

(19) **DANMARK**

(10) **DK/EP 2118559 T3**



(12) **Oversættelse af
europæisk patentskrift**

**Patent- og
Varemærkestyrelsen**

-
- (51) Int.Cl.: **B 60 Q 1/26 (2006.01)** **F 21 S 8/10 (2006.01)** **F 41 H 3/00 (2006.01)**
F 21 Y 101/02 (2006.01)
- (45) Oversættelsen bekendtgjort den: **2014-03-17**
- (80) Dato for Den Europæiske Patentmyndigheds bekendtgørelse om meddelelse af patentet: **2013-12-25**
- (86) Europæisk ansøgning nr.: **08780399.5**
- (86) Europæisk indleveringsdag: **2008-02-01**
- (87) Den europæiske ansøgnings publiceringsdag: **2009-11-18**
- (86) International ansøgning nr.: **US2008052824**
- (87) Internationalt publikationsnr.: **WO2008124204**
- (30) Prioritet: **2007-02-01 US 887673 P**
- (84) Designerede stater: **AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT RO SE SI SK TR**
- (73) Patenthaver: **Grote Industries, Inc., 2600 Lanier Drive, Madison, IN 47250, USA**
- (72) Opfinder: **DRAKE, Matthew, E., 2474 Forest Drive, Madison, IN 47250, USA**
BOLANDER, Albert, J., Jr., 102 Knobview Drive, Memphis, IN 47413, USA
- (74) Fuldmægtig i Danmark: **Budde Schou A/S, Hausergade 3, 1128 København K, Danmark**
- (54) Benævnelse: **Kamufleret komposit militærfartøjslygte**
- (56) Fremdragne publikationer:
DE-A1- 3 911 896
US-A- 5 632 551
US-A- 5 890 794
US-A1- 2002 093 820
US-B1- 6 367 949
US-B1- 6 843 589

Description**CROSS-REFERENCE TO RELATED APPLICATIONS**

[0001] This application is based on provisional patent application Serial No. 60/887,673, filed February 1, 2007, and priority and the benefit of Serial No. 60/887,673 is claimed in the present application to the extent the subject matter of this application is found in that provisional application.

TECHNICAL FIELD

[0002] The present disclosure generally relates to vehicle lamps and, more particularly, to a camouflaged composite military vehicle lamp.

BACKGROUND

[0003] Blackout lamps are commonly used on military vehicles in situations where it is desired to maneuver at night while producing minimal light, while at the same time providing safety for other vehicles following in a convoy formation. Typical blackout lamps for the rear of a military vehicle comprise two housings on either side of the rear of the vehicle, with each housing incorporating two red transparent filter panels with one or more incandescent lamps mounted behind each panel or light emitting diodes mounted behind a white (not clear) lens. Illumination of the incandescent lamps, which produce broad spectrum light, is filtered through the red panels in order to transmit only red light. Illumination of the light emitting diodes diffusely transmits light through the white panels. The lamps are illuminated at low light levels in order to not produce excessive light, which could alert an enemy to the presence of the vehicle. Such lamps also typically have visors protruding from the housing above the blackout lamp panels or the blackout lamps are recessed within the housing in order to limit identification of the lamps from the air. The housings also typically hold standard rear stop/tail/turn lights or front park/turn lights for use during the day and/or when blackout conditions are not warranted.

[0004] German patent application number DE3911896A1 discloses a lamp comprising a housing, a parabolic reflector and a light source. The housing defines an opening that has a light-transmissive disc positioned therein, having projections and recesses. The disc, which may be coloured or have sections of different colours, also includes a flexible blind having flaps aligned with the projections, tensioned over the outside of the disc. As the blind is pulled towards the light source, the projections push the flaps into an open configuration so as to allow light to pass through the flexible blind. The blind may also be of the same colour as the vehicle to which it is attached.

