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(54) **PORTABLE LIGHT HAVING A ROTATABLE HEAD**

TASCHENLAMPE MIT DREHBAREM KOPF

DISPOSITIF D'ÉCLAIRAGE PORTATIF COMPRENANT UNE TÊTE ROTATIVE

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(56) References cited:
US-A- 1 820 960 **US-A- 5 871 272**
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Description

[0001] The present invention relates to a portable light and, in particular, to a portable light having a certain movable parts.

[0002] Portable lights, such as flashlights and other lights, are widely used in many government, professional, business, industrial, sporting, and recreation endeavors and different features may be of greater or lesser importance in various ones of such different areas of use. Many portable lights seem to have features directed to a limited range of uses, while a user might prefer a light with more flexible usability.

[0003] Among some excellent lights presently available is the SURVIVOR® light available from Streamlight, Inc. of Eagleville, Pennsylvania, for example, is a "professional light" that is intended for use in rugged conditions, such as those that may be encountered by firefighters, police, other law enforcement personnel, industrial environments, and the like. The SURVIVOR® light has a spring loaded clip and attachment ring and has a head fixed in position relative to its body. The SYCLONE® light available from Streamlight, Inc. has a rotating clip by which it may be hung from a belt or strap, and has a light-producing head that is articulated relative to its body. The LITEBOX® light also available from Streamlight, Inc. has a light producing head that is pivotable relative to its body.

[0004] In particular, certain users may prefer a light that can be attached or mounted to various objects while other users may prefer a light where the light produced thereby may be directed in a desired direction. Other users may desired hands-free operation and/or a light that can be mounted to a body part, e.g., the head or a hat or helmet. Yet others may desire a light that can stand on a horizontal surface. Heretofore, no portable light is known to have been available that addresses such varied desires.

[0005] In addition, lights intended for many of such areas of use should be robust and durable so as to better withstand the rigors and usual hazards of certain use environments.

[0006] US 7 172 310 B2 describes a portable light according to the preamble of claim 1.

[0007] US 5 993 022 A also describes such a light, but the light source only pivots about 90° about the horizontal axis.

[0008] US 7 338 189 B2 describes a utility light in which a hanger has a ball at and end thereof that resides in a socket.

[0009] US 5 871 272 A describes a light having a head that pivots with respect to a body.

[0010] Accordingly, there is a need for a portable light that offers a great deal of flexibility to assist users in different circumstances, e.g., a multi-purpose light. It would also be desirable that such light be durable and robust.

[0011] To this end, the invention provides a portable light according to claim 1.

[0012] Optional features of the invention are set out in the dependent claims.

BRIEF DESCRIPTION OF THE DRAWING

[0013] The detailed description of the preferred embodiment(s) will be more easily and better understood when read in conjunction with the FIGURES of the Drawing which include:

FIGURE 1 is a perspective view of an example embodiment of a portable light;

FIGURE 2 is a front view of the example portable light;

FIGURE 3 is a side view of the example portable light;

FIGURE 4 is a rear view of the example portable light;

FIGURE 5 is an exploded view of the example portable light;

FIGURES 6A and 6B are an exploded view of the rear side of the example light body and a perspective view of an example hanger housing assembly, respectively;

FIGURE 7 is an exploded view of the head assembly of the example portable light;

FIGURES 8A, 8B and 8C are exploded front and side views and a cross-sectional view, respectively, of the head assembly of the example portable light;

FIGURES 9A and 9B are an exploded view and a cross-sectional view, respectively, of the electronic assembly, and FIGURE 9C is a perspective view of a heat sink member thereof;

FIGURE 10A is a perspective view of an example reflector useful with the example portable light, and FIGURE 10B is a cross-sectional view thereof;

FIGURE 11 is a side view of an example embodiment of a portable light having a magnet and a hanger;

FIGURE 12 is a rear view of the example portable light of FIGURE 11;

FIGURE 13 is an exploded view of the magnet assembly of the example portable light of FIGURES 11 and 12;

FIGURES 14A and 14B are rear and front exploded perspective views, respectively, of an example embodiment of a portable light having a clip and a magnet; and

FIGURES 15A and 15B are rear and front exploded perspective views, respectively, of an example embodiment of a magnet useful with a portable light.

[0014] In the Drawing, where an element or feature is shown in more than one drawing figure, the same alphanumeric designation may be used to designate such element or feature in each figure, and where a closely related or modified element is shown in a figure, the same alphanumeric designation primed or designated "a" or "b" or the like may be used to designate the modified element or feature. Similarly, similar elements or features

may be designated by like alphanumeric designations in different figures of the Drawing and with similar nomenclature in the specification. According to common practice, the various features of the drawing are not to scale, and the dimensions of the various features maybe arbitrarily expanded or reduced for clarity, and any value stated in any Figure is given by way of example only.

DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

[0015] A portable light of the present arrangement preferably has a light head that is movable over a wide range of positions with respect to a light body thereof, and/or preferably is mountable on various objects in different manners. In a first aspect, preferably the light head is rotatable about a first axis that passes through the light body and is rotatable about a second axis that is substantially orthogonal to the first axis. In another aspect, preferably, the portable light is hangable from or hookable to or clipable to a variety of objects and/or is magnetically attachable to a metal object, thereby to allow hands-free use if desired. Such portable light may preferably be made of one or more substantial plastic materials and/or of other durable and robust materials. Other features may be provided as set forth in the following description.

[0016] An example embodiment of a portable light 10 is described in relation to the perspective view of FIGURE 1, the front view of FIGURE 2, the side view of FIGURE 3, and the rear view of FIGURE 4. Portable light 10 comprises a light body 100 to which a head assembly 200 is rotatable mounted, being rotatably retained thereon by retainer ring 180. Light body 100 comprises a housing 110 which has an internal cavity for receiving a battery or other source of electrical power therein. Access to the cavity of housing 110, e.g., for inserting or removing a battery or other electrical power source, maybe via a cover 130 in base 120 that is openable by releasing latch 150 and moving cover 130 about hinge 140. Switch 160 on body 110 actuates an electrical switch that controls the application and removal of electrical power from light source 250 and may also control the manner in which such power is applied, e.g., for dimming and undimming, for flashing, strobing, and different brightness settings, for momentary ON and continuous ON, operating conditions.

[0017] Head assembly 200 is preferably fully rotatable about the central axis 101 of light body 100, i.e. at least 360° of rotation, and electrical contacts which are described below provide electrical conduction paths between light body 100 and head assembly 200. While electrical connections between light body 100 and light head 200 may allow 360° of rotation, it is preferred that electrical contacts that provide unrestricted rotation be employed.

[0018] Head assembly 200, alternatively referred to as light head 200, comprises a pivot base 210 that is rotatably mounted to light body 100, preferably for at least the

full 360° of rotation. Light head 200 further comprises a light source 250 that is pivotably (rotatably) mounted to pivot base 210 and that preferably is pivotable (rotatable) about axis 201 by about 180° relative to pivot base 210.

5 Preferably the pivotable mounting of light source 250 to pivot base 210 may preferably provide at least 180° of pivoting (rotation), however, it may provide greater or lesser angular pivoting (rotation) depending upon the external shapes of pivot base 210 and light source 250. For
10 example, where pivot base 210 is taller, then angular pivoting (rotation) greater than 180° may be provided.

[0019] As a result of the cooperation of the rotatable mounting of light head 200 to light body 100 and the pivotable (rotatable) mounting of light source 250 to pivot
15 base 210, light source 250 is freely positionable using a combination of rotation and pivoting to any position within at least about a complete hemisphere with respect to light body 100. This arrangement provides an advantage to a user who may mount the light 10 to an object and
20 then have great freedom in directing the light produced by light source 250 in a desired direction.

[0020] Hanger housing assembly 300 includes a housing or member 310 that attaches to light body 100 and that includes various arrangements for attaching light 10
25 to an object. For example, housing member 310 may define a track 320 or slot 320 in which a hanger 330 may be engaged. Track 320 presents externally as an elongated slot 320 that is narrower than is track 320 internal to housing member 310 so that hanger 330 is engaged
30 to light body 100 by an enlarged end 332 of hanger 330 that is captive in track 320. Hanger 330 is preferably free to be moved to a desired position along the length of track 320, as well as being moved angularly relative to housing 310 and being rotated relative to housing member 310. As a result, portable light 10 may be attached
35 or hung from other objects in a different positions, thereby to be convenient for a user to aim the light from light source 250 in a desired direction.

[0021] Track 320 may be of a size and shape to provide
40 a desired degree of resistance to the movement of enlarged end 332 of hanger 330 therein. In a presently preferred example, enlarged end 332 is spherical and is only slightly smaller in diameter than is track 320 so as to allow hanger 330 to freely move in track 320 from end to
45 end and angularly, whereby light 10 tends to either hang in an orientation with either head assembly being generally up or base 120 being generally up. The fit between track 320 and hanger 330 may be made tighter so that hanger 330 does not so easily move in track 320 or may
50 be made looser so that hanger 330 moves more freely therein.

[0022] Also preferably, housing member 310 is shaped to define an external groove or other recess 350 into
55 which hanger 330 maybe placed, e.g., for storage. To facilitate such storage, hanger 330 preferably is shaped to have an offset proximate the enlarged end 332 thereof that rides in track 320, thereby to be able to be placed in a storage position against housing member 310. Storage

groove 350 of housing 310 is preferably shaped so that hanger 330 bears against one or more sides or edges of groove 350, e.g., by a lip or ridge or other feature, thereby to be retained in groove 350 on the back of light 10 with sufficient force that it will not fall out, but not so much force that it cannot easily be removed for use by a user of light 10.

[0023] Housing member 310 also preferably includes one or more magnets 340 by which portable light maybe attached to a ferromagnetic object, e.g., a vehicle, structure or any other object, such as a steel object. For example, four magnets 340 may be provided as illustrated so as to provide spaced apart locations of magnetic attachment to the metal object which tends to provide for a more stable mounting thereon. Where the object shape is not generally flat, light 10 may be attached by less than all of the provided magnets 340.

[0024] Magnets 340 may be utilized to attach portable light 10 to a vertical surface or to a horizontal surface or to a surface in any other orientation, and light 10 may be attached with light body 100 generally vertical or horizontal or any other orientation, thereby to provide flexibility for a user to orient light 10 and position light source 200 thereof relative to light body 100 so that light can be directed as a user desires. It is noted that when hanger 330 is stored in recess 350, it is preferably recessed, e.g., is closer to light body housing 110 than is the plane defined by the magnets 340, thereby to not interfere with magnetically attaching light 10 to an object.

[0025] Details of portable light 10 and its component parts are further described and the assembly of light 10 is described in relation to FIGURE 5 which is an exploded view of the example portable light 10, FIGURES 6A and 6B which are an exploded view of the rear side of the example light body 100 and a perspective view of an example hanger housing assembly 300, respectively, and FIGURES 8A and 8B which are exploded front and side views, respectively, of head assembly 200.

[0026] Light body 100 typically includes a molded housing 110 that has an internal cavity into which a source of electrical power, typically a battery, maybe placed for energizing light 10, such as through a covered opening in its base 120. Preferably, the battery includes a battery pack that includes plural batteries, e.g., 4 size AA batteries, in a shaped case, e.g., a molded plastic case. The battery or batteries may include a single-use battery, e.g., an alkaline cell battery, or may include a rechargeable battery, e.g., a NiMH or a lithium-ion cell battery.

[0027] A switch 160 on one side of light housing 110 controls operation of light 10. Switch 160 includes a push-button actuator 162 that is disposed in opening 118 of housing 110 and is maintained therein by retainer ring 164. Pressing on actuator 162 causes it to move inward into opening 118 and to press against an electrical switch 162 therein.

[0028] Head assembly 200 is rotatably attached to the upper end of light body 100 and is retained thereon by

retainer ring 180. Head assembly 200 includes a pivot base 210 that interfaces with housing 110 and provides part of a pivotable connection to light source or light head 250. The base end of pivot base 210 has an outward circular flange 212 and has a groove 213 for receiving an O-ring 186 that seals the rotating joint between head 200 and light body 100. Housing 110 has an outward circular flange 112 at its upper end that is of like size to flange 212 of head 200, and that defines a groove 111. The cylindrical end of pivot base 210 slips into the circular opening of housing 110 and circular flanges 112 and 212 are adjacent each other. Retainer ring 180, is typically a split ring (a ring 180 having a split 181) that can be spread apart so that it can be placed over flanges 112, 212 and then brought back together so as to hold flanges 112, 212 captive, and can be secured in a closed condition. O-ring 186 bears against both parts 110, 210, to provide a rotatable seal.

[0029] A generally cylindrical electronics and switch assembly or module 400 fits into the opening at the upper end of housing 110 and includes various electrical and electronic elements for the electrical operation of light 10. Module 400 includes outer and inner circular contacts 432, 434 on its one end and has a circuit board 460 extending axially from its outer surface that carries an electrical switch 462 at its far end. When module 400 is placed into the opening at the upper end of housing 110, circuit board 460 extends into the interior of housing 110 to locate switch 462 behind the pushbutton switch 160 so that it is actuated when actuator 162 is pressed. Module 400 preferably has two battery contacts 482, 484 extending into the interior cavity of housing 110 and is maintained in housing 110 by fasteners 408.

[0030] Assembly of the rotatable joint between light body 100 and head assembly 200 is preferably as follows. First, module 400 is placed into housing 110 and optionally is fastened 408 therein, either before or after switch actuator 160 and/or cover 130 are assembled to housing 110. Pivot base 210 of assembled head 200 with O-ring 186 in groove 213 of pivot base 210 is slipped into the circular opening of housing 110 until flanges 112, 212 are adjacent. Then retainer 180 which has a groove 182 in the inner surface thereof is placed over flanges 112, 212 so that flanges 112, 212 are captive in the groove 182 thereof, thereby to prevent separation of light body 100 and head assembly 200 while providing a rotatable joint therebetween. Retainer 180 maybe secured in a closed position by any suitable arrangement.

[0031] A preferred arrangement for securing retainer ring 180 in its closed position on light 10 employs a cooperation of various features of retainer ring 180, of light housing 110 and optionally of an element attached to light housing 110, e.g., hanger assembly 300. Specifically, retainer 180 has projections, e.g., prongs, 184, one on either side of the split 181 therein, that extend axially, e.g., in the direction of housing 110 when retainer 180 is on housing 110. Prongs 184 move apart when ring 180 is spread and come closer together when ring 180 is

closed. Housing 110 of light body 100 has complementary recesses 104 at the upper end thereof that are spaced apart by substantially the same distance as are prongs 184 when retainer 180 is closed, so when retainer ring 180 is placed onto housing 110 and closed, prongs 184 become disposed in recesses 104 thereby to maintain retainer ring 180 in the closed condition.

