is complementary to the cavities for engaging a selected cavity corresponding to one of the plurality of axis locations.

9. The adjustable mounting assembly of claim 8 wherein the cavities comprise a plurality of holes, each corresponding to one of the plurality of axis locations, and wherein the projecting member comprises a pin configured for disposal in a selected one of the holes to engage the positioning bushing and the bracket to locate the lamp socket axis in one of the plurality of axis locations.

10. The adjustable mounting assembly of claim 9 wherein the pin comprises two pins in a pin pattern on the bracket side of the positioning bushing, and wherein the plurality of holes comprises a plurality of pairs of holes, each in a pattern complimentary to the pin pattern.

11. The adjustable mounting assembly of claim 2 further comprising:

a slot in the bracket;

a fastener located in the slot and along the lamp socket axis, wherein the fastener is for coupling the socket mounting plate to the positioning bushing at one of the plurality of angular positions, and for coupling the positioning bushing to the bracket at one of the plurality of axis locations, wherein the slot is configured to allow the fastener to slide in the slot from any one of the plurality of axis locations to any other one of the plurality of axis locations.

12. A bushing in a mounting assembly for positioning a lamp in a luminaire comprising:

a first surface configuration on a first side of the bushing for rotationally engaging a first mounting device in one of a plurality of angular positions; and

a second surface configuration on a second side of the bushing for engaging a second mounting device in one of a plurality of axis locations on the second mounting device.

13. The bushing according to claim **12** wherein the first mounting device is a socket mounting plate adapted for mounting to a lamp socket.

14. The bushing according to claim **12** wherein the second mounting device is a bracket in the luminaire for carrying the lamp socket.

15. The bushing according to claim **12** wherein the first surface configuration is a ridge and trough configuration for engaging a complimentary ridge and trough configuration on a surface of the first mounting device.

16. The bushing according to claim **12** wherein the second surface configuration is a protruding member for engaging a complimentary member on a surface of the second mounting device.

17. The bushing according to claim **16** wherein the protruding member is a pin.

18. An adjustable lamp socket assembly comprising:

a lamp socket configured to secure a lamp, where in the lamp socket has a lamp socket axis that is generally perpendicular to and passes through a rear surface of the lamp socket;

a bracket configured to mechanically couple to a luminaire assembly; and

a mounting assembly coupled to the lamp socket and configured to laterally locate the lamp socket axis and selectively engage the bracket at one of a plurality of axis locations.

19. The adjustable lamp socket assembly according to claim 18 wherein the bracket comprises a plurality of axis locating members, and wherein the mounting assembly comprises a complementary axis locating member for engaging a selected one of the plurality of axis locating members.

20. The adjustable lamp socket assembly according to claim 19 wherein the plurality of axis locating members comprise cavities, and wherein the complementary axis locating member comprises a projection.

21. The adjustable lamp socket assembly according to claim 20 wherein the cavities comprise holes, and wherein the projection comprises a pin configured for disposal in a selected one of the holes.

Statement under Article 19(1) of the Patent Cooperation Treaty

Dear Sir:

This is in response to the International Search Report dated November 17, 2006.

Independent claims 1 and 18 have been amended in a simultaneous submission under Article 19 of the PCT, to further define in varying scope the claimed mounting plate's angular rotation about an axis that passes through a rear surface of the lamp socket all as claimed. Support for the amendments is found throughout the various figures as well as specification, e.g., paragraph 33. Thus the specification and figures will not be impacted by these amendments. The references (D1, D2, etc) cited in the November 17, 2006 Written Opinion, do not fairly show or suggest angular rotation or position about such an axis and thus the Applicant respectfully submits that all claims are now novel in accordance with Article 33(2) of the PCT and furthermore now include an inventive step in accordance with Article 33(3) of the PCT. The objections to the specification that have been noted are readily correctable at the National phase.

Respectfully submitted,

GOWLING LAFLEUR HENDERSON LLP

Agents for Applicant
Kent Ledwell
Direct Dial (613) 786-8670
MKL:sl

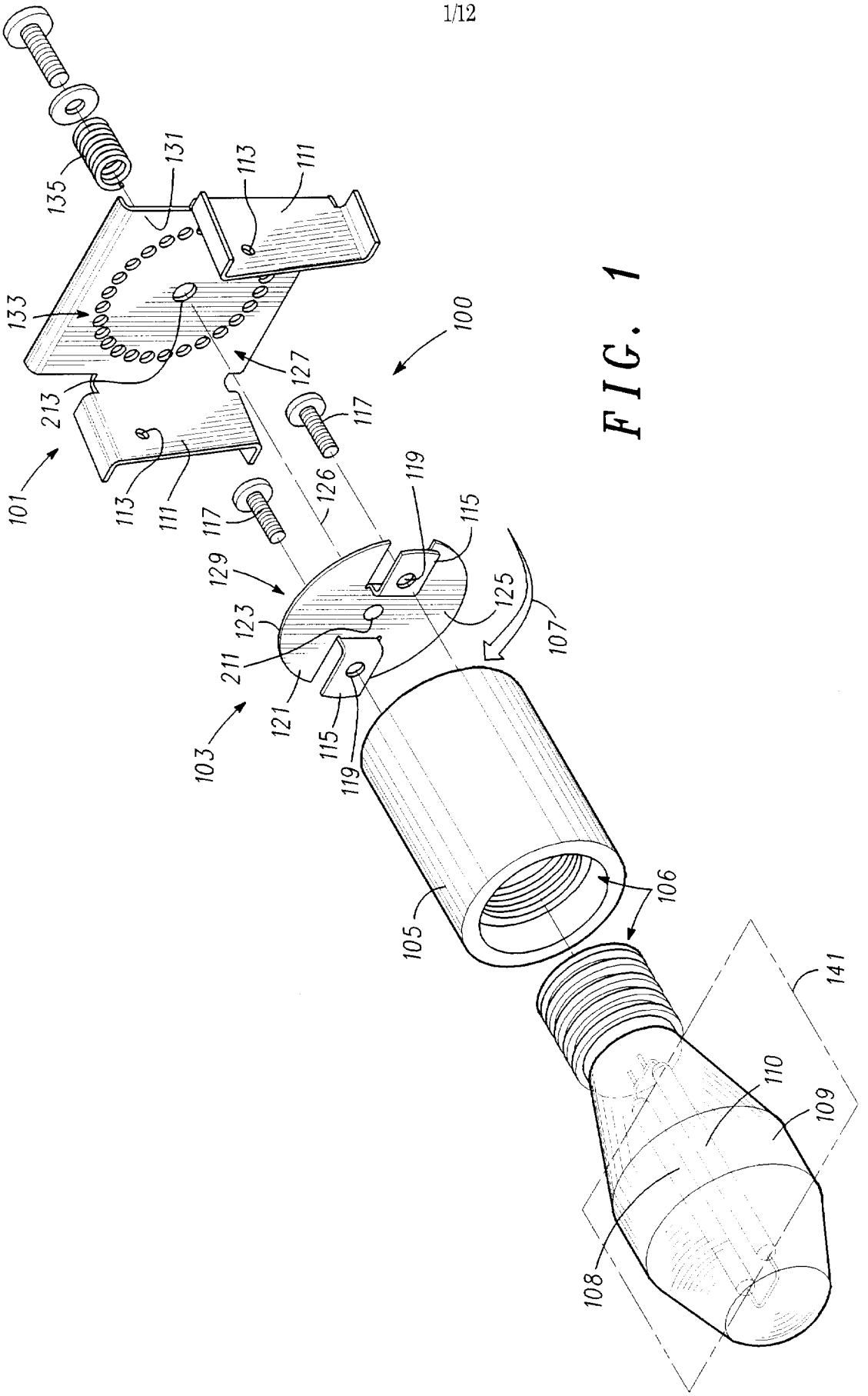

135
131
113
111
133
100
127
213
117
101
113
111
117
126
119
115
129
123
125
107
211
121
115
119
103
106
105
141
110
109
108