[0005] The prior art lamps are effective for camouflaging the vehicle while operating at night. However, the

lamps do not provide adequate camouflage for the vehicle during the day. The military goes to great lengths to paint the vehicles in colors and patterns that make them difficult to spot in the area of anticipated operation, but the lamps on the vehicle are not well camouflaged and therefore compromise the safety of those operating the vehicle. In fact, because the lamps require an opening in the armor of the vehicle, they become targets for the enemy to aim their weapons at in hopes of penetrating the vehicle armor.

[0006] Some of the deficiencies in the prior art lamps used on military vehicles include the fact that the stop/tail/turn lamps are covered by red and/or amber lenses which provide the desired colored appearance to the incandescent white lamps mounted behind the lenses. These colored lenses deviate from the camouflaged appearance of the rest of the vehicle, thereby making the vehicle easier to spot by the enemy. Furthermore, the lenses are made from an optical grade material that is very good at reflecting light which impinges upon its surface from a source external to the lamp. Such reflections off of the lamp lenses also make the vehicle easier to spot. Similarly, the blackout lamps are covered by red or white lenses and are made from plastic with a reflective surface, causing the same problems noted above with respect to the stop/tail/turn lamps. The white lenses also provide a very high contrast with the remaining lamp housing, further drawing attention to the lamp.

[0007] Improvements in these areas are therefore needed.

SUMMARY

[0008] In a first aspect of the invention, a composite lamp assembly for use on a camouflaged military vehicle comprises a lamp housing colored to match the camouflaged scheme of the vehicle, wherein the lamp housing defines an interior space, a first opening in communication with the interior space, and a plurality of second openings in communication with the interior space, and further including a clear lens attached to the housing to occupy the first opening, a plurality of diffusers attached to the housing to occupy the plurality of second openings, and a circuit board arranged within the interior space of the lamp housing, characterized in that a first plurality of colored LEDs are mounted on the circuit board and positioned to provide non-white light through the clear lens, and a second plurality of colored LEDs are mounted on the circuit board and positioned to provide non-white light through the diffusers, wherein a shield is positioned between the circuit board and a front housing component of the lamp housing to substantially prevent light emitted from the second plurality of LEDs from passing through the clear lens, and wherein the diffusers are also colored to match the camouflaged scheme of the vehicle.

[0009] In certain embodiments, the assembly also includes a camouflaged component arranged within the interior space and positioned behind the clear lens such

that at least a portion of the component is at least slightly visible through the clear lens, the camouflaged component being colored to match the camouflaged scheme of the military vehicle.

[0010] In certain embodiments, the composite lamp assembly for use on a camouflaged military vehicle comprises a first lamp portion operable to indicate at least the presence, turning and stopping of the vehicle, and a second lamp portion operable to indicate at least the presence and stopping of the vehicle during nighttime convoy travel. The first lamp portion includes at least the first plurality of coloured LEDs mounted within the camouflaged lamp housing and a clear lens covering the first colored LEDs. The first colored LEDs are operable to emit non-white light directed at the clear lens. The second lamp portion includes at least the second plurality of colored LEDs mounted within the camouflaged lamp housing and at least one camouflaged diffuser covering the second colored LEDs. The second colored LEDs are operable to emit non-white light directed at the diffuser.

[0011] In certain embodiments, the assembly further includes at least one camouflaged visor attached to the housing above the diffuser to reduce the visibility of non-white light emitted from the colored LEDs from above the lamp assembly.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012]

Fig. 1 is a perspective view of a composite military vehicle lamp.

Fig. 2 is an exploded, perspective view of a composite military vehicle lamp according to the embodiment illustrated in Fig. 1.

DESCRIPTION OF THE VARIOUS EMBODIMENTS

[0013] For the purposes of promoting an understanding of the principles of the disclosure, reference will now be made to the embodiment illustrated in the drawings and specific language will be used to describe the same.