[0032] The respective sizes, shapes and locations of prongs 184 and recesses 104 preferably cause prongs 184 to "snap" into and remain in recesses 104. However, additional security against retainer 180 opening maybe provided by a member that attaches to housing 110, e.g., hanger housing 300, wherein hanger housing 310 has a pair of recesses 304 at the upper end thereof that is adjacent retainer 180 when hanger housing 310 is attached to light body 100. Recesses 304 are located and spaced apart so that the portion of prongs 184 that are not fully in recesses 104 will be in recesses 304, thereby to prevent displacement of prongs 304 that could allow split retainer ring 180 to open. The arrangement of pivot base 210, housing 110 and retainer ring 180 advantageously facilitate efficient assembly of light 10.

[0033] The base 120 of housing 110 has a hinged cover 130 that covers the opening to the battery cavity of housing 110. Cover hinge 140 is provided by the hinge plates 144 molded in housing 110 and hinge plate 134 at one end of cover 130, each of which have a hole therethrough into which hinge pin 144 is placed. The opposite end of cover 130 has latch clip 136 disposed in holes in cover 130 that clips over latch projection 116 of housing 110 thereby to provide cover latch 150. Cover 130 typically has an O-ring 138 for sealing the opening of housing 110. Cover 130 may also include charging contacts 135, 137 for connecting a rechargeable battery inside of light body 100 to an external source of charging power, e.g., a charger, when a rechargeable battery is utilized. Preferably, a rechargeable battery may be a battery pack that includes plural batteries, e.g., 4 size AA NiMH or lithium-ion cell rechargeable batteries, in a shaped case, e.g., a molded plastic case.

[0034] Hanger housing assembly 300 includes a housing 310 that attaches to one side of housing 110 for preferably providing a hanger 330 and magnets 340 by which light 10 may be supported from a suitable object. It is noted that hanger housing 310 preferably has two locking recesses 304 at one end thereof that may receive projections 184 for securing retainer ring 180 on housing 110 as described above. Hanger housing 310 is shaped at its base to generally fit against housing 110 and to cover receptacles 108 thereof which are to receive the fasteners 348 that attach hanger housing assembly 300 to housing 110.

[0035] Hanger housing 310 is shaped at its exposed side to provide for hanger 330 and magnets 340. Track 320 of housing is an elongated opening that presents as an elongated slot 320 on the surface of housing 310 and that is of greater width within housing 310 so that a hanger 330 having an enlarged end 332 in track 320 is retained

therein and is movable therein. Track 320 may be generally circular in cross-sectional shape, e.g., so as to retain a generally spherical end 332 of hanger 330 therein. Where the thickness of hanger housing 310 is less than the diameter of enlarged end 332 of hanger 330, track 320 may also include a recess 119, e.g., a curved recess 119 in housing 110 that cooperates with the shape of the part of track 320 provided by housing 310 to provide a track 320 having more of a complete circular cross-sectional shape.

[0036] Hanger 330 has a hanger portion 334 for being placed on or over an object from which light 10 is to be suspended or hung, has a shaft portion 336 into which an offset is provided so that hanger 330 may be placed to lie generally flat on housing 310, and has an enlarged end 332 that rides in track 320 of housing 310 so that hanger 330 may be moved to various locations and positions relative to light body 100. Enlarged portion 332 may be generally spherical in shape as illustrated so that hanger 330 may be moved or may move relatively freely relative to housing 310 and light body 100. E.g., hanger 330 maybe moved along the length of track 320, shaft portion 336 may be angled to any position within a generally cone-shaped volume of positions relative to housing 310, and hanger 330 may be rotated about the axis of shaft portion 336 so that hook end 334 has essentially 360° of rotation relative to housing 310. While hanger 330 maybe hook-shaped as illustrated in a preferred embodiment, it may have any desired shape in view of how it will be utilized, e.g., an eye shape, a tee shape, a loop shape, a nail-head shape, or a combination thereof.

[0037] Preferably, the exterior surface of housing 310 is shaped so as to provide a recess, groove and/or track 350 generally of like shape to hanger 330 so that hanger 330 may be placed into recess 350, e.g., for storage. While the shape and size of recess 350 maybe made to receive hanger 330 in a manner that retains hanger 330 therein, retention of hanger 330 in recess 350 may be provided by other features, e.g., by projecting tabs or lips 343 that extend towards recess 350 from magnet receptacles 342. As illustrated, recess 350 is generally hook or oval shaped to correspond to the hook 334 shape of example hanger 330. Preferably, groove 350 is arranged so that when hanger 330 is therein, hanger 330 is substantially flush along the hanger housing 310 in a way that it is not likely to interfere with attaching light 10 to an object using magnets 340.

[0038] Hanger housing 310 preferably has a plurality of cup-shaped magnet receptacles 342 into which circular magnets 344 which are inside magnetic metal cups 346 are placed to provide the plural magnets 340. Preferably a recess 345 may be provided on the reverse side of hanger housing 310, e.g., under each of magnet receptacles 342, so that fastener receptacles 108 that extend from housing 110 may extend into recesses 345 for helping to properly position housing 310 on light body housing 110.

[0039] As a result of the combination of a hanger 330

that travels along the length of track 320 thereby to allow light 10 to be hung with either end of light body 100 in an upward orientation and/or of magnets 340 which allow light 10 to be attached to suitable metal objects, light 10 is generally suitable for use in industrial and automotive applications as well as by police and fire fighters and other responder personnel. The provision of a hanger 330 and/or magnets 340 allow for hands-free use, if desired. The flexibility in use provided by hanger 330 and magnets 340 is complemented by the ability of light head 250 to rotate at least 360° about light body 100 and also rotate (pivot) about 180° about pivot base 210, whereby the light produced by light head 250 may be easily directed in virtually any direction a user may desire.

[0040] Hanger housing assembly 300 is preferably assembled as follows. Hanger 330 is placed in track 320 from the rear of hanger housing 310 before housing 310 is attached to housing 110, e.g., because the slot 320 in hanger housing 310 is narrower than is the enlarged end 332 of hanger 330 and is wider than is the shaft 336 of hanger 330. Magnets 344 are placed into magnet cups 342 which are placed into receptacles 342 of hanger housing 310. Hanger housing 310 is placed against housing 110 so that prongs 184 of retainer ring 180 are in recesses 304 of hanger housing 310 and so that fastener receptacles 108 are in the recesses 345 at the rear of magnet receptacles 342, and then fasteners 348 are fastened through magnets 340 and housing 310 into fastener receptacles 108 thereby to attach hanger housing assembly 300 to housing 110.

[0041] The arrangement of housing 310, track 320 hanger 330 and magnets 340 advantageously facilitate efficient assembly of light 10.

[0042] Head assembly 200 is further described and its assembly is described in relation to FIGURE 7 which is an exploded view of a head assembly 200 of the example portable light 10, and to FIGURES 8A, 8B and 8C which are exploded front and side views and a cross-sectional view, respectively, thereof. Pivot base 210 is preferably a molded housing 211 that has a surface 218 that is at about 90° to the plane of the rotary joint provided by flanges 112, 212 and retainer ring 180. Light head 250 is preferably a molded housing 251 that has a surface 258 that is at about 90° to the plane of the LED assembly 270 and lens 285 thereof. When light head 250 is pivotably attached to pivot base 210, surfaces 218 and 258 of housings 211, 251 are adjacent and move relative to each other when light head 250 is pivoted relative to pivot base 210, and so surfaces 218, 258 maybe generally flat or may have other complementary shapes. O-ring 202 therebetween provides a seal between surfaces 218, 258, e.g., for the pivot joint.

[0043] As a result the rotation axis of the pivotable joint between pivot base 210 and light head 250 is substantially perpendicular to surfaces 218, 258, and passes through a generally centrally located circular opening 219, 259 in each of surfaces 218, 258 of housings 211, 251 into which the various elements of the pivot joint are

placed. The pivot joint not only allows relative movement of light head 250 with respect to pivot base 210, but also provides for electrically conductive connections 220, 230 through the pivot joint so that electrical power from the power source in light body 100 may be applied to the LED light source elements 270 of head 200. Further each of housings 211, 215 of pivot base 210 and head 250 has a respective larger opening 215, 255 for access and convenience in assembling the pivot joint. Plugs 214, 254 cover openings 215, 255, respectively, in housings 211, 215 after assembly of the pivot joint is completed.

[0044] The pivot joint is provided by an inner metal eyelet 234 that is inside an outer metal eyelet 224, and that are separated by a coaxial generally cylindrical insulating spacer 244 therebetween, and provides both for mechanical pivoting and for electrical conduction paths through the pivoting joint. Each of eyelets 224 and 234 has a preformed head at one end and is otherwise cylindrical before being crimped into place in head assembly 200.

[0045] Outer metal eyelet 224 may be placed through the hole in metal contact 226 and then through the hole 259 in head housing 251 and through hole 219 in pivot housing 211, with eyelet 224 passing through O-ring 202 between housings 211, 251. Contact assembly 222 is inserted into a hole in pivot base housing 211 that is perpendicular to the plane of the rotating joint of flanges 112, 212, so that contact pin 223 thereof extends towards electronic module 400 for making electrical connection to circular contact 434 thereof under the urging of spring 225 thereof when head assembly 200 is assembled to light body 100. The end of outer metal eyelet 224 protruding inside housing 211 is placed through metal ring 221 of contact assembly 222. While metal eyelet 224 is pressed inwardly into place through holes 219, 259 through the opening 255 in housing 251, metal eyelet 224 is crimped down over contact ring 221, whereby a first electrical connection 220 is made through the pivot joint via metal ring 221, outer metal eyelet 224 and metal contact 226, while crimped metal eyelet 224 provides the mechanically rotatable pivot joint between pivot base 210 and light head 250.

[0046] Insulating spacer 244 may be placed through the center of outer metal eyelet 224. Contact assembly 232 is inserted into a hole in pivot base housing 211 that is perpendicular to the plane of the rotating joint of flanges 112, 212, so that contact pin 233 thereof extends towards electronic module 400 for making electrical connection to circular contact 432 thereof under the urging of spring 235 thereof when head assembly 200 is assembled to light body 100. Inner metal eyelet 234 is placed through the hole in metal contact 236 and through the center opening of insulating spacer 244, and insulating spacer 242 is placed over the protruding end of inner metal eyelet 234 in housing 211. The end of inner metal eyelet 234 protruding into housing 211 passes through contact ring 231 of contact assembly 232. Metal spring (wave) washer 246 and metal washer 248 are placed on the end of inner metal eyelet 234, after which the end of inner metal eyelet

234 is crimped down on metal washer 248, whereby a second electrical connection 230 is made through the pivot joint via metal ring 231, inner metal eyelet 234, metal contact 226, and washers 246, 248.

[0047] The resulting assembly is seen in FIGURE 8C wherein spring loaded contacts 222, 232 are seen to extend toward electronic module 400 for respectively contacting contacts 434 and 432 thereof upon which they trace respective circular paths when head assembly 200 is rotated relative to light body 100, thereby to provide a wiping contact action.. It is also seen that surfaces 218, 258 are adjacent each other with O-ring 202 therebetween, and either or both of surfaces 218, 258 may have a circular groove for receiving O-ring 202. The coaxial assembly of eyelets 224, 234 and insulators 242, 244 providing a mechanically rotatable joint about which light head 250 may pivot, e.g., about 180° or more or less, with respect to pivot base 210 may also be seen, as can their respective connections to contact assemblies 222, 232 and metal contacts 226, 236. Plugs 214, 254 are seen in openings 215, 255 for covering the interior of pivot base 210 and light head 250 for sealing the pivot joint assembly.

[0048] Light head 250 further includes an LED and heat sink assembly 270 for producing light when energized through the conducting paths 220, 230. LED assembly 270 includes, e.g., at least one light emitting diode (LED) 274, and preferably two LEDs 274 that are on a circuit board 272 and are thermally coupled to heat sink 276. The prong ends of metal contacts 226, 236 preferably extend into and are soldered into electrically conductive holes in circuit board 272 when LED assembly 270 is inserted into the oval shaped opening of light housing 251. LED and heat sink assembly 270 may be attached to light head 250 by fasteners 278 that extend through heat sink 276 and into receptacles 257 of light housing 251.

[0049] Reflector 260 has a reflecting portion 262 and has openings 264 in the base thereof in which LEDs 274 become disposed when reflector 260 is placed into the oval shaped opening of light housing 251 adjacent to LED assembly 270. Reflecting portion 262 may be of a desired shape, such as a parabolic shape or a squared (rectangular) trapezoidal shape, as may be desired. Further, the surface or surfaces of reflector 260 are typically smooth or polished or mirrored for better reflectivity, and the reflecting surface or surfaces thereof may be shaped so as to provide a flood light beam or a spot light beam, as may be desired. A squared trapezoidal reflector typically has a rectangular base having one or more openings for one or more LEDs 274, and has four trapezoidal sloped surfaces extending forward toward the plane of lens 285 so as to define a substantially rectangular opening proximate lens 285; such reflector 260 may have a generally planar surface substantially parallel to lens 285 to which planar surface the four trapezoidal surfaces intersect and an oval periphery similar to that of lens 285.

[0050] The oval-shaped opening of light housing 251

may have a groove therein for receiving a sealing O-ring 256 therein and lens 285 maybe cup shaped so as to press O-ring 256 between the rim of lens 285 and housing 251. Housing 251 may also have a flange around its oval-shaped opening over which groove 282 of resilient face cap 280 fits so as to hold face cap 280 in place on light head 250. Plugs 214, 254 may be placed into openings 215, 255 of housings 211, 251, respectively, after the pivoting joint is completed. The arrangement of pivot base 210, light head 250 and the elements of the pivot joint 220-244 advantageously facilitate efficient assembly of light head 200.

[0051] Electronics and switch assembly or module 400 is described in relation to FIGURES 9A and 9B which are an exploded view and a cross-sectional view, respectively, of the electronic assembly 400 of the head assembly 200, and FIGURE 9C which is a perspective view of a heat sink member thereof. Generally cylindrical heat sink 410 defines the general shape of module 400 and provides for dissipating heat generated by the various electronic components 452 that are mounted on circuit board 450 for controlling the application of electrical power from a power source in light body 100 to light head 250, e.g., LEDs 274, for producing light responsive to switch 160, 462. Heat sink 450 may have a flange or base 414 extending from its outer cylindrical surface for positioning module 400 in the circular opening at the top of light body 100, e.g., housing 110, and may also have one or more openings 411 through which a fastener or fasteners 408 maybe placed to secure module 400 in housing 110.

[0052] Circuit board 450 of generally circular shape is disposed adjacent to heat sink 410 and is thermally coupled thereto, e.g., to surface 418 thereof. Opening 459 of circuit board 450 engages post 419 of heat sink 450 for maintaining a desired positional relationship therebetween. Heat sink 450 as illustrated has a plurality of openings 417 or voids extending from surface 418, however, heat sink 450 may have different openings 417 or may have no openings (i.e. be substantially solid) in any particular embodiment. It is thought that air may circulate in voids 417 which may help remove heat from heat sink 450. In practice, at least some recesses 417 or other recesses would likely be provided where necessary to allow clearance for electronic parts 452, if any, that are on the side of circuit board 450 that is adjacent heat sink 410. An insulating member may be placed between heat sink 410 and circuit board 450 to prevent electrical connection therebetween.