FIG. 1

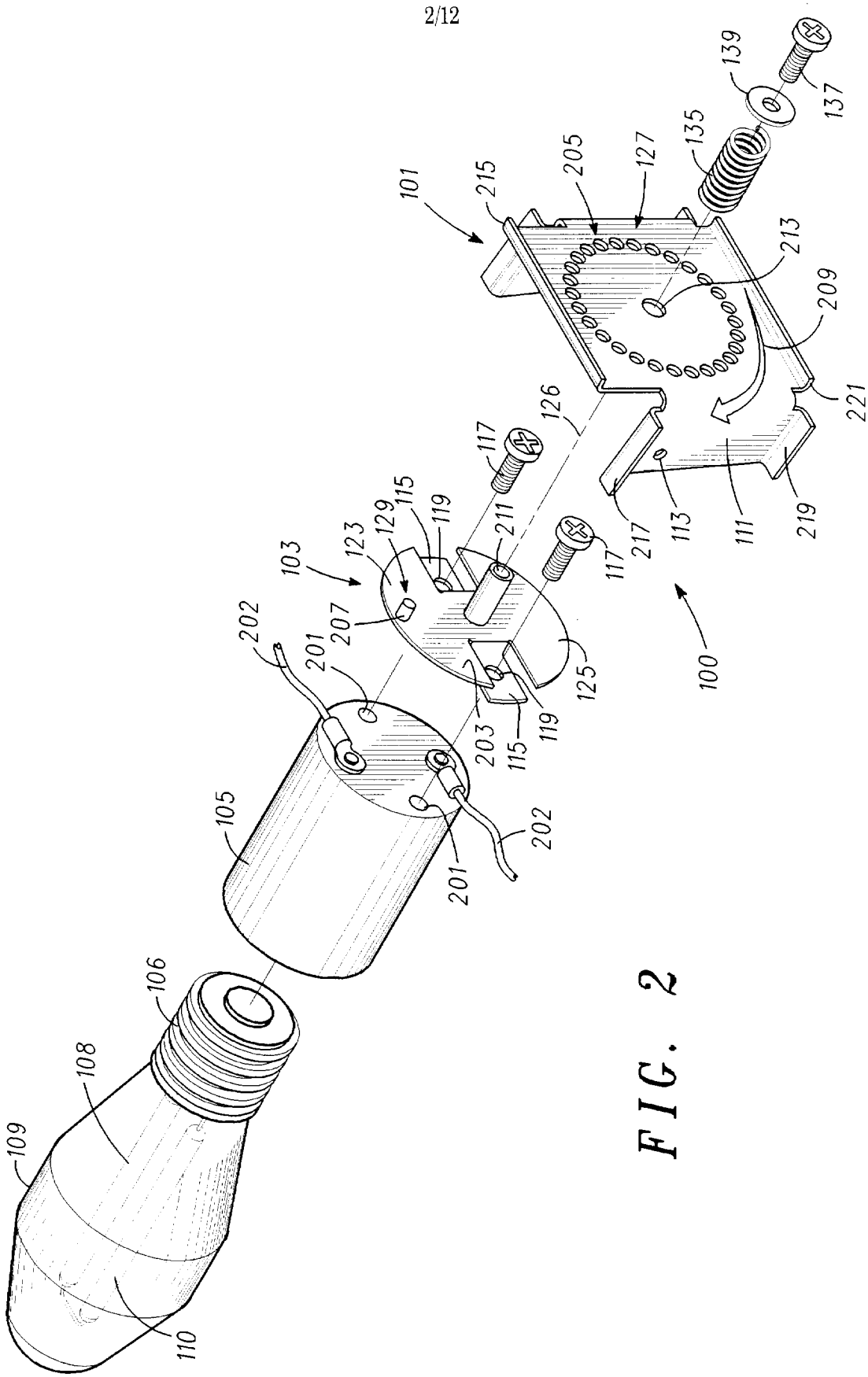

139
137
135
127
205
215
101
213
209
221
126
117
211
115
119
129
123
103
207
202
201
125
203
100
217
113
111
219
105
106
108
109
110