[0014] The present disclosure is generally directed to a military vehicle lamp assembly having a lamp housing colored to match the camouflaged scheme of the military vehicle, the lamp housing containing a circuit board with first and second sets of light emitting diodes ("LEDs") mounted thereto. The LEDs are colored such that they emit non-white light, such as red, amber, or other desired light colors. The lamp assembly includes a clear lens positioned with respect to the housing to cover the first set of LEDs, and a plurality of camouflaged diffusers positioned with respect to the housing to cover the second set of LED's. Accordingly, the camouflaged housing and diffusers along with the clear lens create a camouflaged composite lamp assembly, providing increased safety for the vehicle during the daylight hours.

[0015] Referring generally to Figs. 1 - 2, there is shown

an embodiment of a camouflaged vehicle lamp according to the present disclosure, indicated generally at 10. Lamp 10 has a housing 12 made from a suitable material preferably a weather-resistant plastic as is known in the art.

In some embodiments, housing 12 is formed in a color that matches the camouflage scheme of the vehicle into which it is to be mounted. For example, housing 12 may be formed in a sand color that matches the vehicle paint used by United States military forces in the Middle East.

[0016] In the illustrated embodiment, lamp 10 includes an upper portion 13 and a lower portion 15. Upper portion 13 typically provides for the standard vehicle indicating functions. In the illustrated example, lamp 10 is configured to placement at the rear of the military vehicle. Accordingly, upper portion 13 includes the standard stop/tail/turn functions to indicate or signal the stopping, presence, and/or turning of the vehicle. The present disclosure contemplates use and placement of the lamp at the front of the military vehicle. In such cases, the upper portion would include the standard park/turn functions to indicate or signal the parking and/or turning of the vehicle. To accomplish these functions, the upper portion includes a first plurality of LEDs 36 covered by a clear lens 14, with camouflage color showing through the lens. By using clear lens 14 with camouflage color showing through, the camouflaging of lamp 10 is improved. Additionally, in situations where colored light is desired, by using colored LEDs lens 14 is not required to be formed in a color that contrasts with the housing 12 color, thereby improving the camouflaging of lamp 10.

[0017] Lower portion 15 of the lamp 10 includes the blackout function which allows the vehicle to be used in situations where it is desired to minimize the amount of light produced by the vehicle while still providing safety for a vehicle following closely behind. At the rear of the vehicle, the blackout function of lamp 10 may include stop/tail lighting, while at the front of the vehicle the blackout function of lamp 10 may include park lighting. To accomplish the blackout function, lower portion 15 includes a second plurality of LEDs 38 covered by light diffusers 16. Diffusers 16 are colored to match the color of housing 12, and thus colored to match the camouflaged scheme of the vehicle. Additionally, diffusers 16 may include reduced-opacity, as compared to housing 12, to allow a desired amount of light from LEDs 38 to be visible through the housing when they are activated. In situations where colored light is desired, by using colored LEDs, diffusers 16 are not required to be formed in a color that contrasts with the housing 12 color, thereby improving the camouflaging of lamp 10. It should be appreciated that in other embodiments the functions and configurations of the upper and lower portions can be reversed on the lamp.

[0018] In the illustrated embodiment, housing 12 includes a front housing component 30 and optionally a bucket or rear housing component 32. In certain embodiments, housing components 30 and 32 may be connected together through the use of screws 34. However, it should be appreciated that the housing can be configured

differently as would occur to one skilled in the art, such as having more components, the front and rear components being integrally formed as a unitary piece, or consisting of only the front housing component. Lens 14 and diffusers 16 may be insert-molded to front housing component 30 to cover, at least substantially, corresponding larger and smaller holes, respectively, defined in front housing component 30. In certain embodiments, diffusers 16 may be at least partially recessed within front housing component 30. However, it should be appreciated that lens 14 and diffusers 16 may be attached or otherwise connected with front housing component 30 in other appropriate manners, or may be integral with front housing component 30, as would occur to one skilled in the art. As an example, in other embodiments, diffusers 16 may be portions or areas of front housing component 30 of decreased thickness and/or reduced opacity. Front housing component 30 may optionally include camouflaged visors 20 and 22 to assist in reducing the visibility of the blackout function lights from the air by shielding the light emitted from LEDs 38 through diffusers 16.

