(12) UK Patent (19) GB (11) 2543246 (13) B

(45) Date of B Publication 13.01.2021

(54) Title of the Invention: Handlebar mountable light pipe apparatus for a bicycle

(51) INT CL: ***B62J 6/02*** (2020.01) ***F21V 29/70*** (2015.01) ***G02B 6/00*** (2006.01)

(21) Application No: **1513337.4**

(22) Date of Filing: **29.07.2015**

(43) Date of A Publication **19.04.2017**

(56) Documents Cited:

WO 2014/202726 A1
CN 202593695 U
US 20140268840 A1
CN 203421654 U
JP 2013151177 A
US 20030223247 A1

(58) Field of Search:

As for published application 2543246 A viz:
INT CL **B62J, F21V, G02B**
Other: **EPODOC, WPI, TXTA**
updated as appropriate

Additional Fields
INT CL **B60Q**
Other: **WPI, EPODOC**

(72) Inventor(s):

Richard Brian Thorpe
Peter Angiolini

(73) Proprietor(s):

Karbon Kinetics Ltd
Unit 30, Barwell Business Park, Leatherhead Road, Chessington, Surrey, KT9 2NY, United Kingdom

(74) Agent and/or Address for Service:

Gill Jennings & Every LLP
The Broadgate Tower, 20 Primrose Street, LONDON, EC2A 2ES, United Kingdom