FIG. 2

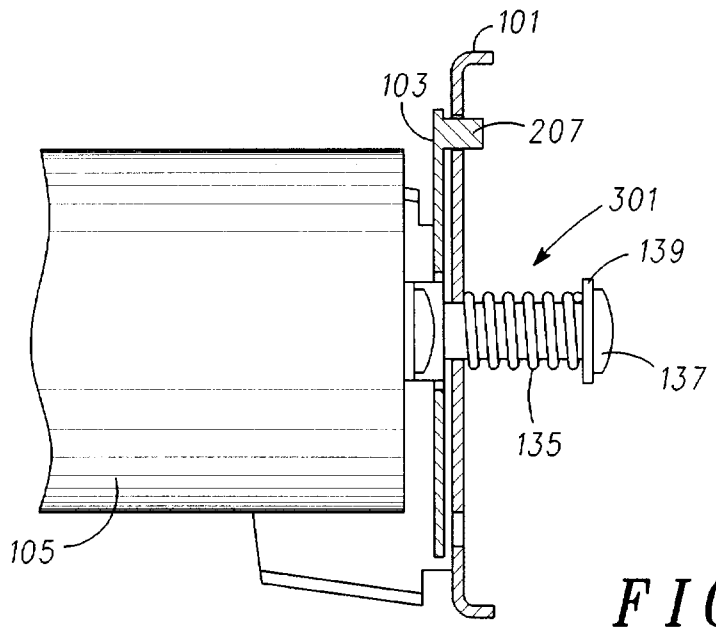

101
103
207
301
139
137
135
105

FIG. 3

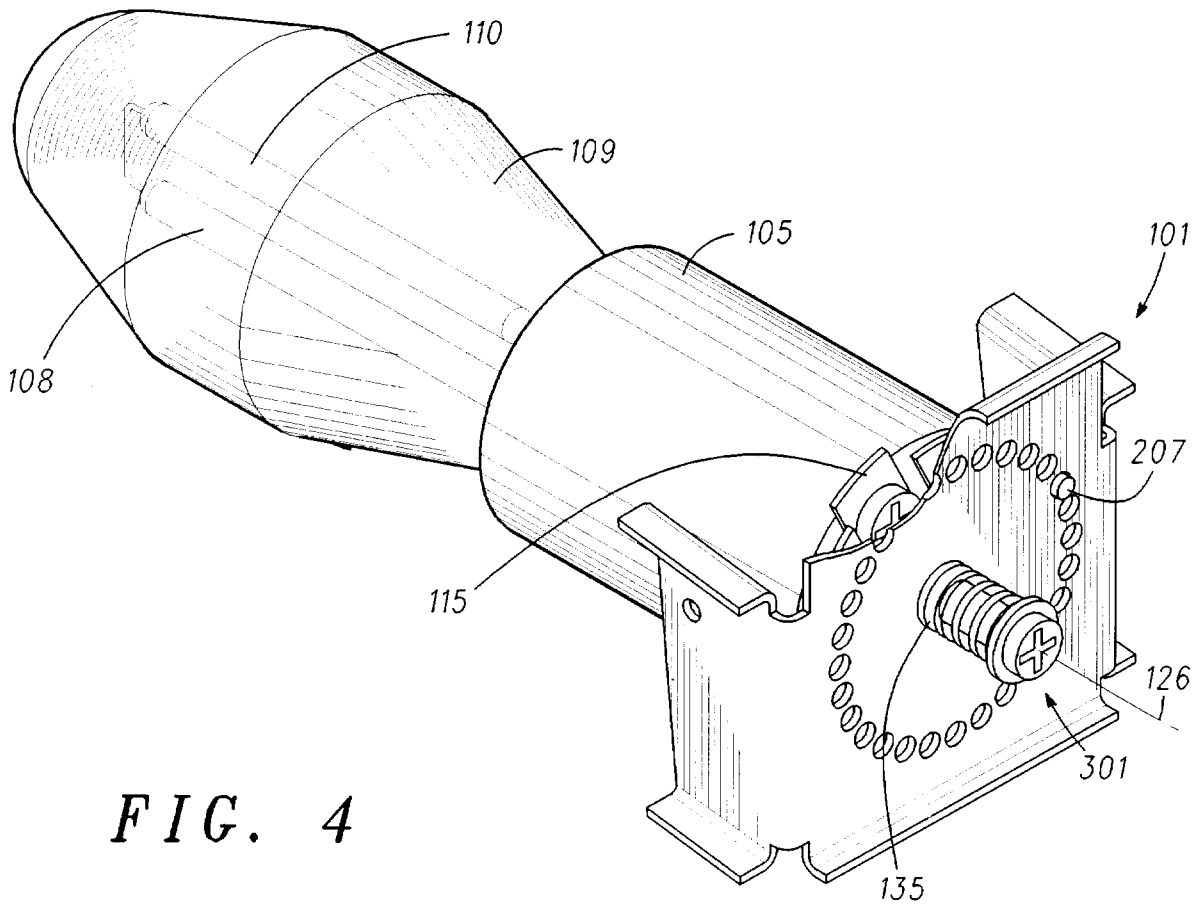

110
109
105
101
108
207
115
126
301
135

FIG. 4

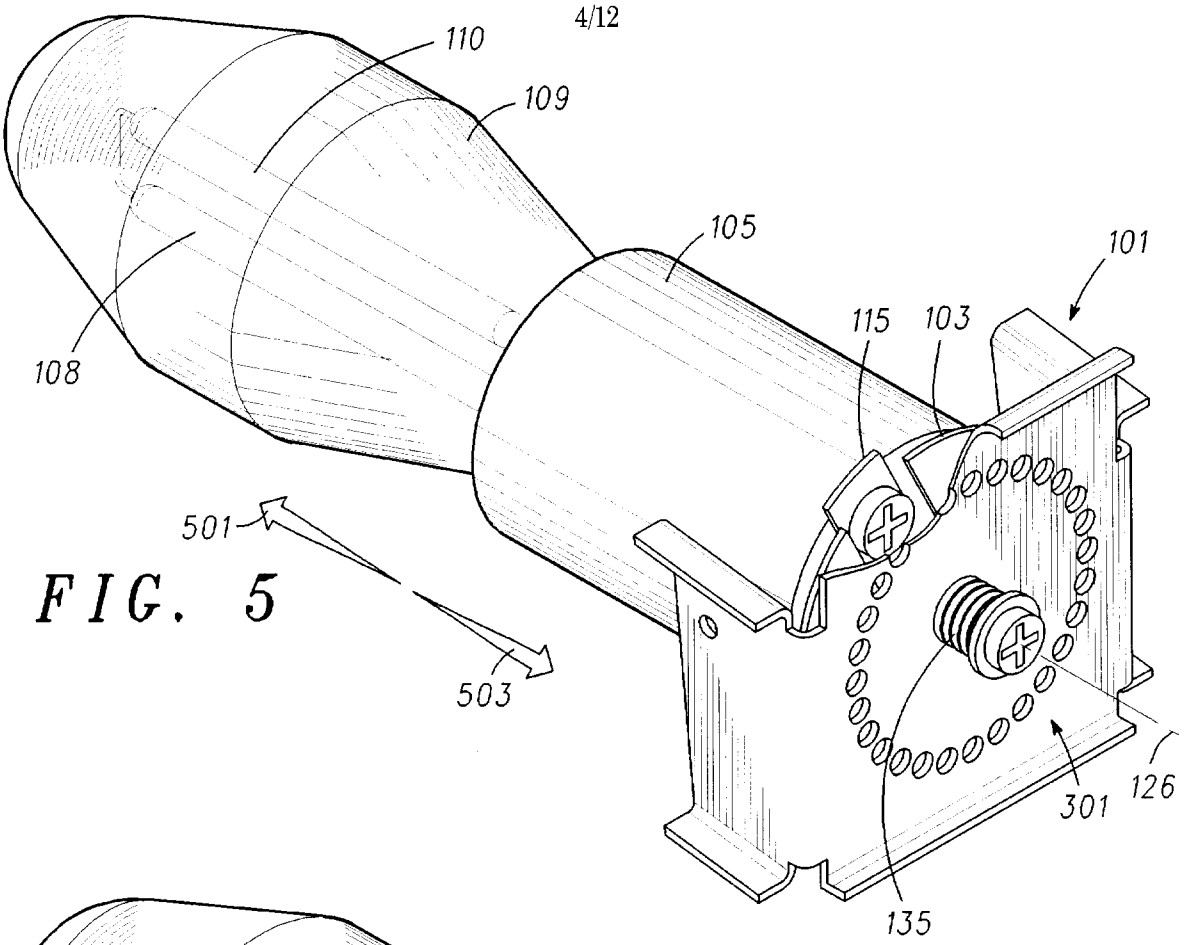

110
109
105
101
108
115
103
501
503
301
126
135

FIG. 5

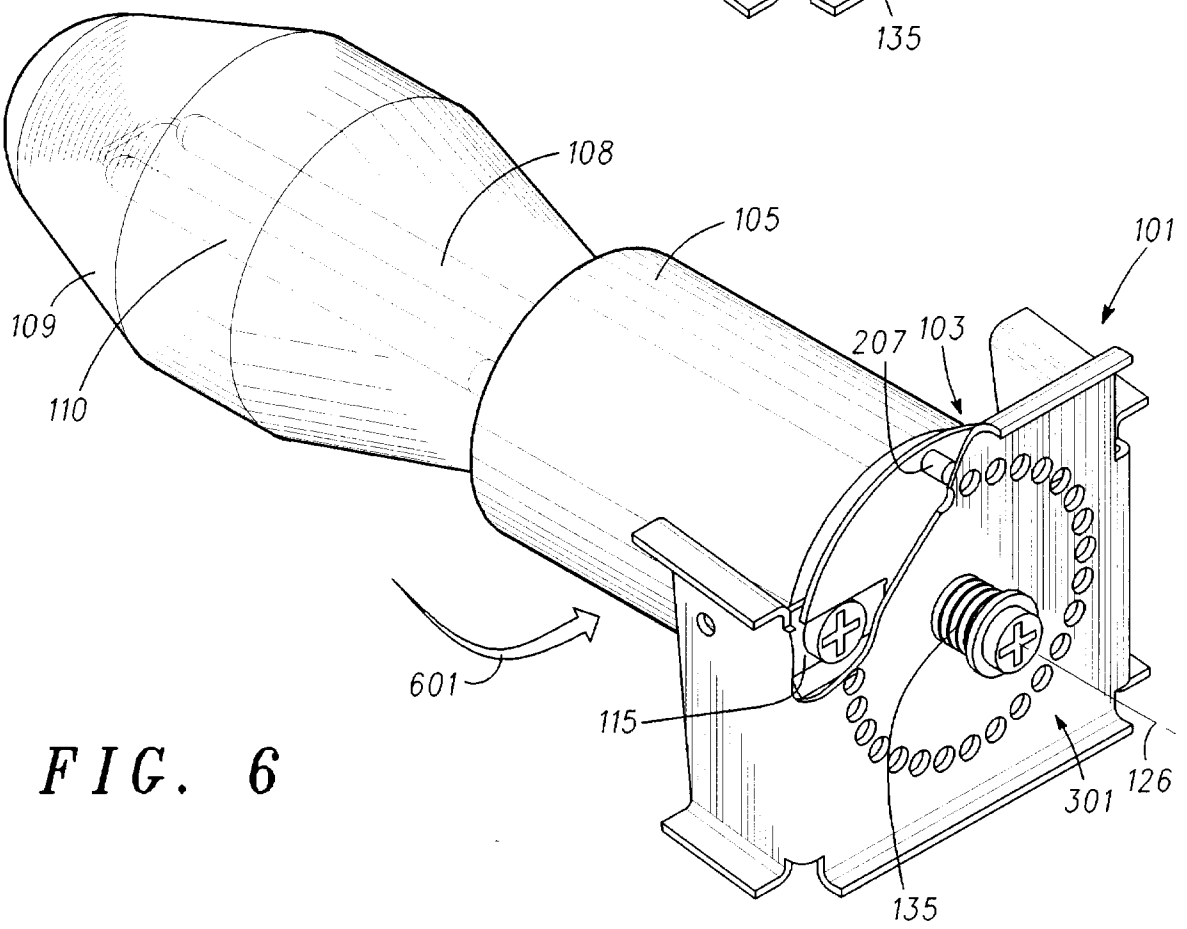