[0019] As used herein, clear lens 14 refers to a non-colored lens. In that way, one or more camouflaged components positioned within housing 12 is (completely, predominantly or partially) visible through clear lens 14 to camouflage the lamp 10. It is contemplated that in certain embodiments clear lens 14 may be completely, predominantly or partially transparent. Additionally, it is contemplated that in certain embodiments clear lens 14 may be completely, predominantly or partially translucent. Further, it is contemplated that in certain embodiments clear lens 14 may include a combination of transparency and translucency. In some embodiments, lens 14 may be made (completely, predominantly or partially) textured with a roughened, frosted or otherwise predominantly non-reflective surface that will significantly diffuse any external light impinging upon its surface. Housing 12 may also be made (completely, predominantly or partially) from a textured material that is predominantly non-reflective. Optionally, lens 14 can include optics 37 corresponding to LEDs 36 to enhance and/or distribute the light emitted from LEDs 36. In certain embodiments, optics 37 may be free from the non-reflective, textured effect applied to the remainder of lens 14. Lens 14 and diffusers 16 may each be made from a suitable material, such as plastic.

[0020] Fig. 2 illustrates an exploded view of one embodiment of the vehicle lamp according to the present disclosure. It should be appreciated that the configuration illustrated in Figs. 1 - 2 is just one example of many different possible configurations of the vehicle lamp. In most cases, the electrical components of the vehicle lamp and configurations thereof can be arranged as desired and remain within the purview of the present disclosure. As illustrated in Fig. 2, in one example embodiment, camouflaged vehicle lamp 10 may include a circuit board 40, an intermediate housing component 42 with plate 44, and a gasket 46 positioned between front and rear housing

components 30 and 32. Optionally, lamp 10 may also include a light shield 48 for the second plurality of LEDs 38 and a mask 50 for the first plurality of LEDs 36. In other embodiments, the lamp according to the present disclosure is embodied as front housing component 30, circuit board 40 with LEDs 36 and 38, and intermediate housing component 42, with gasket 46, shield 48 and mask 50 optionally included, and rear housing component 32 not included.

[0021] As illustrated, circuit board 40 includes LEDs 36 and 38 mounted thereto. The first plurality of LEDs 36 are positioned on circuit board 40 to emit light directed at lens 14, and second plurality of LEDs 38 are positioned on circuit board 40 to emit light directed at the corresponding diffusers 16. Circuit board 40 may define channels 51, as will be discussed in greater detail. Circuit board 40 may be shaped, sized and electrically configured as would occur to one skilled in the art, with the illustrated embodiment showing only an example of one possible version of the circuit board.

[0022] LEDs 36 and 38 may be selectively illuminated to provide light through lens 14 and diffusers 16, respectively. LEDs 36 and 38 are colored LEDs to emit non-white light, such as red or amber light as examples. In certain situations, such as braking for example, it may be desirable and/or required to produce colored light from lamp 10. By using colored LEDs, lens 14 may be clear (i.e. uncolored) and diffusers 16 may be camouflage-colored. As will be appreciated, the use of colored LEDs with clear, non-reflective lens 14 and camouflaged diffusers 16 will significantly reduce the visibility of lamp 10 while on the camouflaged vehicle, at least because the need for colored lenses and diffusers is eliminated. It is contemplated that in certain other situations, such as reversing a vehicle, it may be desirable and/or required to produce white light from lamp 10, in which case the LEDs may include one or more white light-producing LEDs. In the illustrated embodiment, there are five diffusers 16 corresponding to and aligned with five LEDs 38, with four diffusers / LEDs being positioned above one centered diffuser / LED. It is contemplated that there could be a greater or smaller number of diffusers and corresponding LEDs as desired to provide the blackout function of the lamp. As an example, in certain embodiments, there could be a single LED 38. It is also contemplated that there could be a single LED used within lamp 10, such that LEDs 36 and 38 are replaced with one LED.