[0053] Circuit board 450 may have two springs 482, 484 extending therefrom in a direction into light body 100, e.g., for making electrical connections to a battery or other electrical power source therein. Plural tabs 454 extend from circuit board 450 and are disposed in openings 464 of switch circuit board 460 for making electrical connection to conductors thereon, e.g., typically by soldering. E.g., two or three conductors may be on circuit board 460 for connecting switch 462 to the circuitry of circuit board 450. Circuit board 450 may be secured to heat sink 410

by a fastener 458 through a central hole therein and seated in central hole 415 of heat sink 410.

[0054] Thus, circuit boards 450, 460 may be assembled and maintained in a particular positional relationship, e.g., substantially at right angles to each other, once soldered or otherwise secured. Switch circuit board 460 carries electrical switch 462 which extends into housing 110 and the operation of which via switch actuator 160, 162 controls operation of light 10, e.g., by controlling the operation of electronic circuitry on circuit board 450. The upper end of circuit board 460 may be disposed in a recess 440 in the cylindrical outer surface of heat sink 410, e.g., for further support. Preferably, circuit board 460 may be disposed in a channel inside housing 110 for aiding in positioning switch 462 relative to switch actuator 160, 162.

[0055] The upper circular end of heat sink 410 may have a central circular pedestal 412 extending therefrom onto which an insulating member 420, e.g., shaped like a short top hat, is placed for insulating conductor rings 430 from heat sink 410. Conductor rings 430 include an inner circular contact 434 from which a conductor 433 extends and an outer annular contact 432 from which a conductor 435 extends. The circular portion of contact 434 is preferably seated in and positioned coaxially by a recess 424 of insulator 420 with conductor 435 thereof extending downward in an axial direction in a space between two of insulating guides 426. The circular annular portion of contact 432 is preferably seated on and positioned coaxially by a seat 422 of insulator 420 with conductor 433 thereof extending downward in an axial direction in a different space between two of insulating guides 426. Insulating guides 426 are disposed in opening 416 of heat sink 410 and conductors 433, 435 extend to and are connected to respective contacts of circuit board 450, e.g., the narrowed ends of conductors 433, 435 and connected in respective holes of circuit board 450.

[0056] FIGURE 10A is perspective view of an example reflector 260' useful with the example portable light 10, e.g., as illustrated in FIGURES 1 and 2, and FIGURE 10B is a cross-sectional view thereof. Reflector 260' has a relatively flat oval-shaped front face 261' surrounding its rectangular open front end with face 261' residing adjacent to lens 285. Opposite front face 261' is a smaller rectangular rear face 265' in which are one or more openings 264' in which one or more LEDs 274 reside when reflector 260' is situated in head 250. Between front face 261' and rear face 265' are four generally trapezoidal reflective faces 263' defining a generally "rectangular cone" between front and rear faces 261', 265'.

[0057] Typically, the surfaces of trapezoidal faces 263' have a reflective surface for reflecting light produced by LEDs 274 and face 265' may have a like finish, as may face 261'. The reflective surface finish maybe, e.g., polished, silvered, smooth, textured, or any other suitable finish, as may be convenient for obtaining a particular light quality, e.g., relatively sharper or relatively diffuse. The relative sizes of rear face 265' and the angle or an-

gles at which trapezoidal faces 263' are positioned maybe set as maybe convenient for obtaining an appropriate shaping of the light produced by LEDs 274 into a beam, e.g., a spot beam, a flood beam, or another beam.

[0058] FIGURE 11 is a side view and FIGURE 12 is a rear view of an example portable light 10', and FIGURE 13 is an exploded view of the magnet assembly 300' of the example portable light 10' of FIGURES 11 and 12. Light body 100 and light head assembly 200 of light 10' are as described herein and operate as described herein in relation to light 10. Example light 10' differs in that hanger housing assembly 300' includes a magnet 340' that is nearer an upper end of hanger housing 310' in addition to hanger 330. Hanger housing assembly 300' includes a housing 310' that is attached to light body housing 110 by fasteners 348 and includes a hanger 330 that is movable in track 320 and is stowable in housing 310' as described herein.

[0059] Magnet 340' is attached nearer the upper end of housing assembly 300' by washer 347 and fastener 349 passing through respective holes in magnetic member 344', cup 346', receptacle 342' and hole 312 of housing 310' to engage member 380. Member 380 includes a base 382 from which extend two extension arms 384 in a V configuration. Arms 384 have respective holes 388 through which pass fasteners 348 to engage holes 108 of housing 110 thereby securing member 380 between housing 310' and light body housing 110 of light 10'. Fastener 349 engages opening 386 of base 382 of member 380 to attach magnet 340' to light 10'. Preferably, member 380 may be a plastic part and hole 386 maybe a metal insert that extends into opening 312 of housing 310', e.g., for aligning and/or stabilizing member 380.

[0060] Magnet 340' typically includes, e.g., a central generally cylindrical magnetized member 344' that resides in a cylindrical metal cup 346', preferably a steel cup 346', in similar manner to magnet 340 as described herein. The foregoing of magnet 340' are attached to light 10' by fastener 349 passing through into member 380 and by optional washer 347. Preferably, magnet 340' is sufficiently strong to securely attach light 10' to an irregular surface of an object including a ferromagnetic material, e.g., a steel, as may be convenient in placing a light at various locations on an automobile or other vehicle or machinery. A circular spacer 362 and thin steel washer 364 may be provided on the face of magnet 340' for protection during shipping, and may be discarded prior to use. Optionally, but preferably, magnet 340' may be provided with a rubber or other resilient cover 360 (described below) to protect a surface to which light 10' may be attached by magnet 340'. Magnet 340' and/or hanger 330 may be used alone or in cooperation for attaching light 10' is a desired location.

[0061] Face cap 280 of light 10' (or of light 10) may have at least one clasp 284, and preferably two clasps 284, that engages a feature of housing 251 of light head 250 to retain face cap 280 thereon, either in addition to the engaging of groove 282 and flange 252 or in place

thereof. Typically, a projection of housing 251 is engaged by a recess of clasp 284 or a recess of housing 251 is engaged by a projection of clasp 284. Retainer ring 180 may be held closed on light body 100 by a pin, screw or other fastener.

[0062] FIGURES 14A and 14B are rear and front exploded perspective views of an example embodiment of a portable light 10" having a clip 500 and a magnet 340' as described herein. Light body 100 and light head assembly 200 of light 10" and hanger housing 310 are typically as described herein and operate as described herein in relation to lights 10 and 10'. Example light 10" differs in that hanger housing assembly 300' includes a magnet 340' that is nearer a lower end of hanger housing 310 and a clip 500, but light 10" does not include a hanger 330. Even though a hanger 330 is not included, light 10" may utilize the same hanger housing 310, 310' as described herein in relation to lights 10 and 10'.

[0063] In this embodiment, magnet 340' is attached to housing 300 nearer the end thereof remote from head 250, e.g., using a member 380 as described herein. A pocket or belt clip 500 is attached to light 10" nearer the upper end of light body 100, e.g., to a projection extending from hanger housing 310, e.g., as by a member similar to member 380, but including a projection, and attached to light 10" as described in relation to member 380 herein. Clip 500 preferably has a relatively longer extension 510 that extends along the body 100 of light 10" and that is pivotable so that the distal end thereof may be movable closer to an further away from housing 300.

[0064] Pivotable clip 500 may be retained to light 10" by a pivot pin 520 passing transversely through clip 500 and through a projection extending from pivot support 580 which is attached to hanger housing 310 by fasteners 348. Clip 500 is biased to move towards and bear against hanger housing 310. Alternatively, and preferably, clip 500 may be attached using a bracket 580 which is similar to bracket 380 and to which clip 500 is attached by pivot pin 520. Bracket 580 is attached to receptacles 108 of housing 110 by fasteners 348 which pass through hanger housing 310. Typically, a spring, e.g., a coil spring with extended ends or a spring strip, may be employed for biasing extension 510 of clip 500 towards housing 310.

[0065] Optionally, but preferably, clip 500 also includes an upper extension 530 extending in a direction opposite to extension 510 and extension 530 preferably defines an opening or loop 530 which can be employed for hanging light 10" on a projection such as a pin or bolt or nail and the like. Clip 500 may be employed for attaching light 10" to a person, article of clothing, a work piece or other object, as may be desired by a user of light 10". Magnet 340' and/or clip 500 may be used alone or in cooperation for attaching light 10" is a desired location.

[0066] FIGURES 15A and 15B are rear and front exploded perspective views of an example embodiment of a magnet 340, 340' useful with a portable light 10, 10', 10', e.g., as described herein. Magnet 340, 340' compris-

es a generally circular permanent magnet 344, 344' that is disposed in a cup 346, 346', preferably a ferromagnetic metal cup 346, 346' such as a steel cup 346, 346', as described. Optionally and preferably, a cover 360 fits over magnet cup 346, 346', e.g., as by a friction fit, so as to enclose magnet 344, 344'. More preferably, cover 360 is of a rubber or other resilient material that friction fits on cup 346, 346' and provides a resilient outer surface for protecting objects to which a light 10, 10', 10" might be magnetically attached by magnet 340, 340'. Optionally, a nylon spacer ring 362 maybe provided adjacent cover 360 and a thin steel washer 364 maybe provided adjacent spacer 362 for shipping light 10, 10', 10" and may be removed by a user prior to use. Spacer 362 and washer 364 may be removably attached by a suitable fastener, e.g., by fastener 347 or by a releasing adhesive or by another suitable fastener.

[0067] In one example embodiment, housing 110, pivot base 210, light head 250, retainer ring 180, hanger housing 310, plugs 214, 254, switch ring 164, and cover 130, were molded of a suitable plastic material, e.g., an ABS plastic, nylon, an engineered nylon, an impact-resistant nylon, a modified nylon, or other suitable plastic, and hanger 330 was molded of similar material with reinforcing, e.g., with carbon fiber or glass fiber or other suitable reinforcing. Metal electrical parts, e.g., contacts 222, 232, eyelets 224, 234, contacts 226, 236, contacts 432, 434, may be made of any suitable electrically conducting metal, e.g., copper, brass, beryllium copper and the like. Insulators, e.g., spacers 242, 244, and member 420, may be of any suitable insulating material, preferably a plastic material, e.g., polycarbonate, ABS plastic and the like. Heat sinks 276 and 410 may be of any suitable thermally conductive material, preferably, copper or aluminum. Lens 285 is typically polycarbonate or polystyrene or other suitable plastic or glass, while face cap 280 and actuator 162 may be any suitable resilient or rubbery material, e.g., neoprene, silicone, rubber, melt processable rubber or other suitable material.

[0068] As used herein, the term "about" means that dimensions, sizes, formulations, parameters, shapes and other quantities and characteristics are not and need not be exact, but may be approximate and/or larger or smaller, as desired, reflecting tolerances, conversion factors, rounding off, measurement error and the like, and other factors known to those of skill in the art. In general, a dimension, size, formulation, parameter, shape or other quantity or characteristic is "about" or "approximate" whether or not expressly stated to be such. It is noted that embodiments of very different sizes, shapes and dimensions may employ the described arrangements.

[0069] Although terms such as "up," "down," "left," "right," "front," "rear," "side," "top," "bottom," "forward," "backward," "under" and/or "over," maybe used herein as a convenience in describing one or more embodiments and/or uses of the present arrangement, the articles described may be positioned in any desired orien-

tation and/or may be utilized in any desired position and/or orientation. Such terms of position and/or orientation should be understood as being for convenience only, and not as limiting of the invention as claimed.

[0070] The term battery is used herein to refer to an electro-chemical device comprising one or more electro-chemical cells, and so a battery may include a single cell or plural cells, whether as individual units or as a packaged unit.

[0071] Further, what is stated as being "optimum" or "deemed optimum" may or not be a true optimum condition, but is the condition deemed to be desirable or acceptably "optimum" by virtue of its being selected in accordance with the decision rules and/or criteria defined by the applicable controlling function, e.g., the current flowing in LEDs 274 may be "optimized" for different parameters, e.g., light output, efficiency, operating temperature or another parameter.

[0072] While the present invention has been described in terms of the foregoing example embodiments, variations within the scope and spirit of the present invention as defined by the claims following will be apparent to those skilled in the art. For example, the hanger 330 may be of any suitable shape, e.g., hanger 330 may have a hook shape or an eye shape or a tee shape or a nail-head shape, or any other shape or combination of shapes by which the light 10 may be hung from or attached to an object.

[0073] Alternatively, the diameter of track 320 may be made to alternate between a slightly smaller diameter and a slightly larger diameter along the length of track 320 so as to provide a serrated track that tends to define particular positions of larger diameter along the length of track 320 where hanger 330 may be placed and will tend to remain.

[0074] While certain elements may be shown as having a projection that fits into a complementary recess of another element, such recesses and projections may be interchanged between elements so long as the complementary mating relationship is maintained. For example, circuit boards 450 and 460 could have their respective interconnecting openings and tabs exchanged, as could the be the projection 116 and clip 136 of latch 150 and/or the prongs 184 of retainer 180 and the recesses 304 of housing 310, 310'.

[0075] While four magnets are illustrated for holding portable light 10 to a metallic object, a greater or lesser number of magnets may be employed. In a preferred embodiment, a relatively larger single magnet may be employed so as to render light 10 more firmly attachable to an irregular or non-planar surface. In another preferable embodiment, at least three magnets are employed because they define a plane which is thought to improve the stability of light 10 relative to the object to which it is magnetically attached. Further, while light 10 is attached to an object by its magnets 340, hanger 330 may be employed to support another object, e.g., a tool, from light 10 whereby the magnets 340 and hanger 330 of light 10

serve dual functions for supporting light 10 and for light 10 supporting another object.

[0076] Fasteners may be employed for retaining various elements of light 10 in desired locations. Such fasteners may include screws, bolts, pins, drive screws, drive pins, rivets, nails, adhesives, sonic or heat welding, peened pins or rivets, or any other suitable fastener arrangement.

[0077] Finally, numerical values stated are typical or example values, are not limiting values, and do not preclude substantially larger and/or substantially smaller values. Values in any given embodiment may be substantially larger and/or may be substantially smaller than the example or typical values stated.