108
105
101
109
110
207
103
601
115
301
126
135

FIG. 6

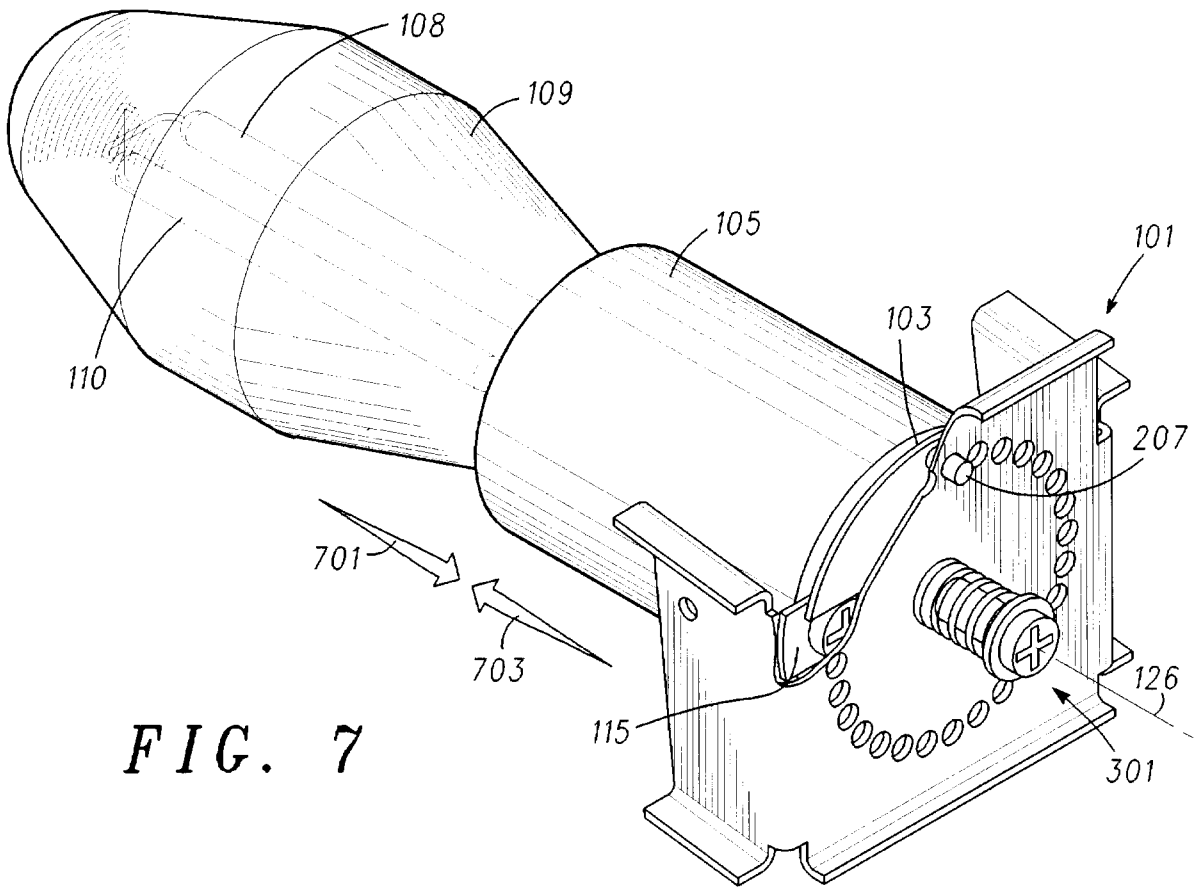

108
109
105
101
103
110
207
701
703
115
126
301

FIG. 7

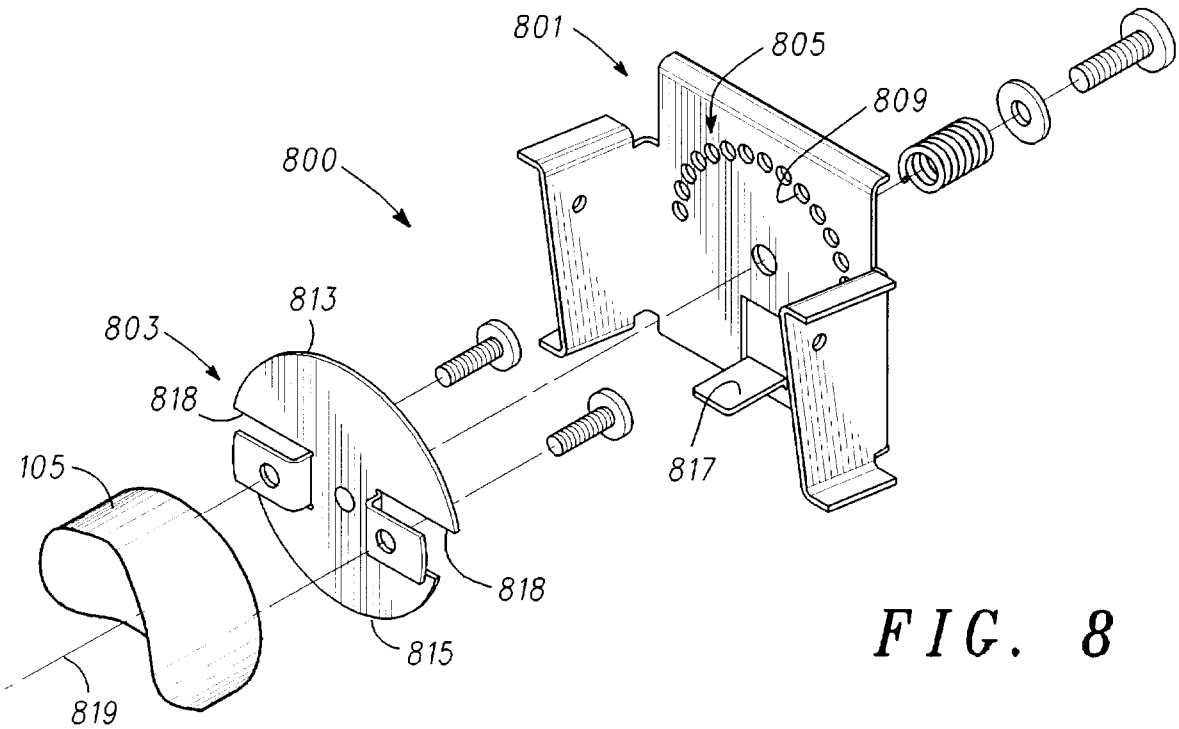

801
805
809
800
813
803
818
105
817
818
815
819

FIG. 8

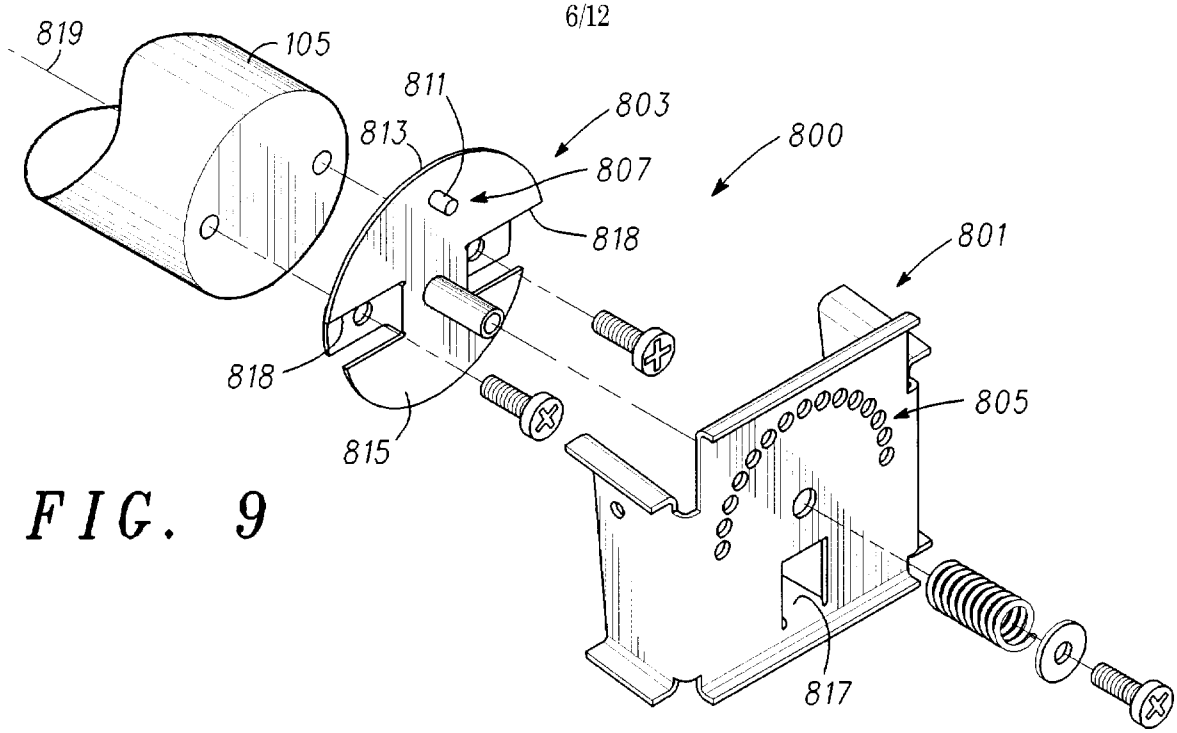

819