[0023] Shield 48 may be positioned between circuit board 40 and front housing component 30 to shield and/or substantially prevent light emitted from LEDs 38 from passing through lens 14. During operation of the blackout function of lamp 10, it is generally desirable for light emitted from LEDs 38 to pass only through the corresponding diffusers 16, and not lens 14. Accordingly, shield 48 may be designed to direct light emitted from LEDs 38 toward diffusers 16 and shield the light from passing through lens 14.

[0024] Generally aligned with shield 48, lamp assem-

bly 10 may optionally include a mask 50 also positioned between circuit board 40 and front housing component 30. In the illustrated embodiment, mask 50 defines holes 52 corresponding to LEDs 36, such that light emitted from LEDs 36 passes through holes 52 and then lens 14. Accordingly, there are twelve illustrated holes 52 corresponding to the twelve illustrated LEDs 36. Additionally, there are twelve illustrated optics 37 on lens 14 corresponding to the twelve illustrated LEDs 36. However, it should be appreciated that optics 37, holes 52 and LEDs 36 could number greater or less than twelve as would generally occur to one skilled in the art. As an example, in certain embodiments, there could be a single LED 36. Additionally, it is contemplated that the optics, holes and LEDs can be arranged in various other configurations as desired.

[0025] Mask 50 is a camouflaged component colored to match the camouflaged coloring of housing 12, and thus match the camouflaged scheme of the vehicle. In this way, the same color as the housing 12 color is visible through clear lens 14, furthering the camouflaged design of lamp 10. In other embodiments, mask 50 may be absent and circuit board 40 (or another component visible through lens 14) is colored to match the housing 12 camouflage color, and thus match the camouflaged scheme of the vehicle.

[0026] Intermediate housing component 42 is positioned behind circuit board 40 and defines a recessed portion 54 configured to receive optional plate 44. In such embodiments having plate 44, wire seals 55 may be used to secure plate 44 within recessed portion 54. In certain embodiments, plate 44 is a heat sink plate designed to pull heat away from LEDs 36 and 38. Additionally, component 42 includes projections 56 which align with channels 51 defined in circuit board 40 to urge circuit board 40 toward front housing component 30 upon assembly of lamp 10. As illustrated, projections 56 are designed to extend at least partially through channels 51, the projections and the channels being of the same pattern, to maintain proper positioning of circuit board 40. Component 42 also may include an outer ridge 57 configured to surround circuit board 40. Accordingly, outer ridge 57 defines a shape substantially the same as the outer shape of circuit board 40, such that circuit board 40 and component 42 nest together upon assembly of lamp 10.

[0027] Gasket 46 is optionally positionable between intermediate housing component 42 and rear housing component 32, and defines a hole 60 to allow for passage of the electrical conducting wires or cables which electrically couple with circuit board 40. Additionally, in certain embodiments recessed portion 54 of intermediate housing component 42 may protrude through hole 60 upon assembly of lamp 10. The lamp 10 may include any appropriate wiring harness 24 that, as is known in the art, provides a means of coupling conductive paths to the LEDs 36 and 38 on circuit board 40 for selective activation of the LEDs. In the illustrated embodiment, wiring harness 24 includes plug ends 25 which can couple with the

back of circuit board 40 to provide power to LEDs 36 and 38. As illustrated, wiring harness 24 may pass through a typical electrical box 62 which resides in rear housing component 32. Other configurations for coupling a source of power to the LEDs will be readily apparent to those of ordinary skill in the art.

[0028] Rear housing component 32 defines a rear hole 70 for entry of wiring harness 24 into housing 12 to electrically couple conductive paths to LEDs 36 and 38 mounted on circuit board 40. Additionally, a ring 72 may be positioned within hole 70 to assist in maintaining the proper positioning of the wires or cables comprising wiring harness 24 with respect to rear housing component 32. Upon assembly, front housing component 30 may be connected with rear housing component 32 via screws 34 as discussed above. In such embodiments, front housing component 30, gasket 46 and rear housing component 32 define screw holes to receive the screws 34. In certain embodiments, lamp 10 may be injected with thermally conductive potting either before or after assembly of the lamp. It should be appreciated that the housing components may be connected together in other appropriate manners as are generally known. Additionally, it is contemplated that the lamp according to the present disclosure may be initially assembled without rear housing component 32 or gasket 46, and connected with a housing bucket at a later time.