GB 2543246 B

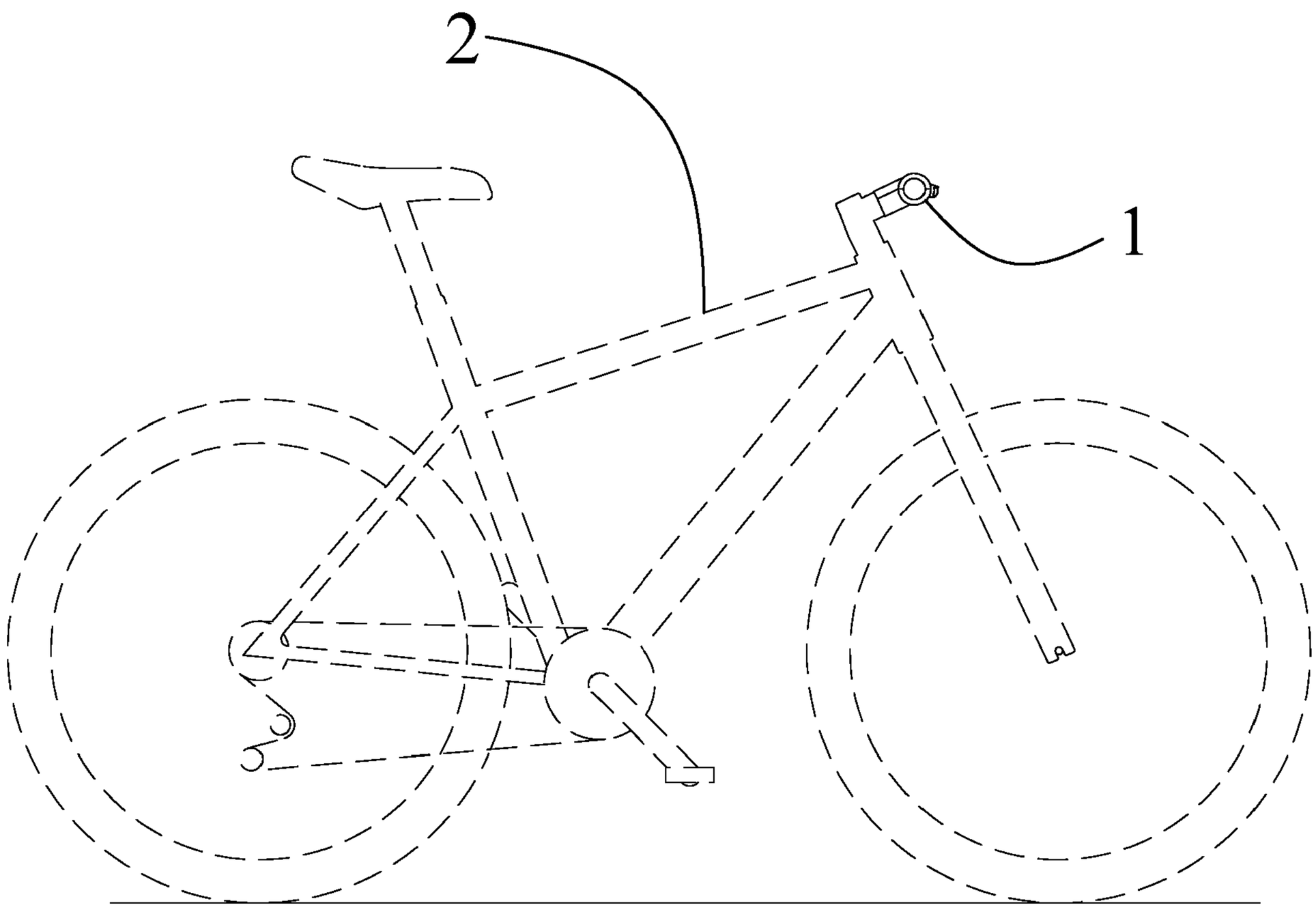

Figure 1