Claims

1. A portable light comprising:

a light body (100) having first and second ends and defining an axis (101) between the first and second ends,

a light head (200) including a pivot base (210) rotatably mounted at the first end of said light body (100) and rotatable about the light body axis (101),

wherein the rotatable mounting of said light head (200) and said light body (100) includes an electrical slip ring (222, 232, 430) providing electrical connections (220, 230) through the rotatable mounting of said light head and said light body; said light head (200) including a light source (250) pivotably mounted to the pivot base (210) thereof and pivotable at least 180° relative to the pivot base,

characterised in that the pivotable mounting of said light source (250) and said pivot base (210) includes coaxial electrically conductive members (224, 234) providing two electrical connections (220, 230) through one pivotable mounting joint of said light source and said pivot base,

wherein the coaxial electrically conductive members comprise: a pair of coaxial electrically conductive members (224, 234) separated by a coaxial insulating member (244), wherein said pair of coaxial electrical conductive members (224, 234) separated by a coaxial insulating member (244) provide the pivotable mounting and at least two electrical conduction paths between said light body (100) and said light source (250), and

wherein said light body (100) and the pivot base (210) of said light head (200) have respective circular flanges (112, 212) of like diameter positioned adjacent each other, further comprising a retainer ring (180) having a groove (182) on

an inner surface thereof, wherein said retainer ring is positioned over the respective circular flanges (112, 212) of said light body (100) and said pivot base (210) to provide a rotatable joint.

2. The portable light of claim 1 wherein said light body (100) has a track (320) and further comprises:

a hanger (330) having an end (332) riding in the track of said light body (100) and movable therein, wherein said hanger (330) is movable to positions over a range of angles relative to said light body.

3. The portable light of claim 2 wherein said light body (100) comprises a light body housing (110) and a hanger housing (310, 310') attached to said light body housing, wherein said hanger housing (310, 310') provides the track (320) for said hanger (330).

4. The portable light of claim 1 wherein the electrical slip ring comprises:

a pair of coaxial circular electrical contacts (432,434) coaxial with the circular flange (112, 212) of one of said light body (100) and said pivot base (210); and

a pair of electrical contacts (222, 232) in the other of said light body and said pivot base, each of said pair of electrical contacts (222, 232) positioned for contacting a respective one of said pair of coaxial circular electrical contacts (432,434),

whereby at least two electrical conduction paths are provided between said light body (100) and said light head (200).

5. The portable light of claim 1 further comprising:

a clip (500) mounted to a side of said light body (100); or

at least one magnet (340, 340') mounted to a side of said light body (100) for holding said light body proximate a metal object; or

at least one magnet (340, 340') mounted to a side of said light body (100) for holding said light body proximate a metal object and a clip (500) mounted to the side of said light body; or

at least one magnet (340, 340') mounted to a side of said light body (100) proximate said light head (200) for holding said light body proximate a metal object; or

at least one magnet (340, 340') mounted to a side of said light body (100) remote from said light head (200) for holding said light body proximate a metal object; or

a plurality of magnets (340, 340') mounted to a side of said light body (100) for holding said light

body proximate a metal object.

6. The portable light of claim 1 wherein:

said light head (200) is rotatable at least 360° about the light body axis (101), or said light source (250) is pivotable about 180° about the base (210); or

said light head (200) is rotatable at least 360° about the light body axis (101) and said light source (250) is pivotable about 180° about the base (210) of the light head.

7. The portable light of claim 1 wherein:

said light body (100) further comprises a pivotable clip (500) pivotably mounted to said light body, wherein said pivotable clip has a clipping end (510) biased to bear against said light body (100).

8. The portable light of claim 1 wherein said light head (200) includes a light source (250) and said light source includes a reflector (260), and:

wherein said reflector has a parabolic shape or a squared trapezoidal shape; or

wherein said reflector (260) is shaped to provide a flood light beam or is shaped to provide a spot light beam; or

wherein said reflector has a parabolic shape or a squared trapezoidal shape and is shaped to provide a flood light beam or is shaped to provide a spot light beam.

Patentansprüche

1. Tragbare Lampe, umfassend:

einen Lampenkörper (100), der ein erstes Ende und ein zweites Ende aufweist und der eine Achse (101) zwischen dem ersten Ende und dem zweiten Ende definiert,

einen Lampenkopf (200), der einen Drehsockel (210) aufweist, der drehbar an dem ersten Ende des Lampenkörpers (100) befestigt ist und der drehbar um die Lampenkörperachse (101) ist, wobei die drehbare Befestigung des Lampenkopfes (200) und des Lampenkörpers (100) einen elektrischen Schleifring (222, 232, 430) aufweist, der elektrische Verbindungen (220, 230) durch die drehbare Befestigung des Lampenkopfes und des Lampenkörpers hindurch bereitstellt;

wobei der Lampenkopf (200) eine Lichtquelle (250) aufweist, die schwenkbar an dem Drehsockel (210) befestigt ist und die um zumindest

180° relativ zu dem Drehsockel verschwenkbar ist,

dadurch gekennzeichnet, dass die schwenkbare Befestigung der Lichtquelle (250) und des Drehsockels (210) koaxial angeordnete, elektrisch leitfähige Stücke (224, 234) aufweist, die zwei elektrische Verbindungen (220, 230) durch ein schwenkbares Befestigungsgelenk der Lichtquelle und des Drehsockels bereitstellen, wobei die koaxial angeordneten, elektrisch leitfähigen Stücke das Folgende aufweisen:

ein Paar koaxial angeordneter, elektrisch leitfähiger Stücke (224, 234), die durch ein koaxial angeordnetes, isolierendes Stück (244) voneinander getrennt sind, wobei das Paar der koaxial angeordneten, elektrisch leitfähigen Stücke (224, 234), die durch ein koaxial angeordnetes, isolierendes Stück (244) voneinander getrennt sind, die schwenkbare Befestigung und zumindest zwei elektrische Leitungswege zwischen dem Lampenkörper (100) und der Lichtquelle (250) bereitstellen, und

wobei der Lampenkörper (100) und der Drehsockel (210) des Lampenkopfes (200) jeweils benachbart zueinander angeordnete Rundflansche (112, 212) gleichen Durchmessers aufweisen, weiterhin einen Sicherungsring (180) aufweisen, der eine Nut (182) an dessen innerer Oberfläche aufweist, wobei der Sicherungsring über die jeweiligen Rundflansche (112, 212) des Lampenkörpers (100) und des Drehsockels (210) positioniert ist, um ein Drehgelenk bereitzustellen.

2. Tragbare Lampe nach Anspruch 1, wobei der Lampenkörper (100) eine Rille (320) aufweist und weiterhin umfasst:

einen Aufhänger (330), der ein Ende (332) aufweist, das in der Rille des Lampenkörpers (100) geführt ist und darin bewegbar ist, wobei der Aufhänger (330) in Positionen über einen Winkelbereich relativ zu dem Lampenkörper bewegbar ist.

3. Tragbare Lampe nach Anspruch 2, wobei der Lampenkörper (100) ein Lampenkörpergehäuse (110) und ein an dem Lampenkörpergehäuse befestigtes Aufhängergehäuse (310, 310') aufweist, wobei das Aufhängergehäuse (310, 310') die Rille (320) für den Aufhänger (330) bereitstellt.

4. Tragbare Lampe nach Anspruch 1, wobei der elektrische Schleifring aufweist:

ein Paar koaxial angeordneter, kreisförmiger elektrischer Kontakte (432, 434), die koaxial zu dem Rundflansch (112, 212) entweder des Lampenkörpers (100) oder des Drehsockels (210) angeordnet sind; und

ein Paar elektrischer Kontakte (222, 232) in der entsprechend anderen Komponente entweder im Lampenkörper oder im Drehsockel, wobei jeder Kontakt des Paares elektrischer Kontakte (222, 232) zum Kontaktieren eines entsprechenden Kontaktes des Paares koaxial angeordneter, kreisförmiger elektrischer Kontakte (432, 434) angeordnet ist,

wobei zumindest zwei elektrische Leitungswege zwischen dem Lampenkörper (100) und dem Lampenkopf (200) bereitgestellt sind.

5. Tragbare Lampe nach Anspruch 1, die weiterhin aufweist:

eine Klammer (500), die an einer Seite des Lampenkörpers (100) befestigt ist; oder zumindest einen Magnet (340, 340'), der an einer Seite des Lampenkörpers (100) befestigt ist, um den Lampenkörper unmittelbar an einem Metallobjekt zu halten; oder

zumindest einen Magnet (340, 340'), der an einer Seite des Lampenkörpers (100) befestigt ist, um den Lampenkörper unmittelbar an einem Metallobjekt zu halten und eine Klammer (500), die an der Seite des Lampenkörpers befestigt ist; oder

zumindest einen Magnet (340, 340'), der an einer Seite des Lampenkörpers (100) nahe des Lampenkopfes (200) befestigt ist, um den Lampenkörper unmittelbar an einem Metallobjekt zu halten; oder

zumindest einen Magnet (340, 340') der an einer Seite des Lampenkörpers (100) entfernt von dem Lampenkopf (200) befestigt ist, um den Lampenkörper unmittelbar an einem Metallobjekt zu halten; oder

eine Vielzahl von Magneten (340, 340') die an einer Seite des Lampenkörpers (100) befestigt sind, um den Lampenkörper unmittelbar an einem Metallobjekt zu halten.

6. Tragbare Lampe nach Anspruch 1, wobei:

der Lampenkopf (200) um zumindest 360° um die Lampenkörperachse (101) drehbar ist, oder die Lichtquelle um ungefähr 180° um den Sockel (210) schwenkbar ist; oder

der Lampenkopf (200) um zumindest 360° um die Lampenkörperachse (101) drehbar ist und

die Lichtquelle (250) um ungefähr 180° um den Sockel (210) des Lampenkopfes schwenkbar ist.

7. Tragbare Lampe nach Anspruch 1, wobei:

der Lampenkörper weiterhin eine schwenkbare Klammer (500) aufweist, die schwenkbar an dem Lampenkörper befestigt ist, wobei die schwenkbare Klammer ein anklammerndes Ende (510) aufweist, das vorgespannt ist, um gegen den Lampenkörper (100) zu drücken.

8. Tragbare Lampe nach Anspruch 1, wobei der Lampenkopf (200) eine Lichtquelle (250) aufweist und die Lichtquelle einen Reflektor (260) aufweist, und:

wobei der Reflektor eine parabolische Form oder eine eckige, trapezförmige Form aufweist; oder
wobei der Reflektor geformt ist, um einen Flutlichtstrahl oder einen Spot-Lichtstrahl bereitzustellen; oder
wobei der Reflektor eine parabolische Form oder eine eckige, trapezförmige Form aufweist und geformt ist, um einen Flutlichtstrahl bereitzustellen oder geformt ist, um einen Spot-Lichtstrahl bereitzustellen.

Revendications

1. Dispositif d'éclairage portatif comprenant :

un corps (100) de dispositif d'éclairage ayant des première et seconde extrémités et définissant un axe (101) entre les première et seconde extrémités,
une tête (200) de dispositif d'éclairage comprenant une base pivotante (210) montée à rotation sur la première extrémité dudit corps (100) de dispositif d'éclairage et pouvant tourner autour de l'axe (101) du corps de dispositif d'éclairage, le montage rotatif de ladite tête (200) de dispositif d'éclairage et dudit corps (100) de dispositif d'éclairage comprenant un collecteur tournant électrique (222, 232, 430) fournissant des connexions électriques (220, 230) à travers le montage rotatif de ladite tête de dispositif d'éclairage et dudit corps de dispositif d'éclairage ;
ladite tête (200) de dispositif d'éclairage comprenant une source lumineuse (250) montée de manière pivotante sur la base pivotante (210) de celle-ci et pouvant pivoter d'au moins 180° par rapport à la base pivotante,
caractérisé en ce que le montage pivotant de ladite source lumineuse (250) et de ladite base pivotante (210) comprend des éléments coaxiaux électroconducteurs (224, 234) fournissant deux connexions électriques (220, 230) à travers un joint d'assemblage pivotant de ladite source lumineuse et de ladite base pivotante,

les éléments coaxiaux électroconducteurs comprenant : une paire d'éléments coaxiaux électroconducteurs (224, 234) séparés par un élément coaxial isolant (244), ladite paire d'éléments coaxiaux électroconducteurs (224, 234) séparés par un élément coaxial isolant (244) fournissant le montage pivotant et au moins deux trajets de conduction électrique entre ledit corps (100) de dispositif d'éclairage et ladite source lumineuse (250), et ledit corps (100) de dispositif d'éclairage et la base pivotante (210) de ladite tête (200) de dispositif d'éclairage ayant des brides circulaires (112, 212) respectives de diamètre analogue positionnées de manière adjacente l'une à l'autre, comprenant en outre une bague de retenue (180) munie d'une rainure (182) sur sa surface interne, ladite bague de retenue étant positionnée sur les brides circulaires (112, 212) respectives dudit corps (100) de dispositif d'éclairage et de ladite base pivotante (210) pour fournir un joint rotatif.

2. Dispositif d'éclairage portatif selon la revendication 1, dans lequel ledit corps (100) de dispositif d'éclairage présente un rail (320) et comprend en outre :

un crochet (330) dont une extrémité (332) est montée dans le rail dudit corps (100) de dispositif d'éclairage et peut se déplacer à l'intérieur de celui-ci, ledit crochet (330) étant mobile dans plusieurs positions selon des angles différents par rapport audit corps de dispositif d'éclairage.

3. Dispositif d'éclairage portatif selon la revendication 2, dans lequel ledit corps (100) de dispositif d'éclairage comprend un logement (110) de corps de dispositif d'éclairage et un logement (310, 310') de crochet fixé audit logement de corps de dispositif d'éclairage, ledit logement (310, 310') de crochet fournissant le rail (320) pour ledit crochet (330).

4. Dispositif d'éclairage portatif selon la revendication 1, dans lequel le collecteur tournant électrique comprend :

une paire de contacts coaxiaux électriques circulaires (432, 434) positionnés de manière coaxiale par rapport à la bride circulaire (112, 212) d'un élément parmi ledit corps (100) de dispositif d'éclairage et ladite base pivotante (210) ; et
une paire de contacts électriques (222, 232) dans l'autre élément parmi ledit corps de dispositif d'éclairage et ladite base pivotante, chaque contact de ladite paire de contacts électriques (222, 232) étant positionné pour venir en contact avec un contact respectif de ladite paire de con-

tacts coaxiaux électriques circulaires (432, 434), moyennant quoi au moins deux chemins de conduction électrique sont prévus entre ledit corps (100) de dispositif d'éclairage et ladite tête (200) de dispositif d'éclairage.