PATENTKRAV

1. Kompositlygtearrangement (10) til anvendelse på et kamufleret militært fartøj, omfattende:

- 5 et lampehus (12) farvet til at passe til kamuflagemønsteret på fartøjet, hvor lygtehuset (12) afgrænser et indvendigt rum, en første åbning i forbindelse med det indvendige rum og adskillige andre åbninger i forbindelse med det indvendige rum;
- en klar linse (14) fastgjort til huset (12) til at udfylde den første åbning;
- 10 adskillige diffusere (16) fastgjort til huset (12) til at udfylde de adskillige andre åbninger;
- et kredsløbskort (40) anbragt i det indre rum af lygtehuset (12);
- kendetegnet ved, at**
- en første mangfoldighed af farvede LED'er (36) er monterede på kredsløbskortet (40) og positionerede til at tilvejebringe ikke hvidt lys igennem den klare linse (14);
- 15 en anden mangfoldighed af farvede LED'er (38) er monterede på kredsløbskortet (40) og positionerede til at tilvejebringe ikke-hvidt lys igennem diffusere (16), hvor en skærm (48) er positioneret imellem kredsløbskortet (40) og en forreste huskomponent (30) af lygtehuset (12) til i det væsentlige at forhindre lys udsendt fra den anden mangfoldighed af LED'er (38) i at passere igennem den klare linse (14); og
- 20 hvor diffusere (16) er farvede til at stemme overens med kamuflagemønsteret på fartøjet.

2. Arrangement (10) ifølge krav 1, **kendetegnet ved, at** diffusere (16) er i det mindste delvis undersænkede i huset (12).

25

3. Arrangement (10) ifølge krav 1, som yderligere er **kendetegnet ved, at** omfatte et ledningssæt (24) forbundet med kredsløbskortet (40) til at forbinde de ledende baner med den første og anden mangfoldighed af farvede LED'er (36, 38).

- 30 4. Arrangement (10) ifølge krav 1, som yderligere er **kendetegnet ved** en kamufleret komponent (50) anbragt i det indvendige rum og placeret bag den klare linse (14) således, at i det mindste en del af komponenten (50) er i det mindste en smule synlig igennem den klare linse (14).

- 35 5. Arrangement (10) ifølge krav 4, **kendetegnet ved, at** den kamuflerede komponent (50) er farvet til at stemme overens med kamuflagemønsteret på det militære fartøj.

6. Arrangement (10) ifølge krav 1, **kendetegnet ved, at** den første mangfoldighed af farvede LED'er (36) er indrettede til at indikere i det mindste tilstedeværelsen, drejning og standsning af fartøjet.
- 5 7. Arrangement (10) ifølge krav 1, **kendetegnet ved, at** den anden mangfoldighed af farvede LED'er (38) er indrettede til at indikere i det mindste tilstedeværelsen og standsningen af fartøjet under natlig konvojrejse.
8. Arrangement (10) ifølge krav 1, som yderligere er **kendetegnet ved** i det mindste
10 én kamufleret blænde (20, 22) monteret på det kamuflerede lygtehus (12) for at reducere synligheden af ikke-hvidt lys udsendt fra den anden mangfoldighed af farvede LED'er (38) fra oven over lygtearrangementet (10).
9. Arrangement (10) ifølge krav 1, som yderligere er **kendetegnet ved, at** den klare
15 linse (14) er ikke reflekterende til i det væsentlige at diffusere ydre lys, som rammer den nævnte linse (14).
10. Arrangement (10) ifølge krav 1, som yderligere er **kendetegnet ved** et pansret
20 militært fartøj, hvor lampearrangementet (10) er monteret på det pansrede militære fartøj.