105
811
803
813
800
807
818
801
818
805
815
817

FIG. 9

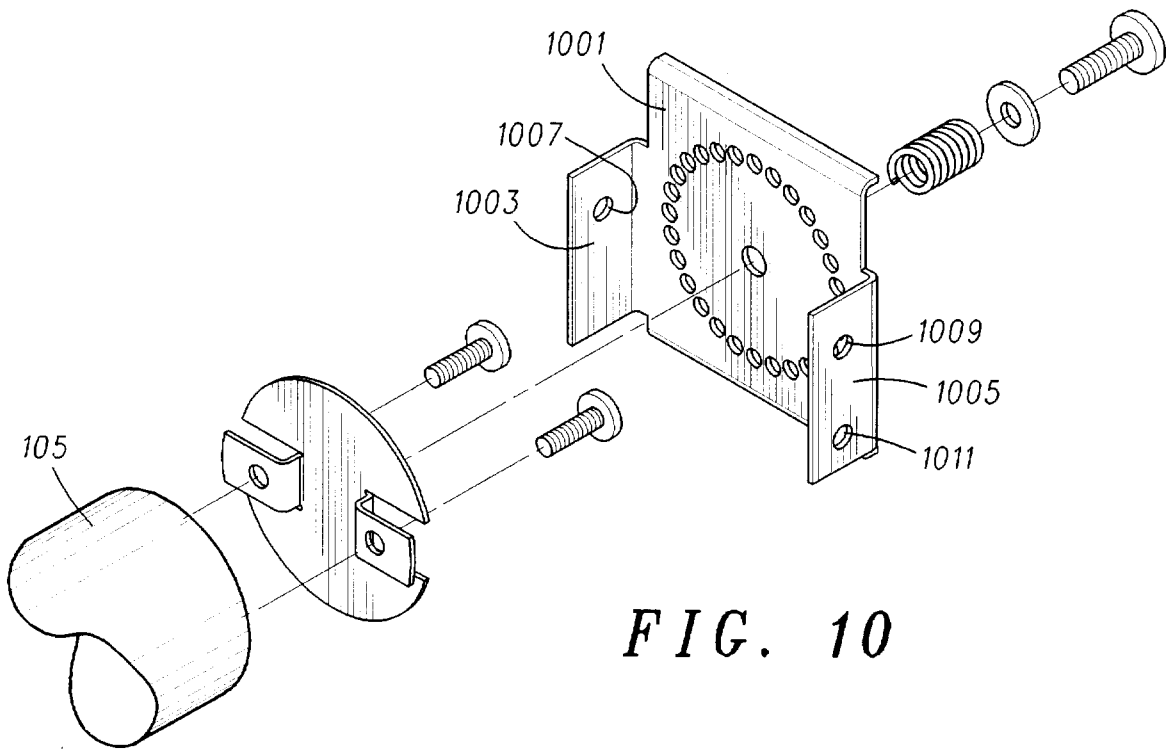

1001
1007
1003
1009
1005
105
1011

FIG. 10

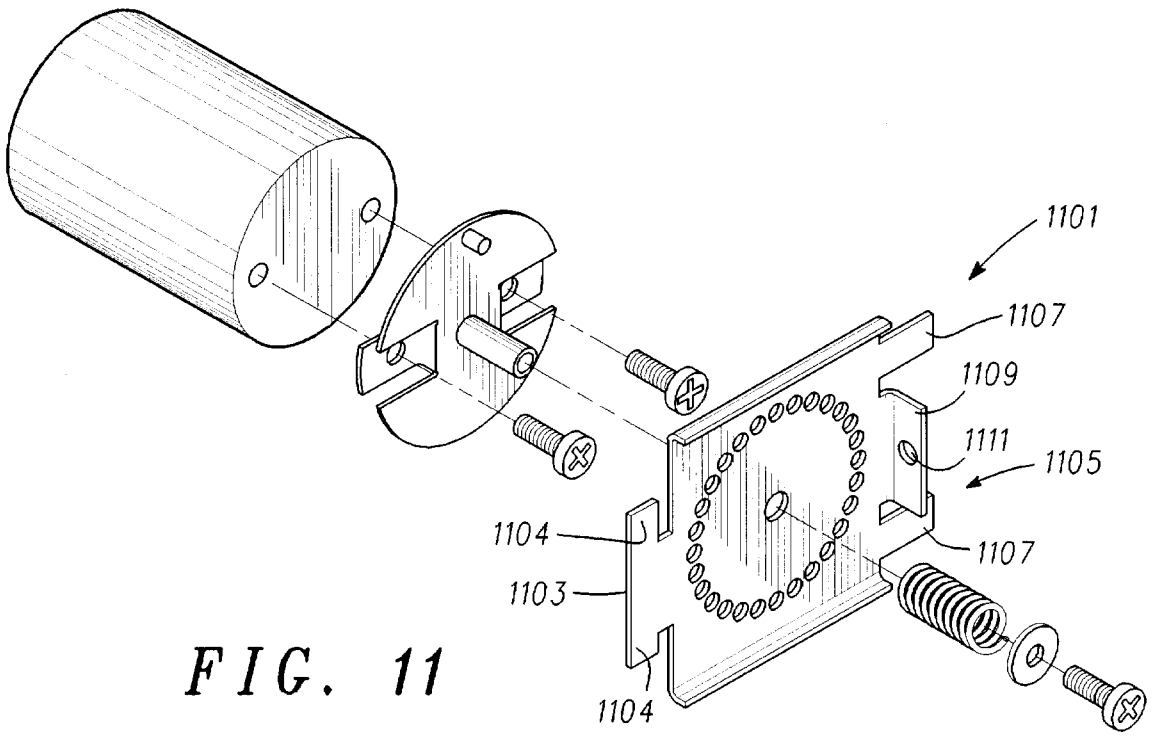


FIG. 11

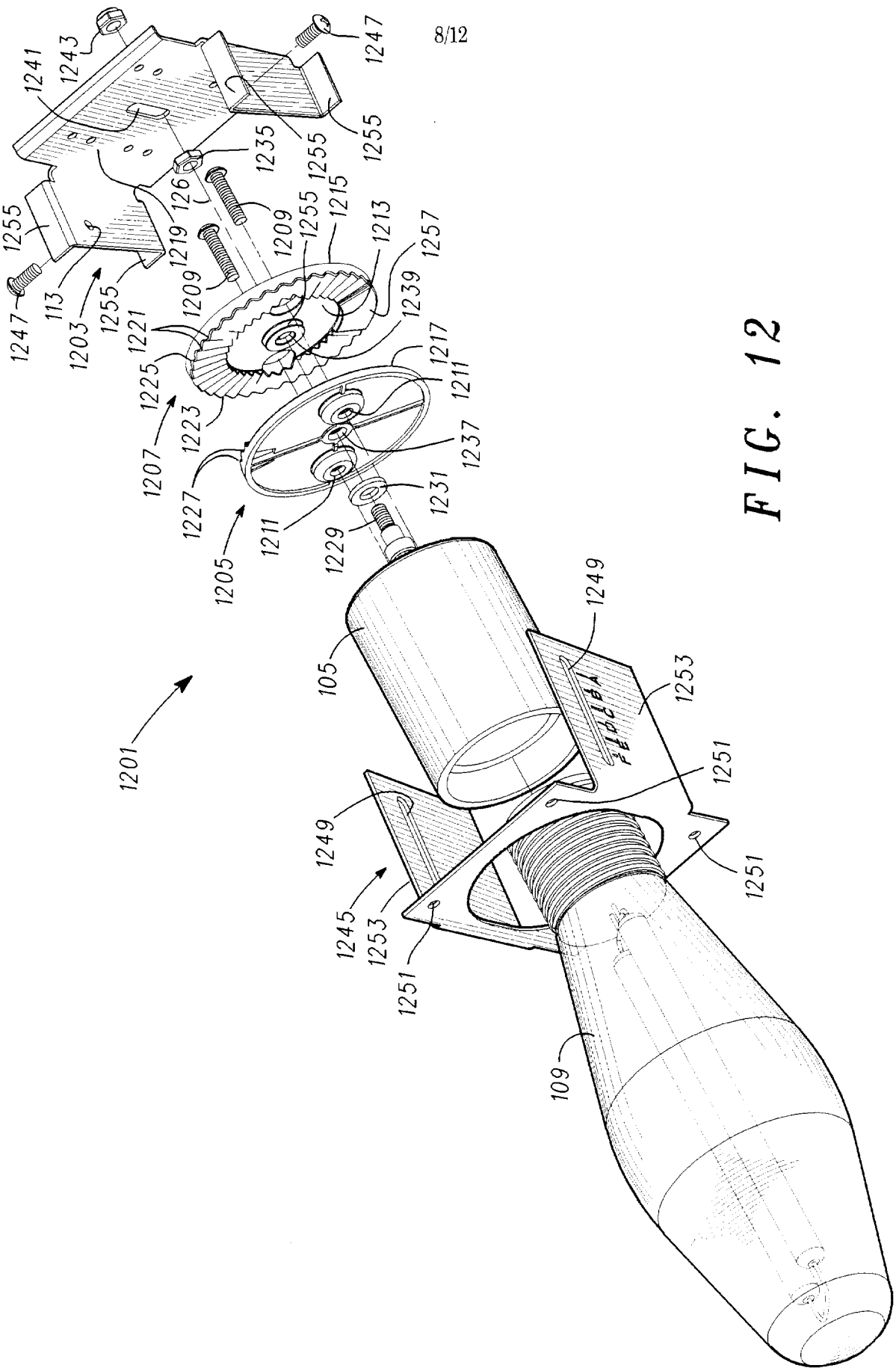

1241
1243
1247
1255
1235
1255
1255
1215
1213
1257
1239
1217
1211
1237
1231