5. Dispositif d'éclairage portatif selon la revendication 1 comprenant en outre :

un clip (500) monté sur un côté dudit corps (100) de dispositif d'éclairage ; ou
 au moins un aimant (340, 340') monté sur un côté dudit corps (100) de dispositif d'éclairage pour maintenir ledit corps de dispositif d'éclairage à proximité d'un objet métallique ; ou
 au moins un aimant (340, 340') monté sur un côté dudit corps (100) de dispositif d'éclairage pour maintenir ledit corps de dispositif d'éclairage à proximité d'un objet métallique et un clip (500) monté sur le côté dudit corps de dispositif d'éclairage ; ou
 au moins un aimant (340, 340') monté sur un côté dudit corps (100) de dispositif d'éclairage à proximité de ladite tête (200) de dispositif d'éclairage pour maintenir ledit corps de dispositif d'éclairage à proximité d'un objet métallique ; ou
 au moins un aimant (340, 340') monté sur un côté dudit corps (100) de dispositif d'éclairage éloigné de ladite tête (200) de dispositif d'éclairage pour maintenir ledit corps de dispositif d'éclairage à proximité d'un objet métallique ; ou
 une pluralité d'aimants (340, 340') montés sur un côté dudit corps (100) de dispositif d'éclairage pour maintenir ledit corps de dispositif d'éclairage à proximité d'un objet métallique.

6. Dispositif d'éclairage portatif selon la revendication 1, dans lequel :

ladite tête (200) de dispositif d'éclairage peut tourner au moins à 360° autour de l'axe (101) du corps de dispositif d'éclairage, ou
 ladite source lumineuse (250) peut pivoter sur environ 180° autour de la base (210) ; ou
 ladite tête (200) de dispositif d'éclairage peut tourner au moins à 360° autour de l'axe (101) du corps de dispositif d'éclairage et ladite source lumineuse (250) peut pivoter sur environ 180° autour de la base (210) de la tête de dispositif d'éclairage.

7. Dispositif d'éclairage portatif selon la revendication 1, dans lequel :

ledit corps (100) de dispositif d'éclairage comprend en outre un clip pivotant (500) monté de manière à pouvoir pivoter sur ledit corps de dis-

positif d'éclairage, ledit clip pivotant ayant une extrémité d'accrochage (510) sollicitée pour s'appuyer contre ledit corps (100) de dispositif d'éclairage.

8. Dispositif d'éclairage portatif selon la revendication 1, dans lequel ladite tête (200) de dispositif d'éclairage comprend une source lumineuse (250) et ladite source lumineuse comprend un réflecteur (260), et :

dans lequel ledit réflecteur est de forme parabolique ou de forme trapézoïdale carrée ; ou
 dans lequel ledit réflecteur (260) est configuré pour projeter un faisceau lumineux large ou bien configuré pour projeter un faisceau lumineux étroit ; ou
 dans lequel ledit réflecteur est de forme parabolique ou de forme trapézoïdale carrée et est configuré pour projeter un faisceau lumineux large ou bien configuré pour projeter un faisceau lumineux étroit.

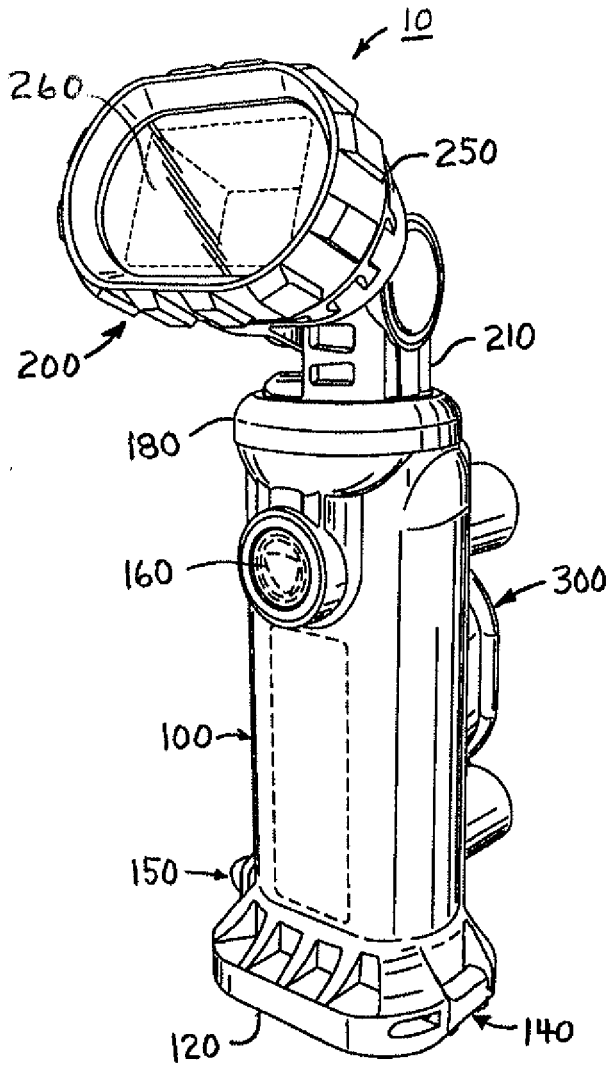


Fig. 1

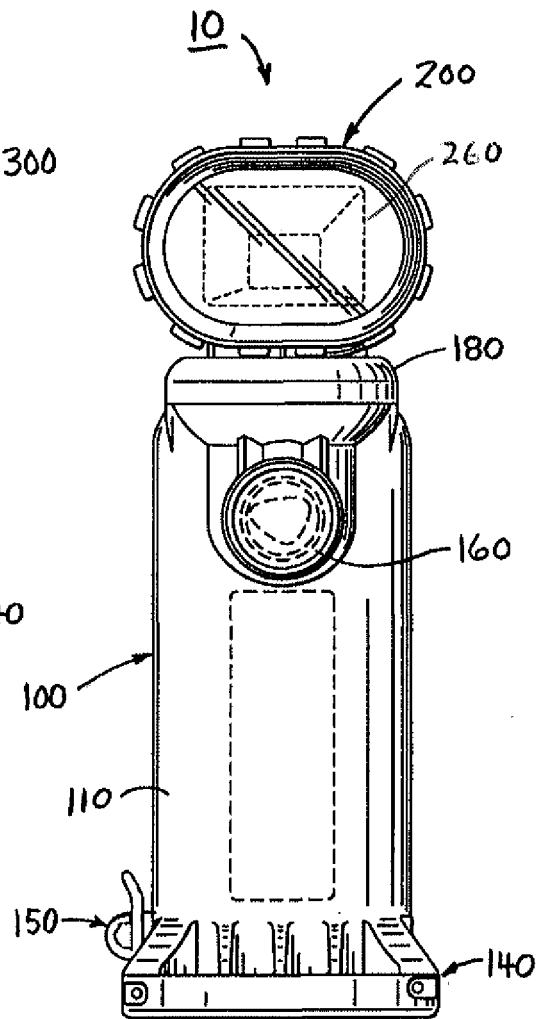
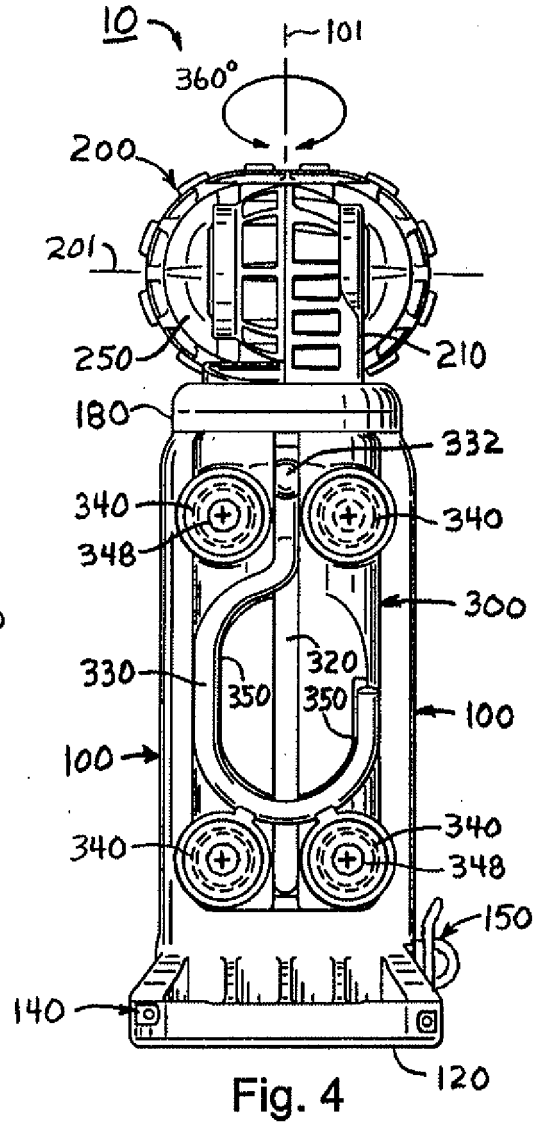
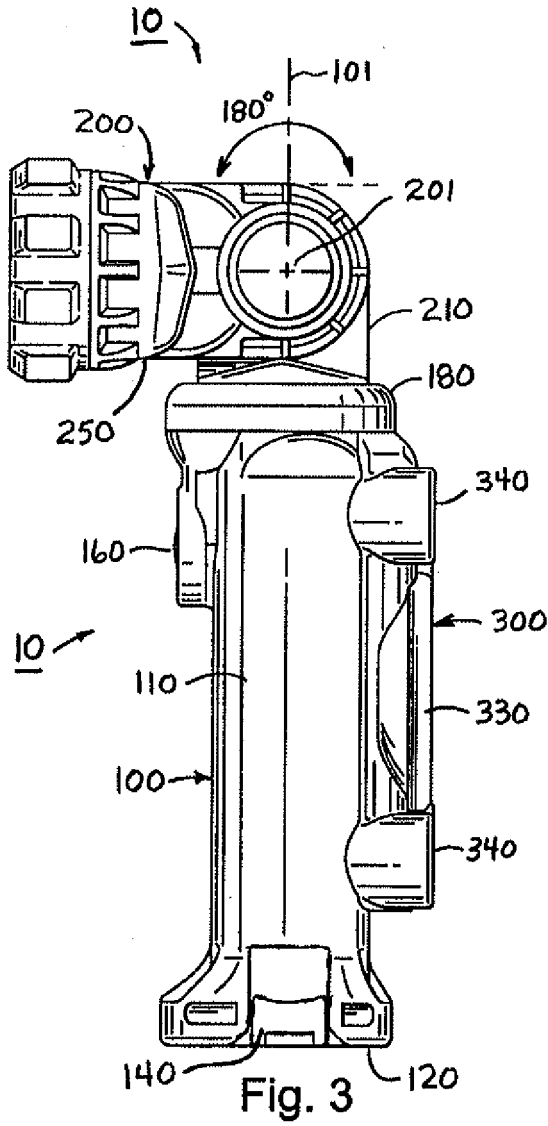


Fig. 2



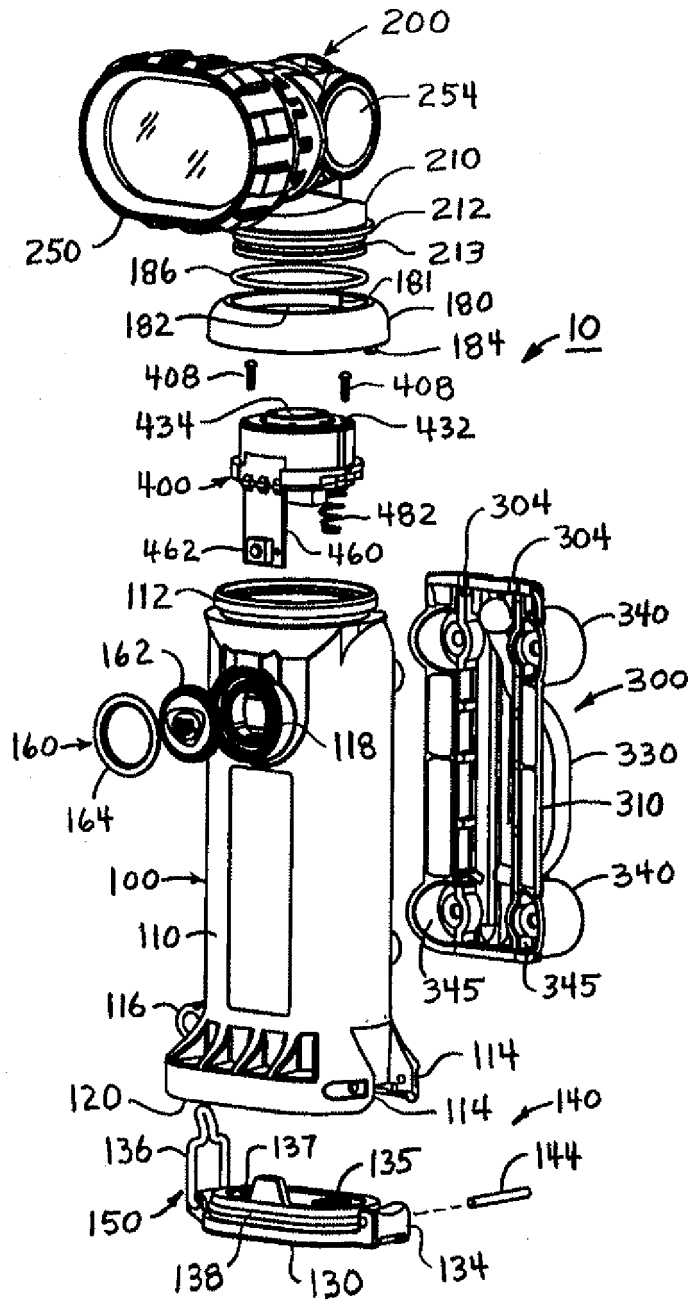


FIG. 5.