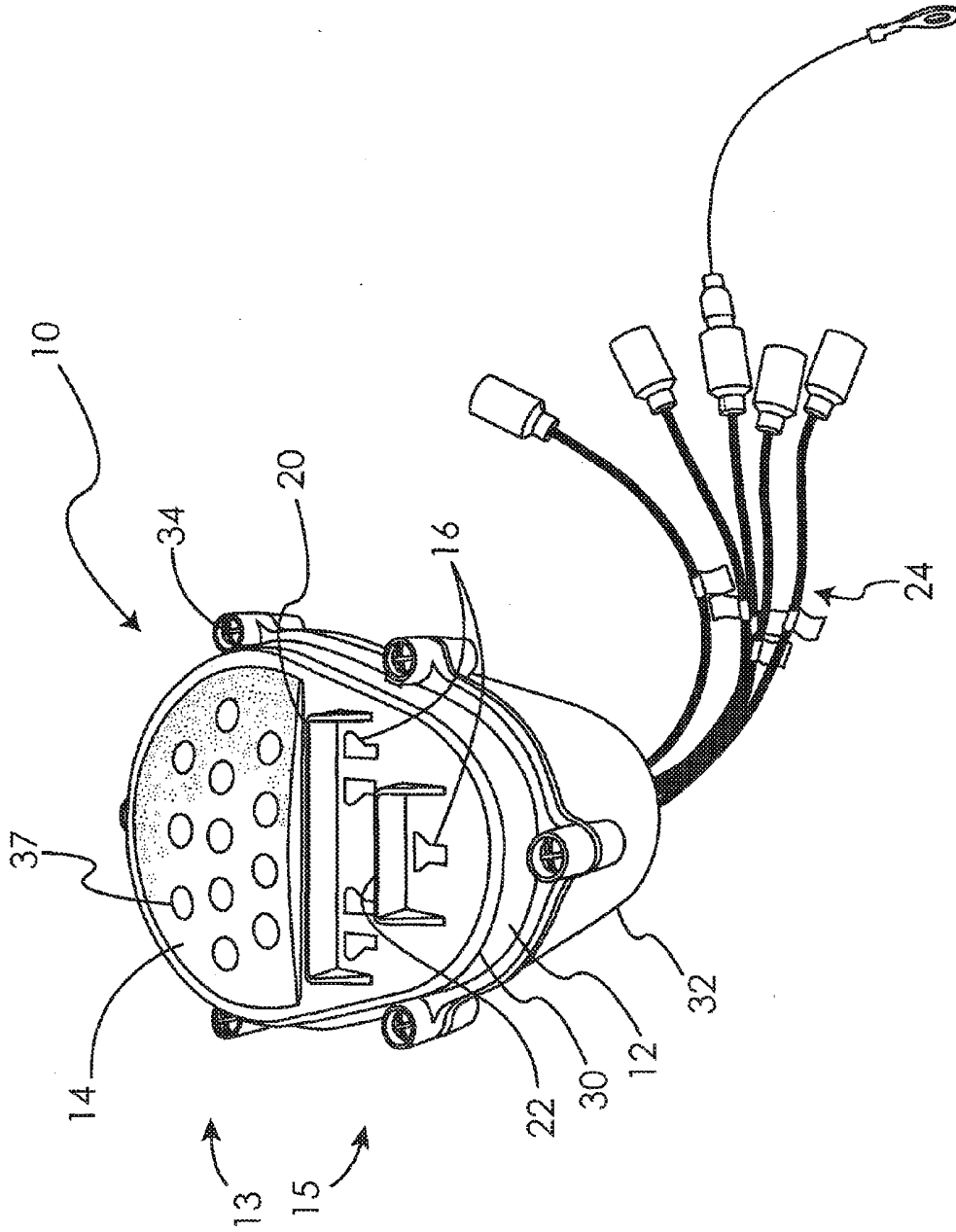


Fig. 1