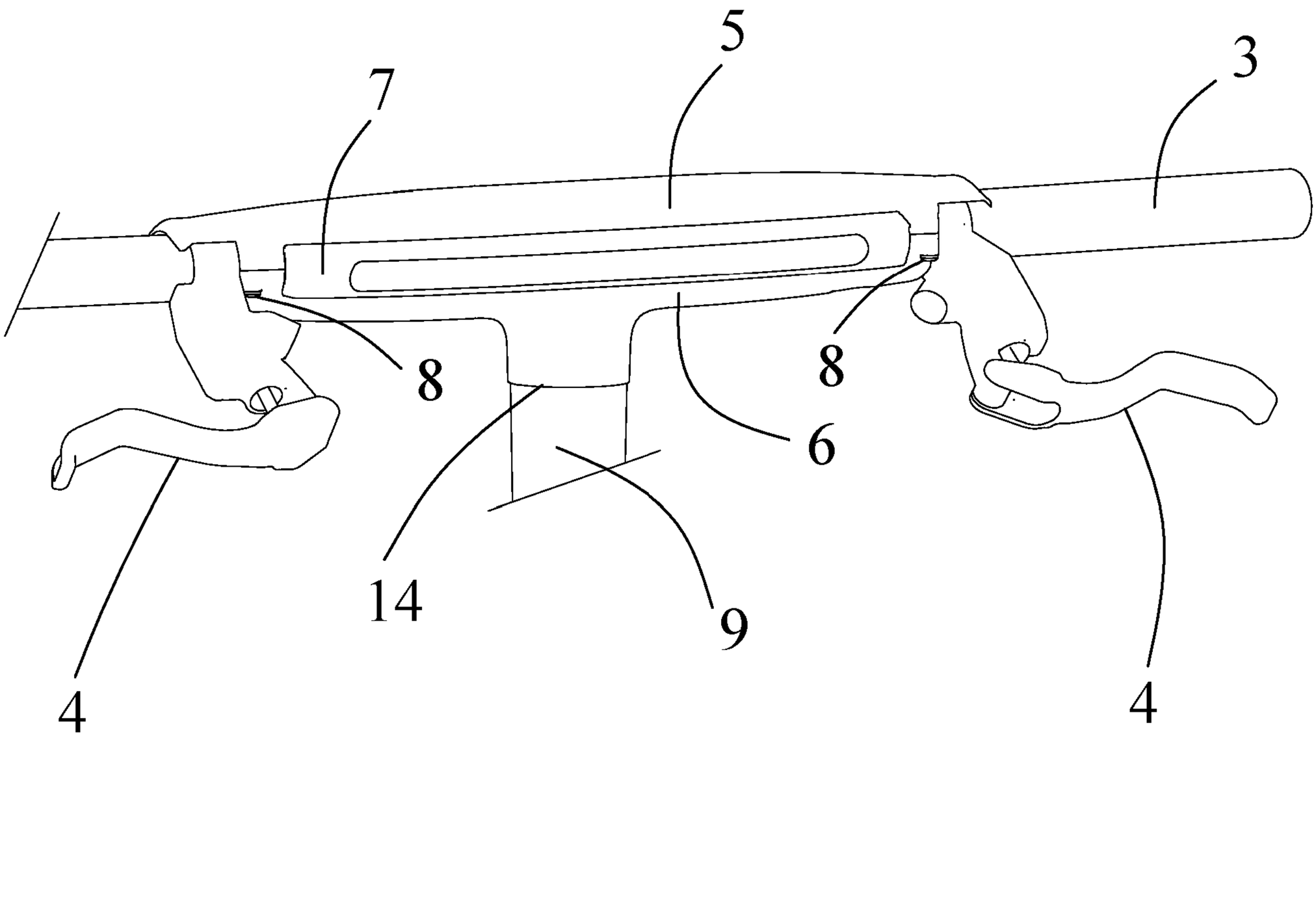

Figure 2