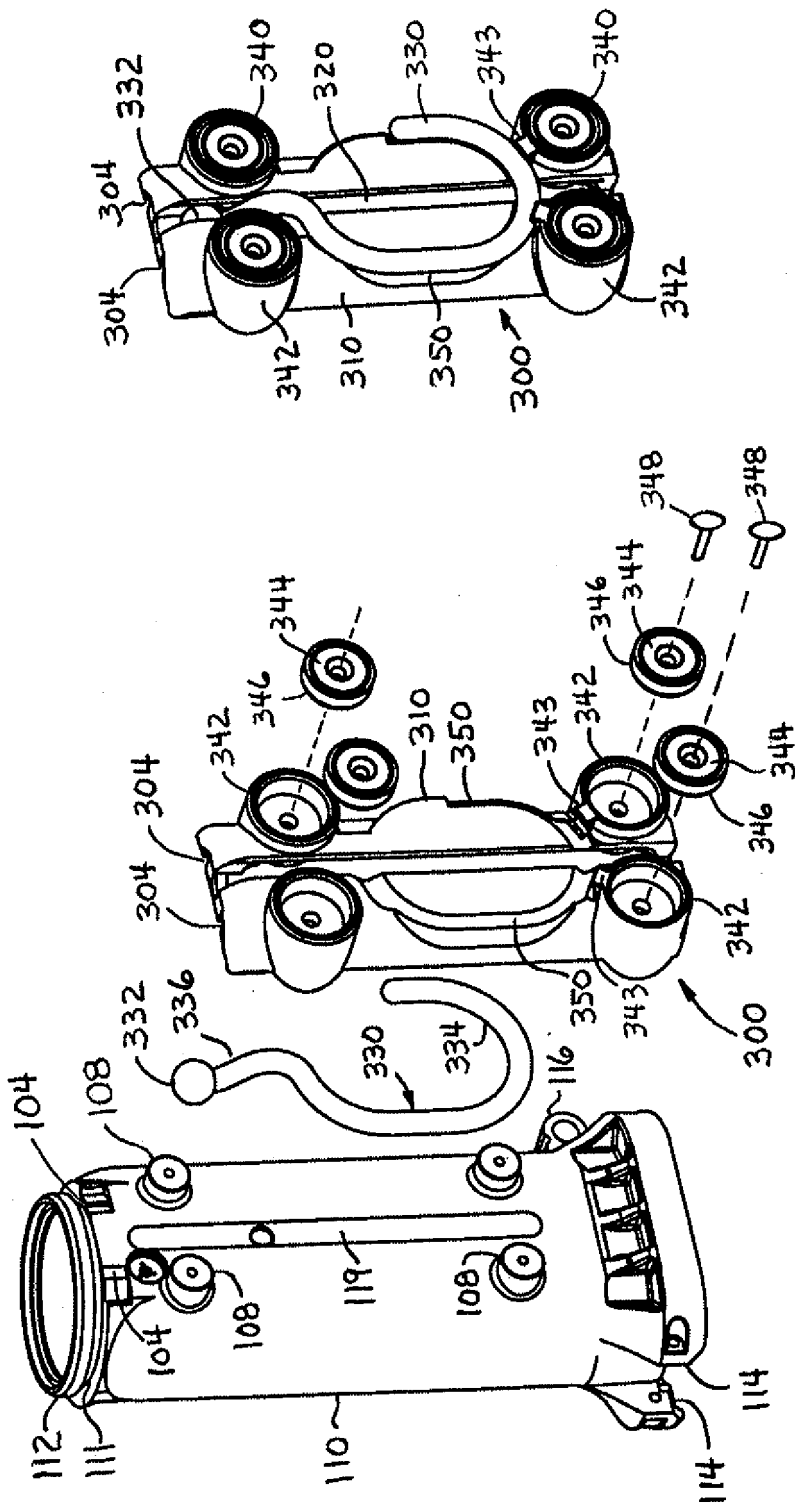


FIG. 6B

FIG. 6A.

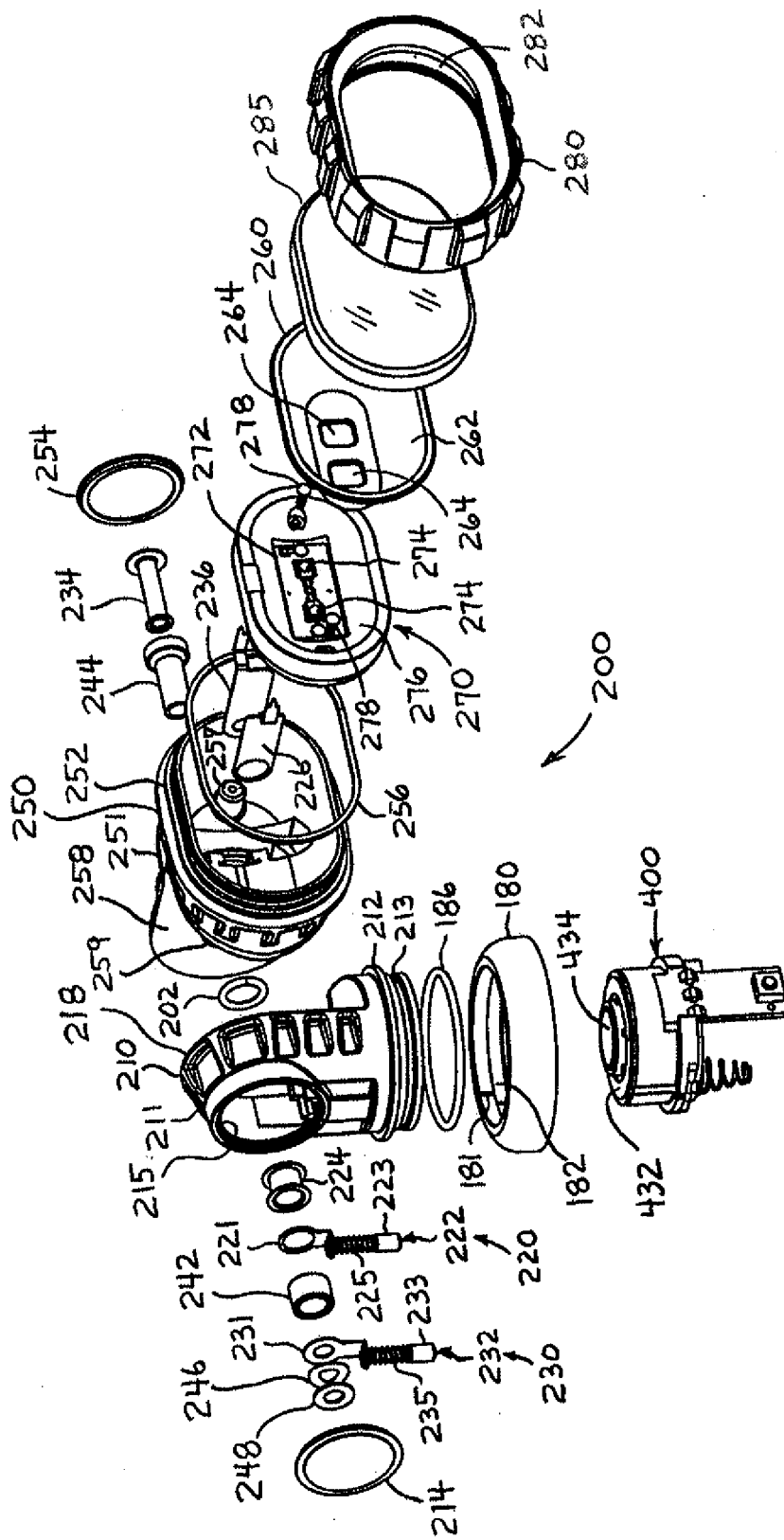


FIG. 7.

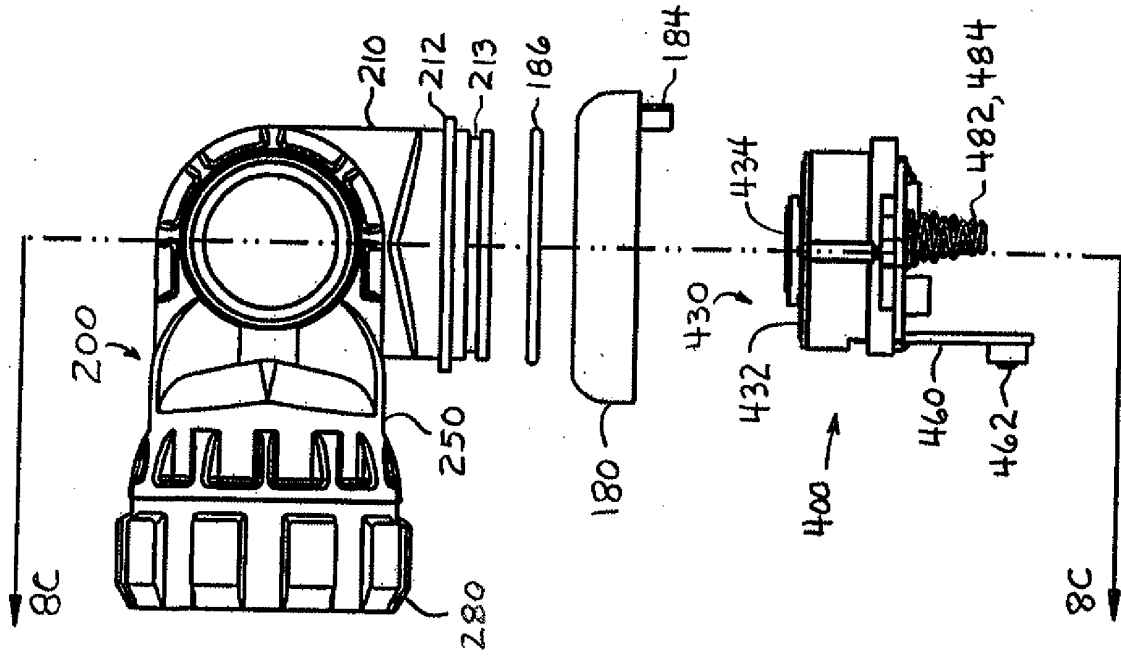


FIG. 8B

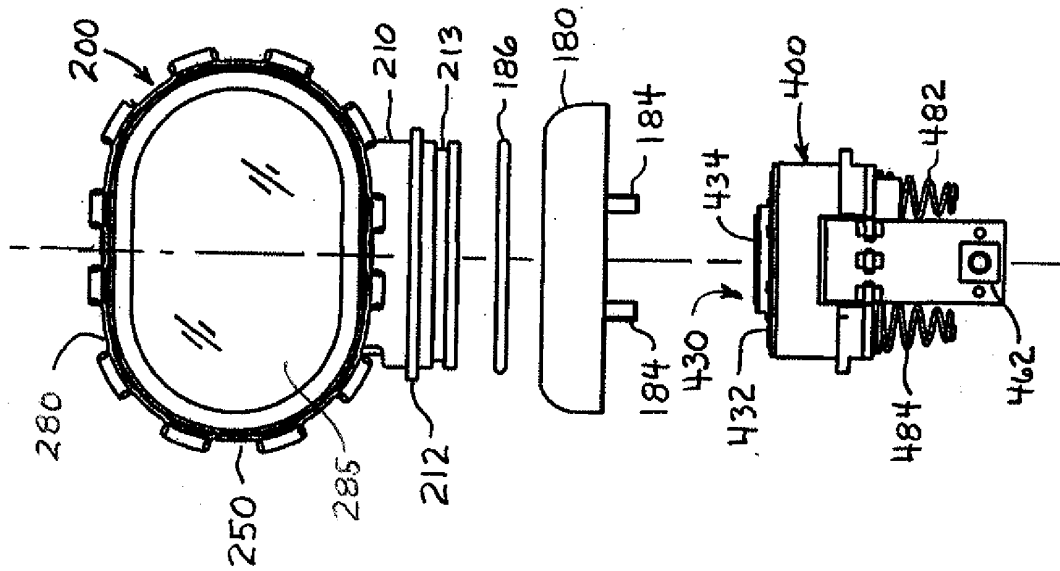


FIG. 8A

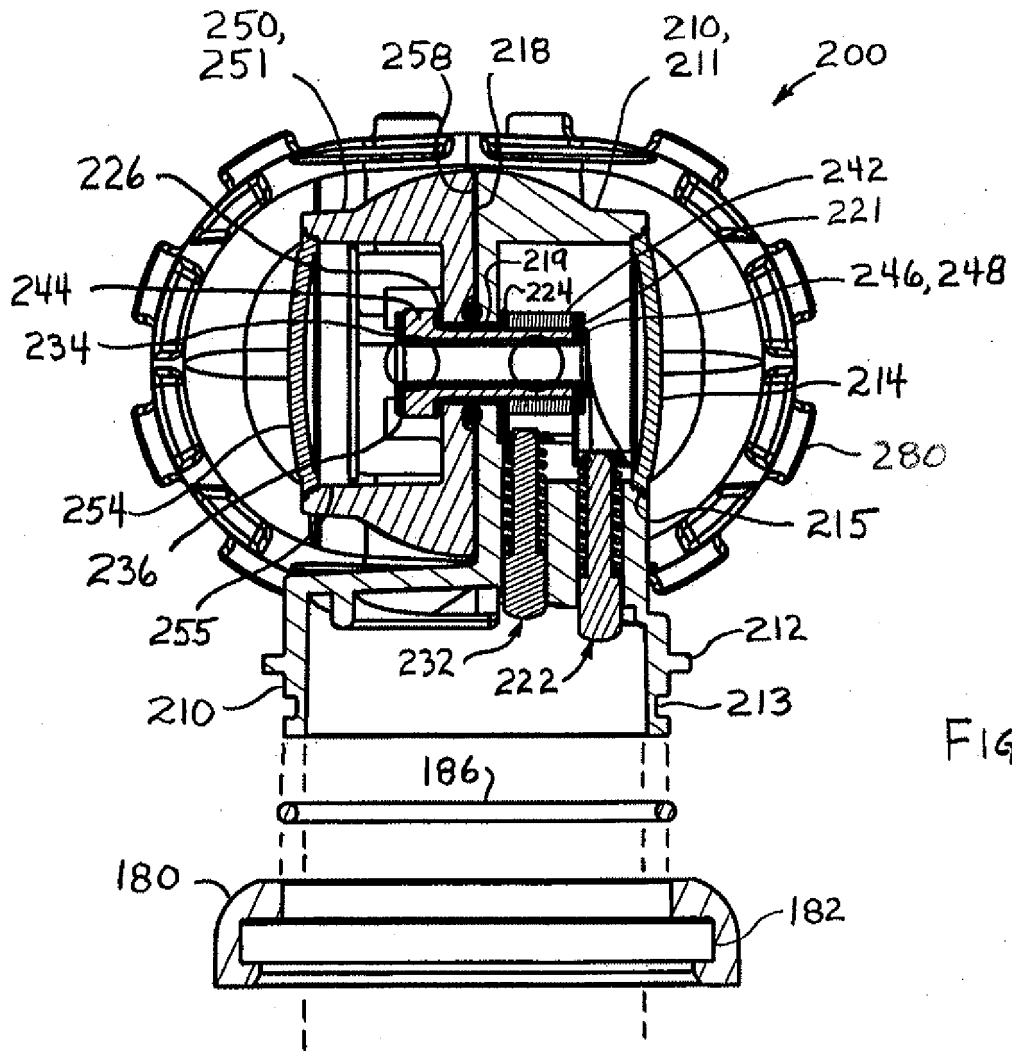


FIG. 8C.

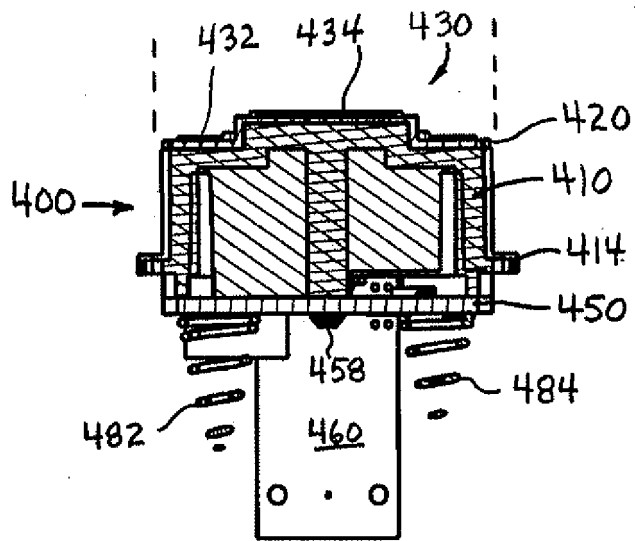


FIG. 9B.