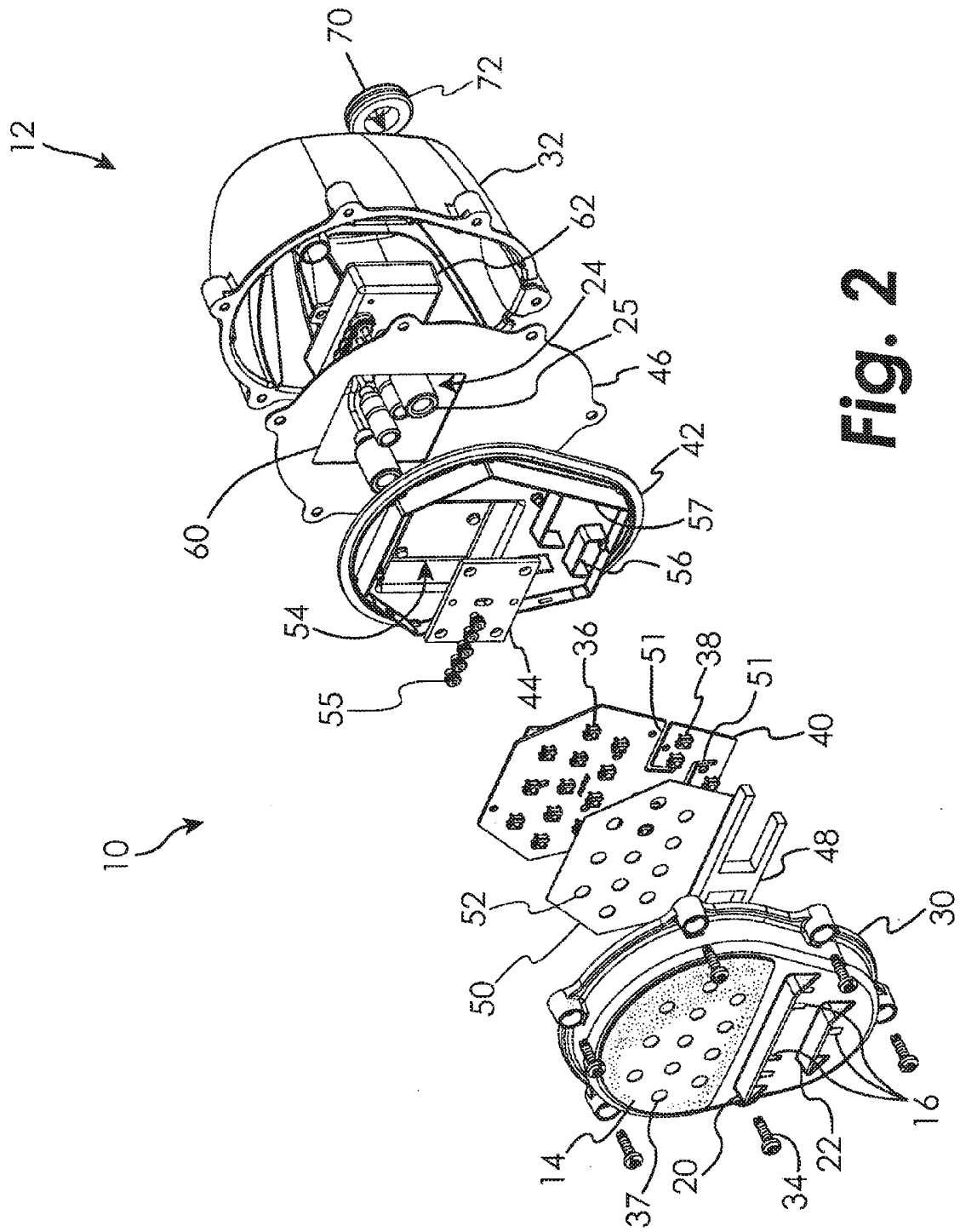


Fig. 2