1229
1211
1205
1227
1207
1223
1225
1221
1203
113
1255
1219
126
1209
1209
1255
1247
1201
105
1249
1253
1251
1249
1245
1253
1251
1251
109

FIG. 12

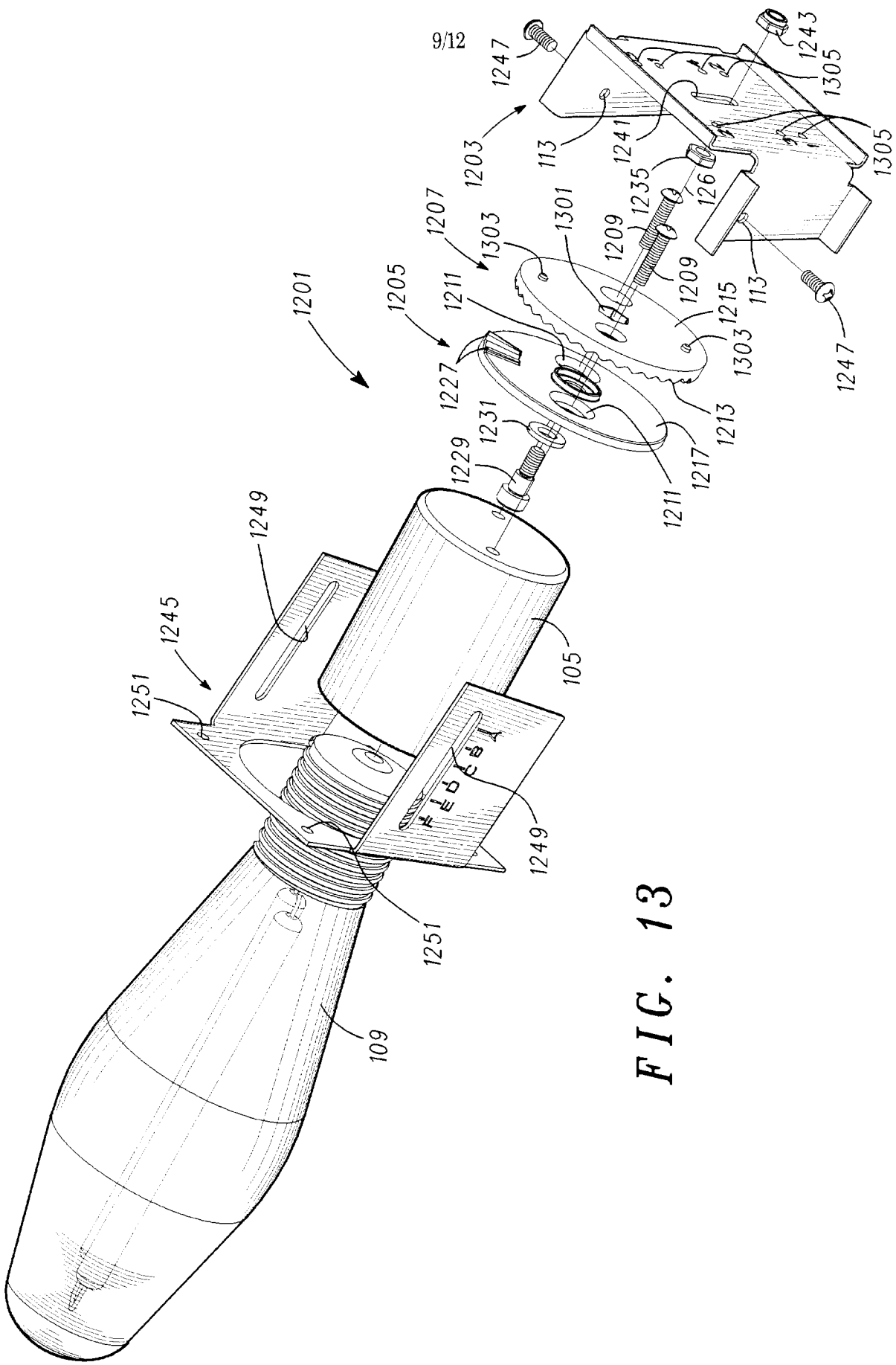

1201
1203
1205
1207
1209
1211
1213
1215
1217
1227
1229
1231
1235
1241
1243
1245
1247
1249
1251
1301
1303
1305
105
109
113
126