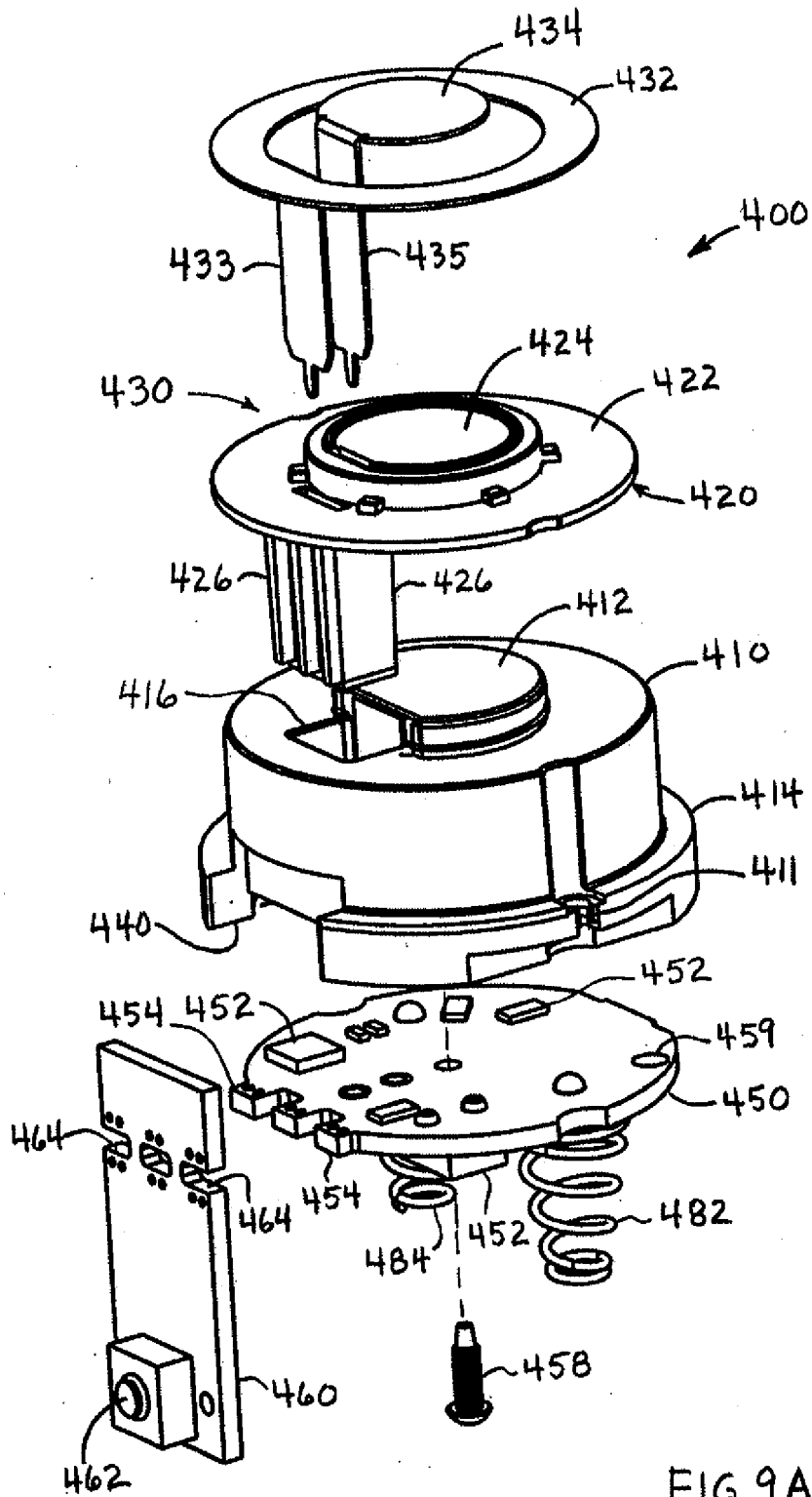


FIG. 9A.

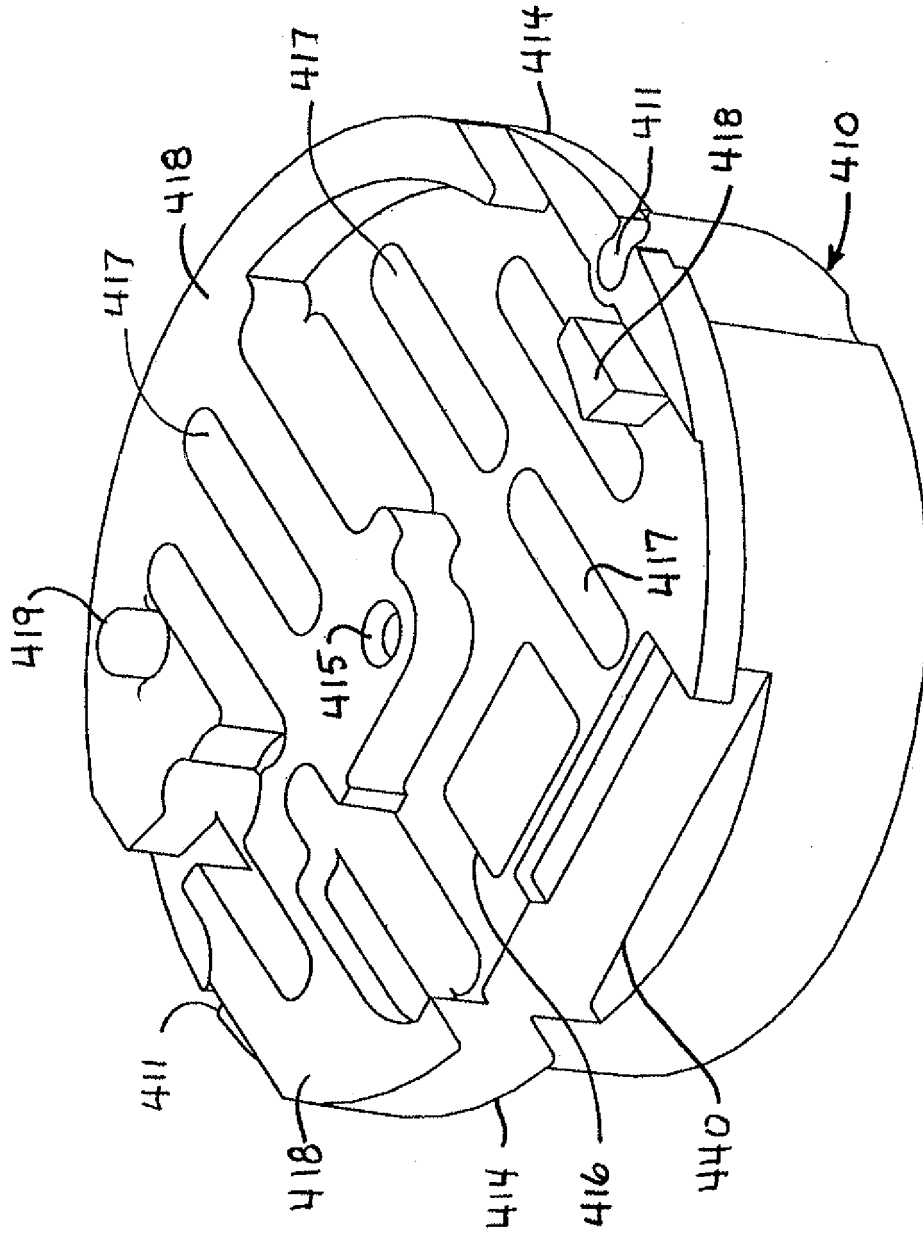


FIG. 9C.