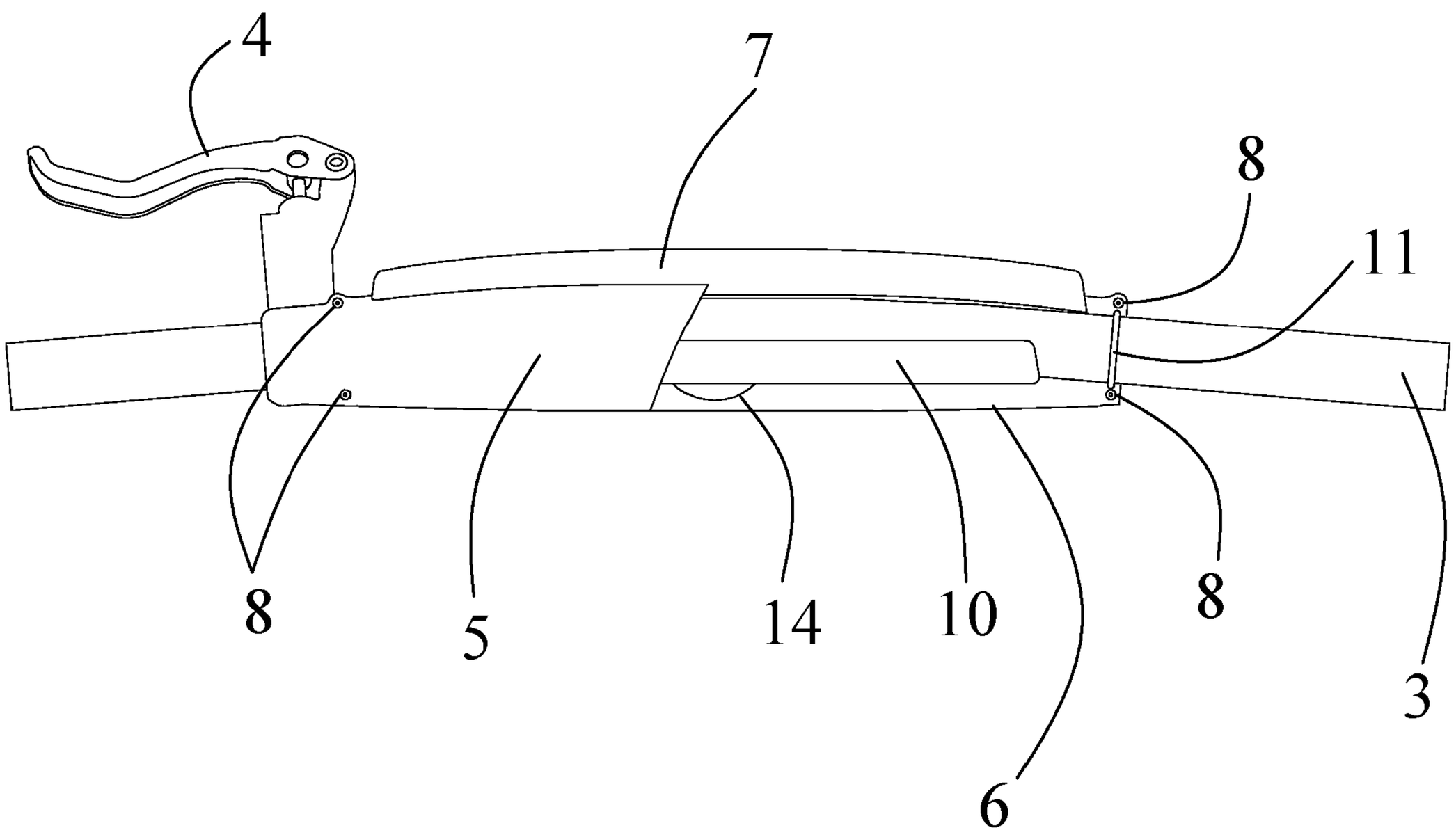

Figure 3

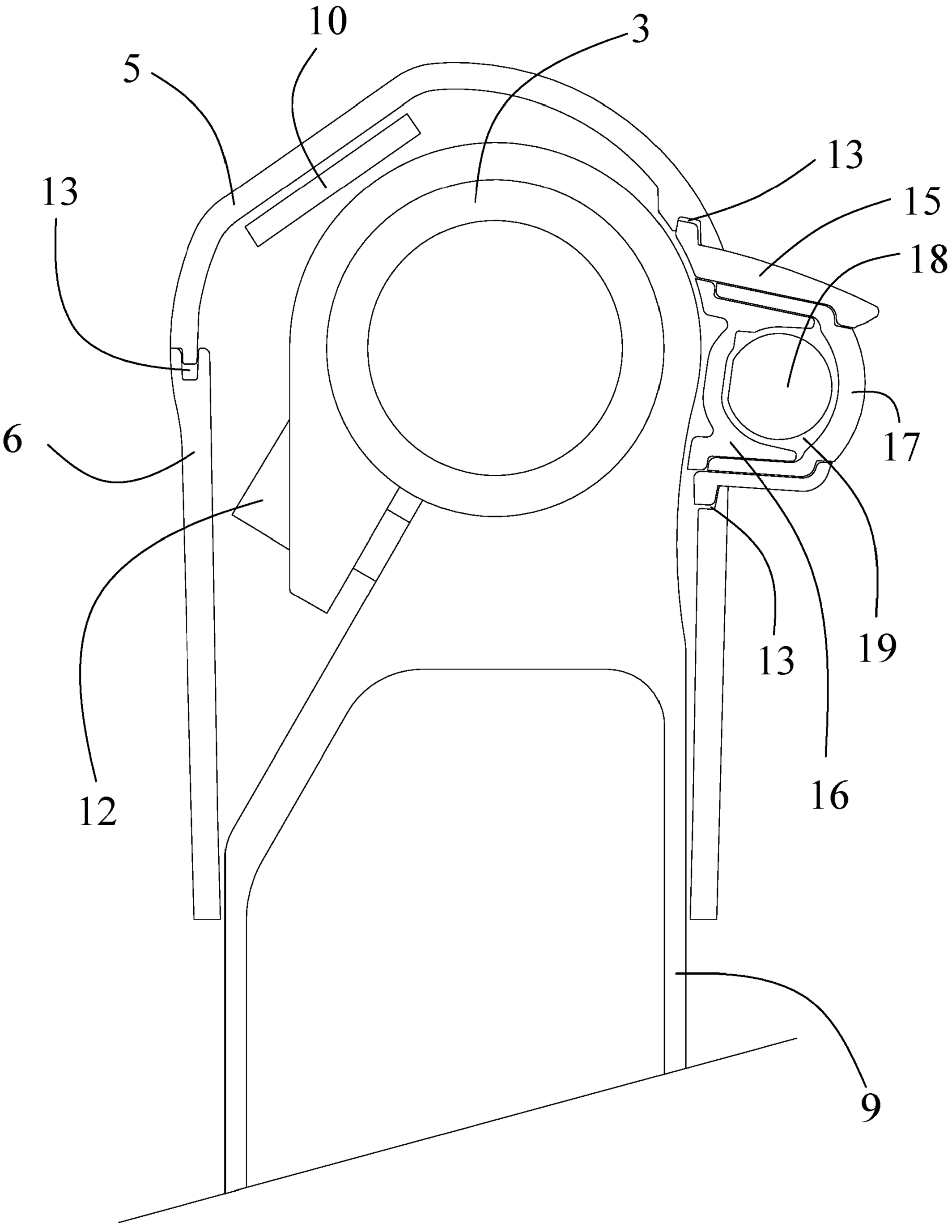