FIG. 13

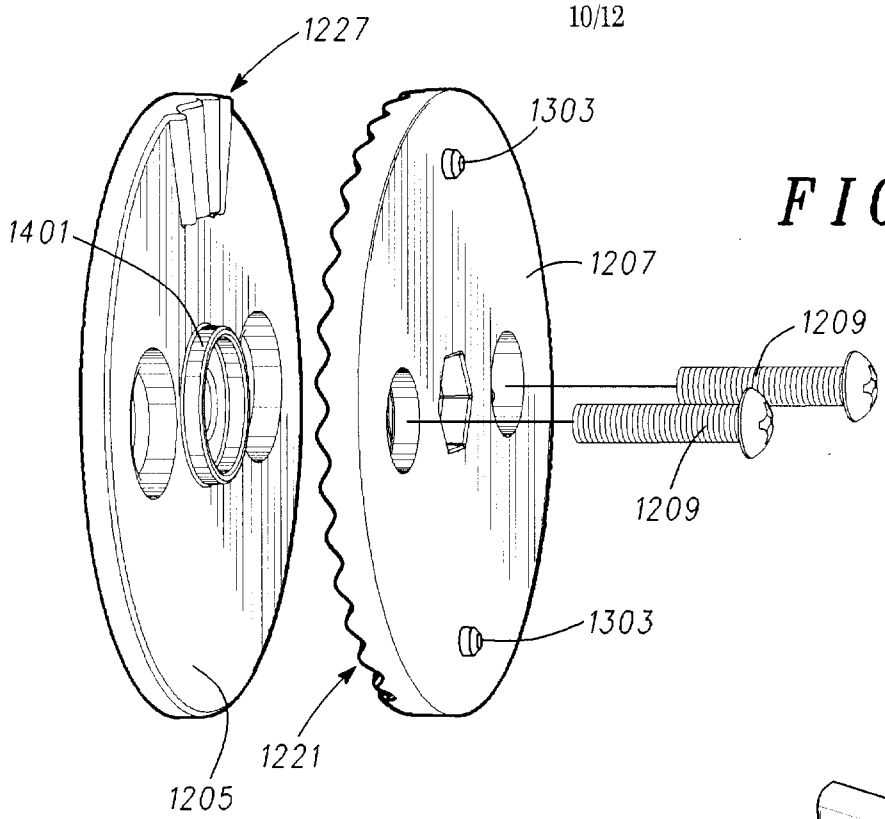

1227
1303
1401
1207
1209
1209
1303
1221
1205

FIG. 14

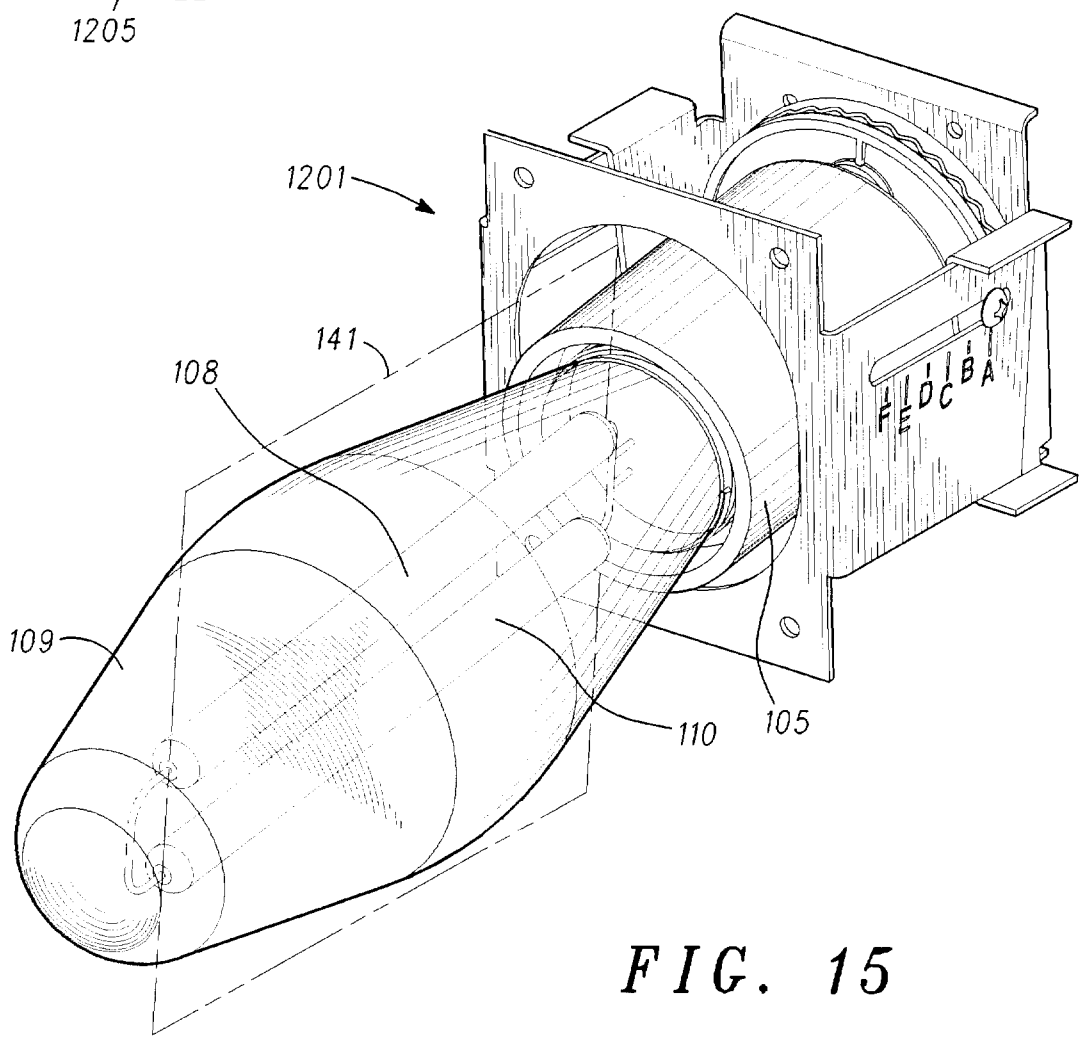

1201
141
108
109
110
105
A
B
C
D
E
F

FIG. 15

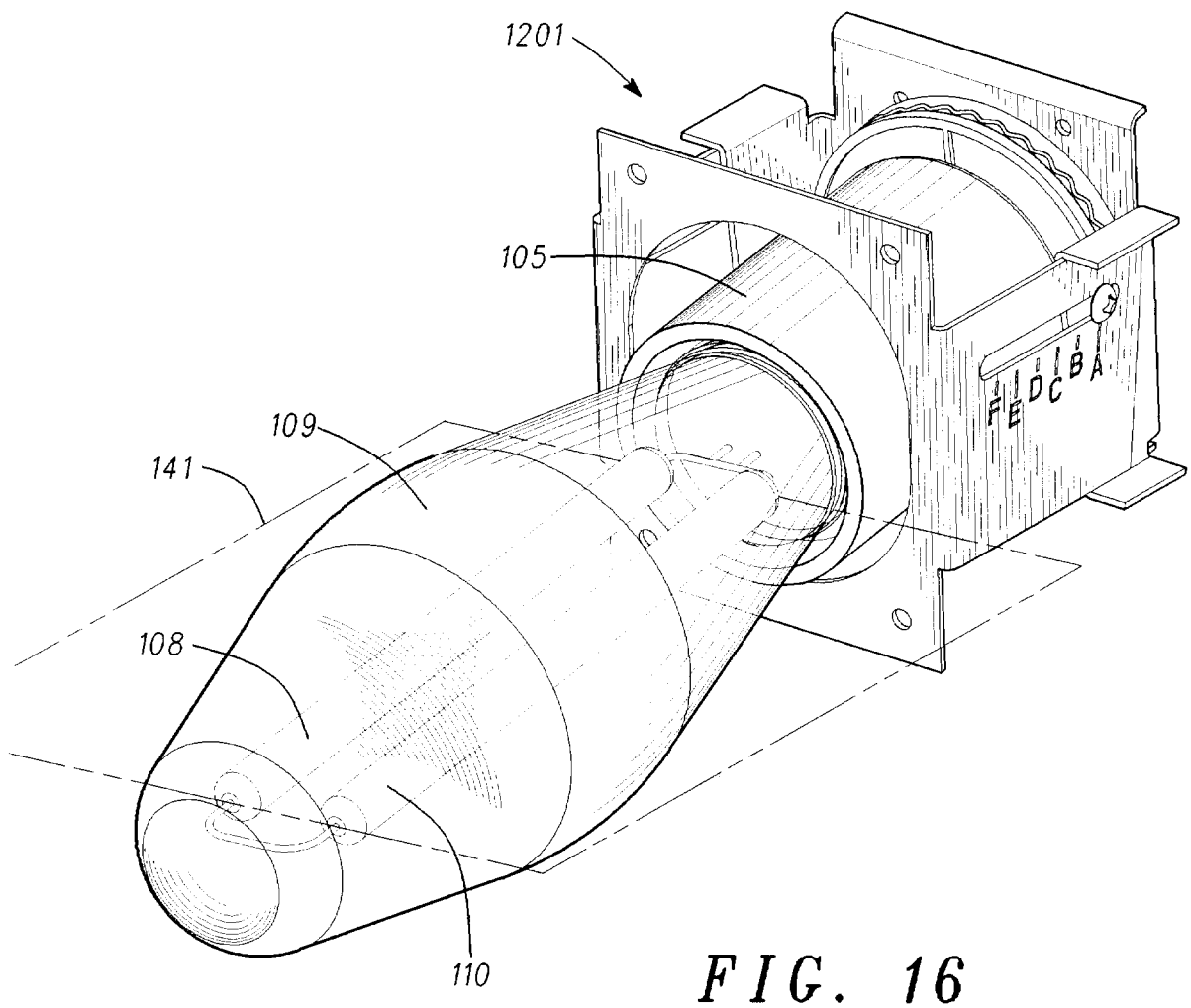


FIG. 16

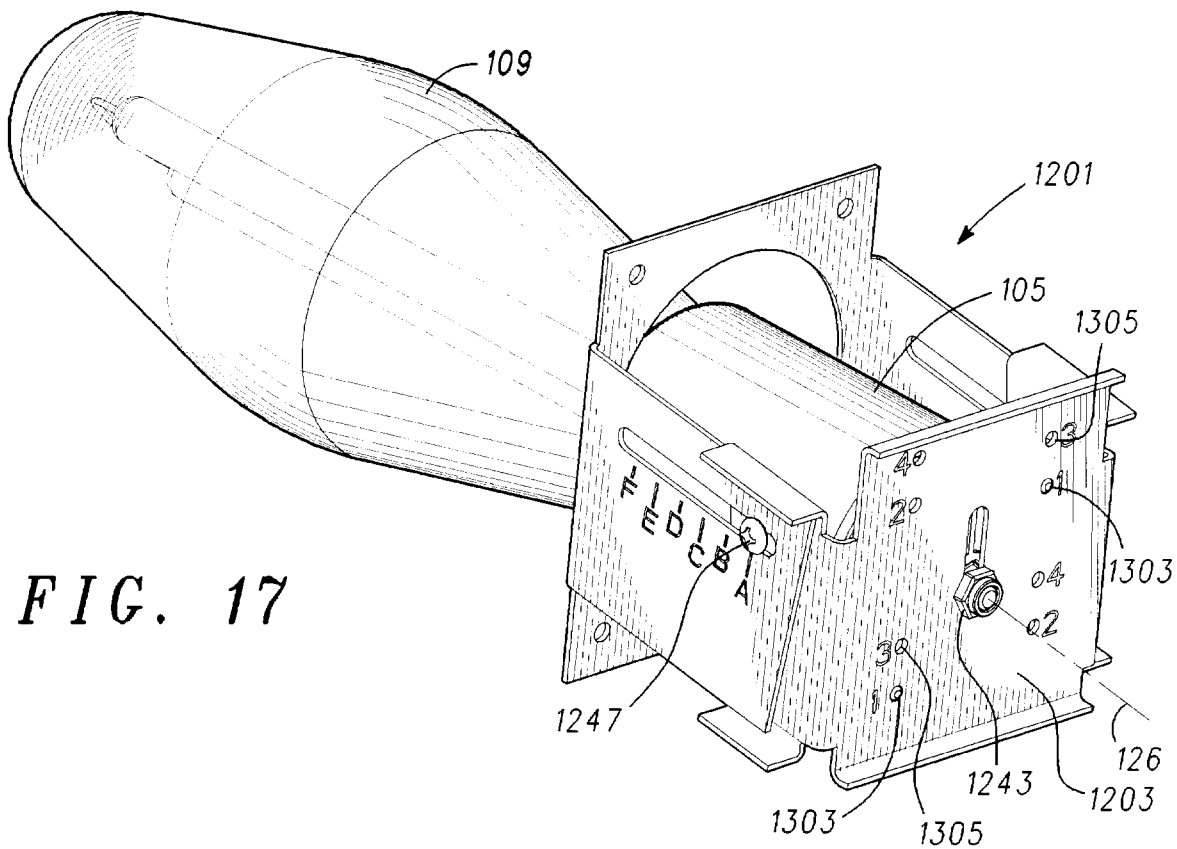

109
1201
105
1305
03
40
01
20
1303
04
02
30
10
126
1247
1243
1203
1303
1305
F
E
D
C
B
A

FIG. 17

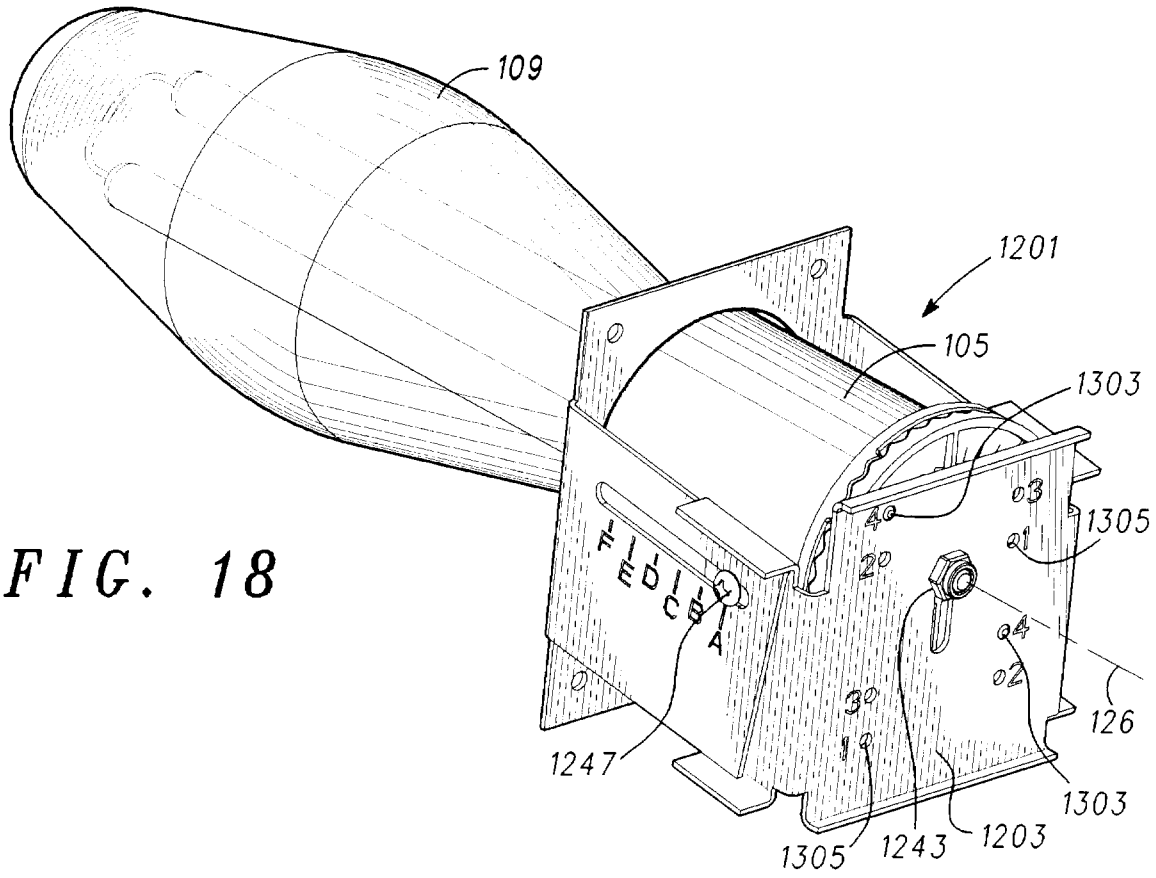

109
1201
105
1303
03
40
1305
01
20
04
02
126
30
10
1247
1303
1305
1243
1203
F
E
D
C
B
A

FIG. 18

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA2006/001233

A. CLASSIFICATION OF SUBJECT MATTER
IPC: ***F21V 19/02*** (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: F21V 19/02 (2006.01) ; US CL 362/370

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)
CANADIAN PATENT DATA BASE ; DELPHION (lamp, socket, adjust*, angle, bracket, plate, slot, angul*)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4319313 A (EBERHART, C. W. et al.) 09 March 1982 (09-03-1982) Fig. 4, col. 3, lines 24 - 62	1- 5, 8 - 14, 16 - 21
A	whole document	6, 7, and 15
X	US 4173037 A (HENDERSON, A. J. JR et al.) 30 October 1979 (30-10-1979) Fig. 1, 2, and 6, col. 2, lines 35 -68	1, 18, 19, 20 and 21
A	whole document	2 - 17
A	US 3694649 A (THOMPSON, R. L.) 26 September 1972 (26-09-1972) whole document	1 - 21
A	JP 2000011735 A2 (MASAAKI, I.) 14 January 2000 (14-01-2000) abstract	1 - 21
A	US 3391890 A (PERBAL, A. C.) 09 July 1968 (09-07-1968) whole document	1 - 21

[ ] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"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)

"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

"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

"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

"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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
21 September 2006 (21-09-2006)	17 November 2006 (17-11-2006)

Name and mailing address of the ISA/CA
Canadian Intellectual Property Office
Place du Portage I, C114 - 1st Floor, Box PCT
50 Victoria Street
Gatineau, Quebec K1A 0C9
Facsimile No.: 001(819)953-2476

Authorized officer
Malgorzata Samborski
(819) 956-0759

Patent Document Cited in Search Report	Publication Date	Patent Family Member(s)	Publication Date
US4319313 A	09-03-1982	CA1146135 A1	10-05-1983
US4173037 A	30-10-1979	NONE	
US3694649 A	26-09-1972	NONE	
JP2000011735 A2	14-01-2000	NONE	
US3391890 A	09-07-1968	GB1188988 A JP50005505B	22-04-1970 04-03-1975