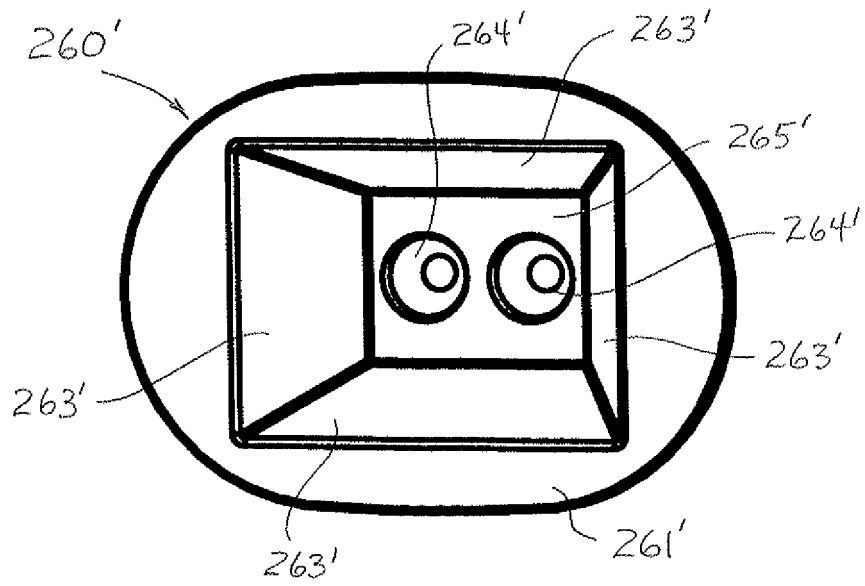


FIGURE 10A

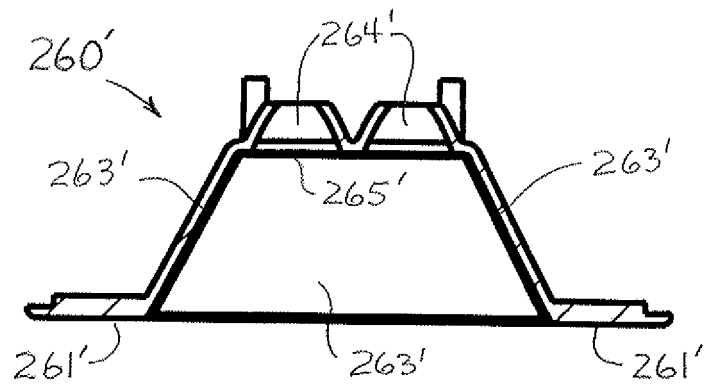


FIGURE 10B

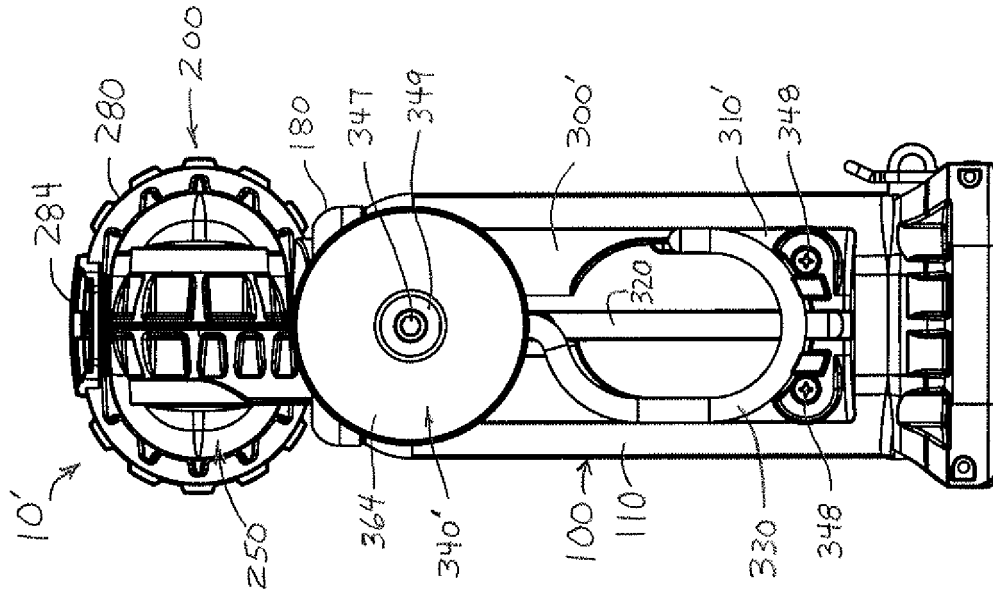


FIGURE 12

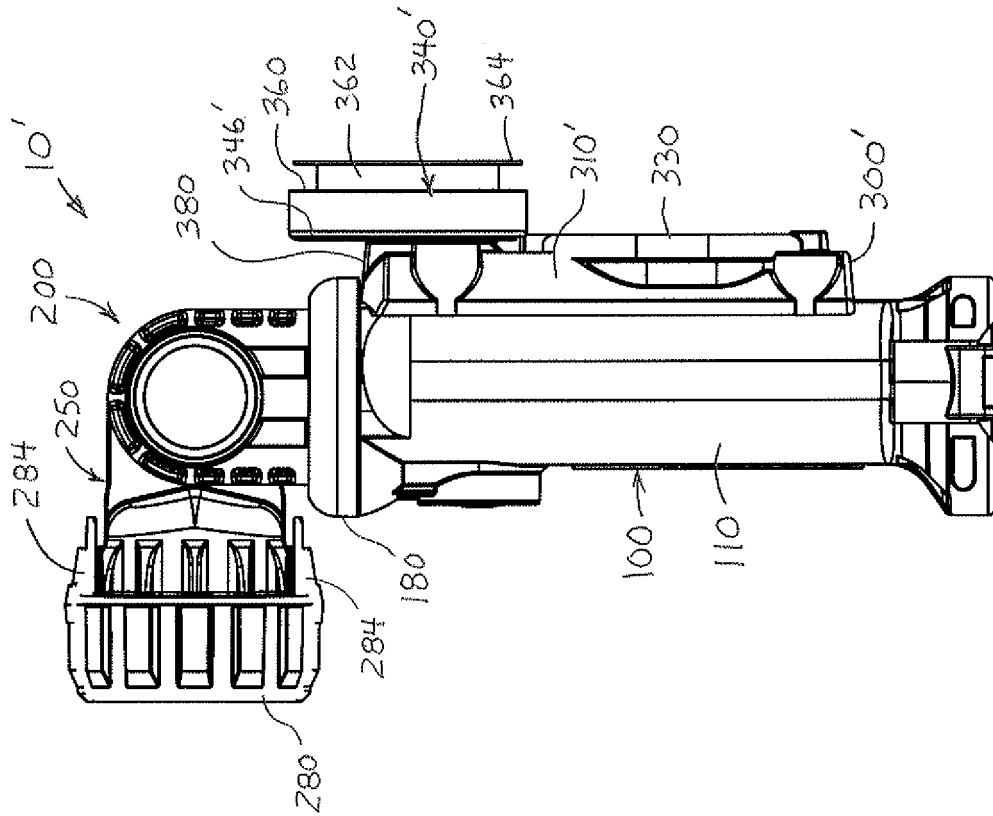


FIGURE 11

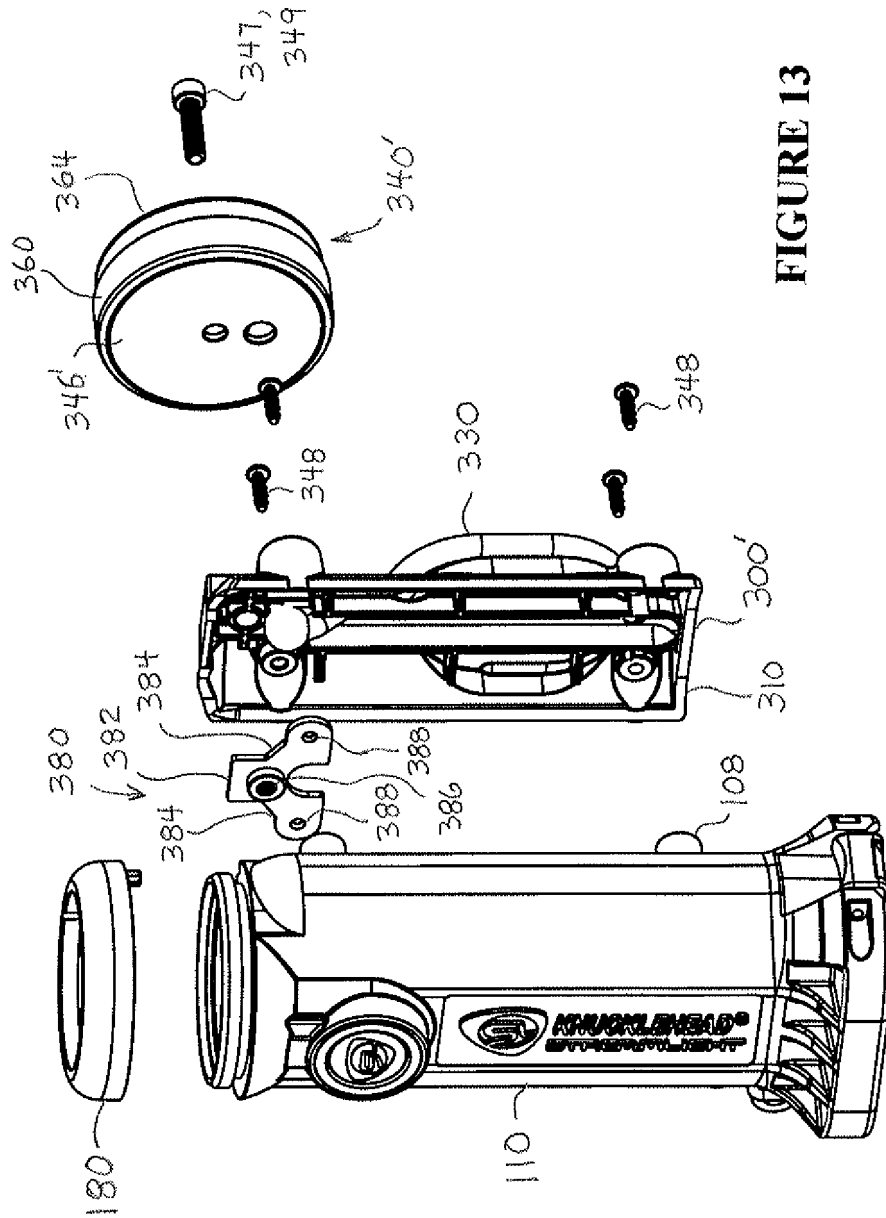


FIGURE 13

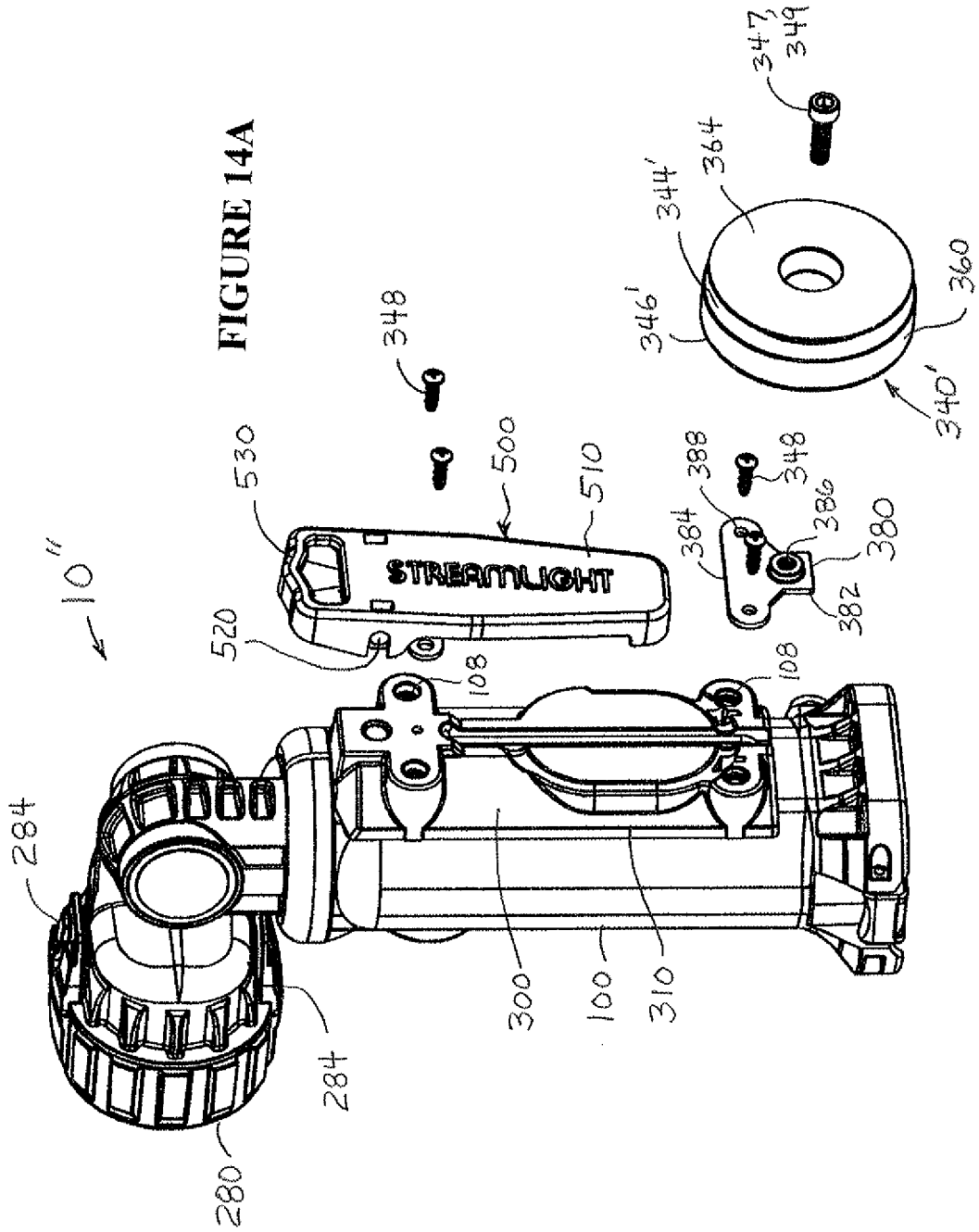
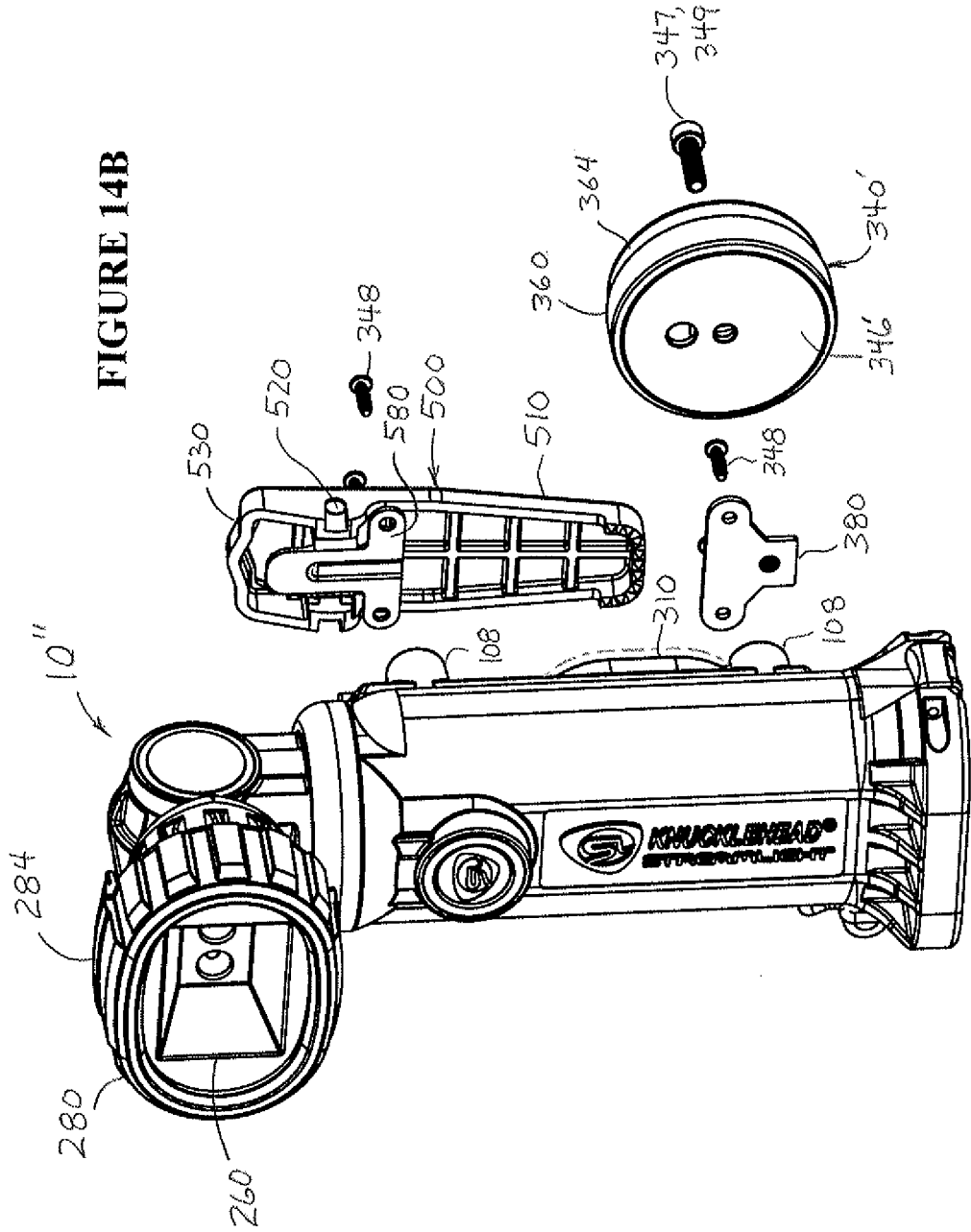


FIGURE 14B



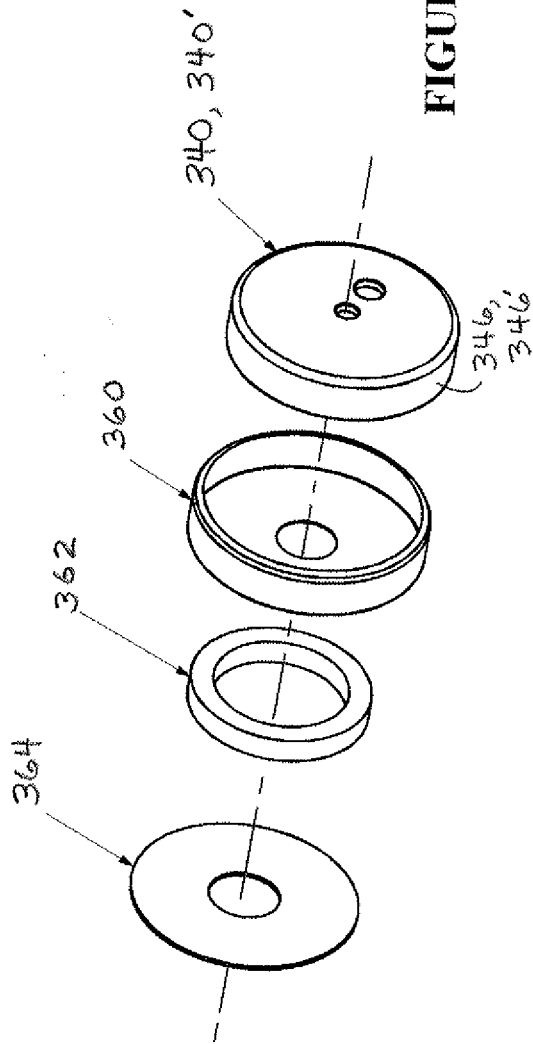


FIGURE 15A

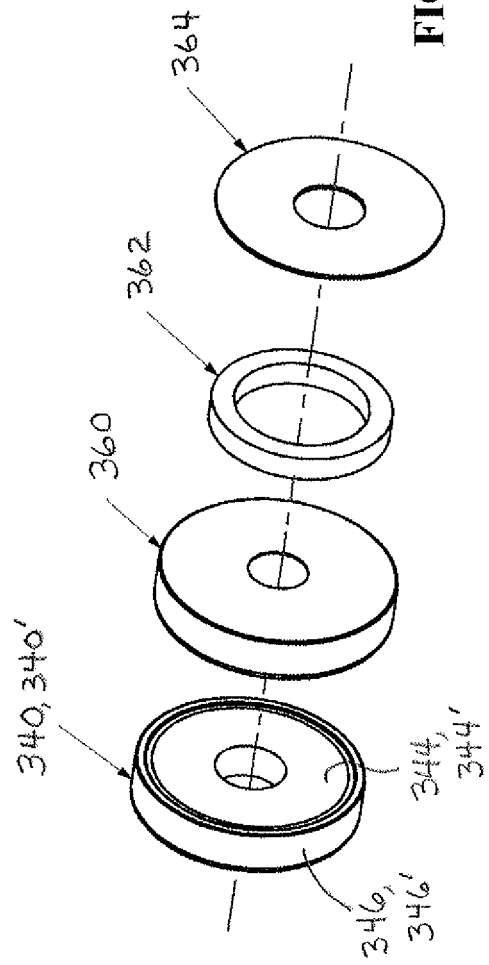


FIGURE 15B

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 7172310 B2 [0006]
- US 5993022 A [0007]
- US 7338189 B2 [0008]
- US 5871272 A [0009]