Figure 4

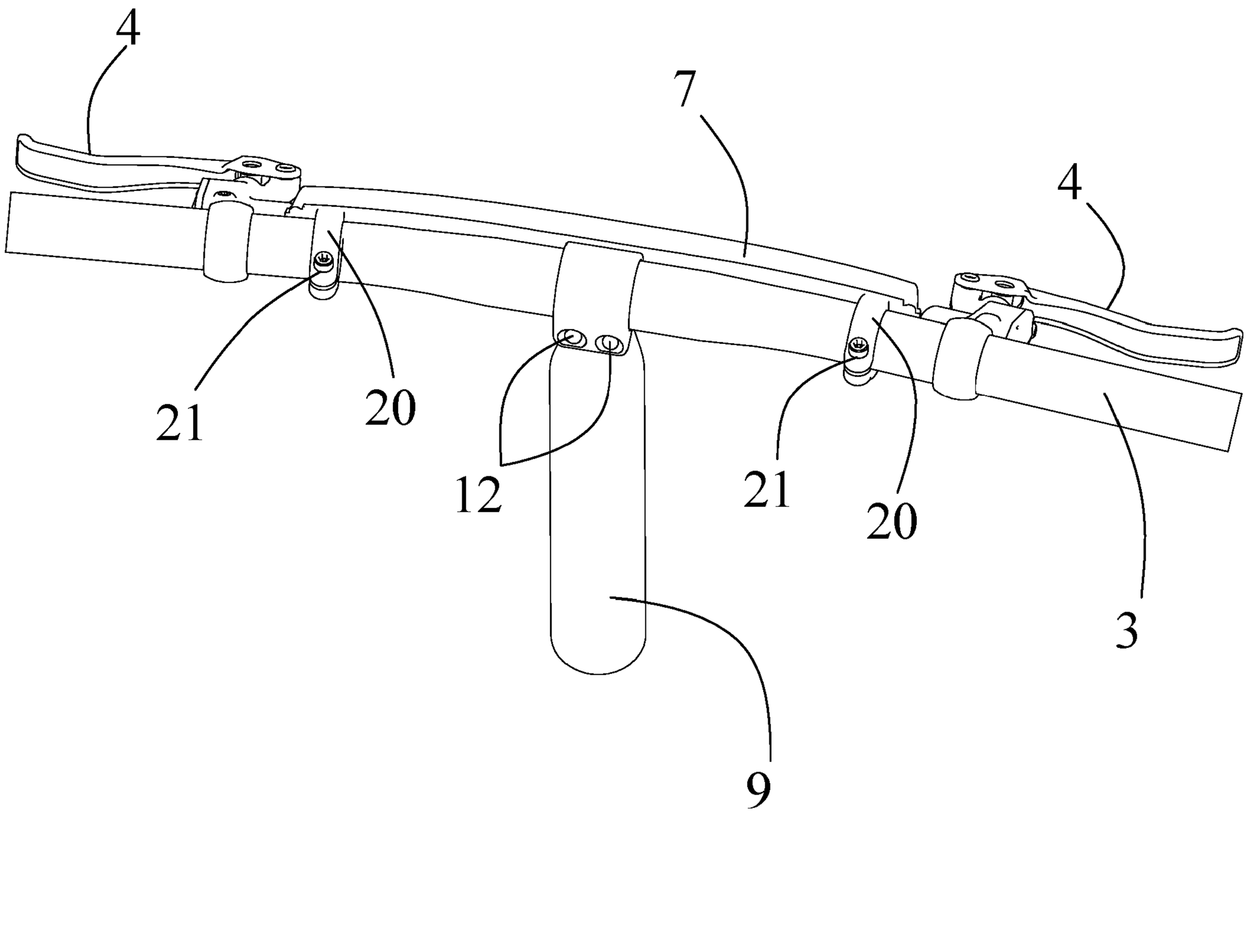

Figure 5

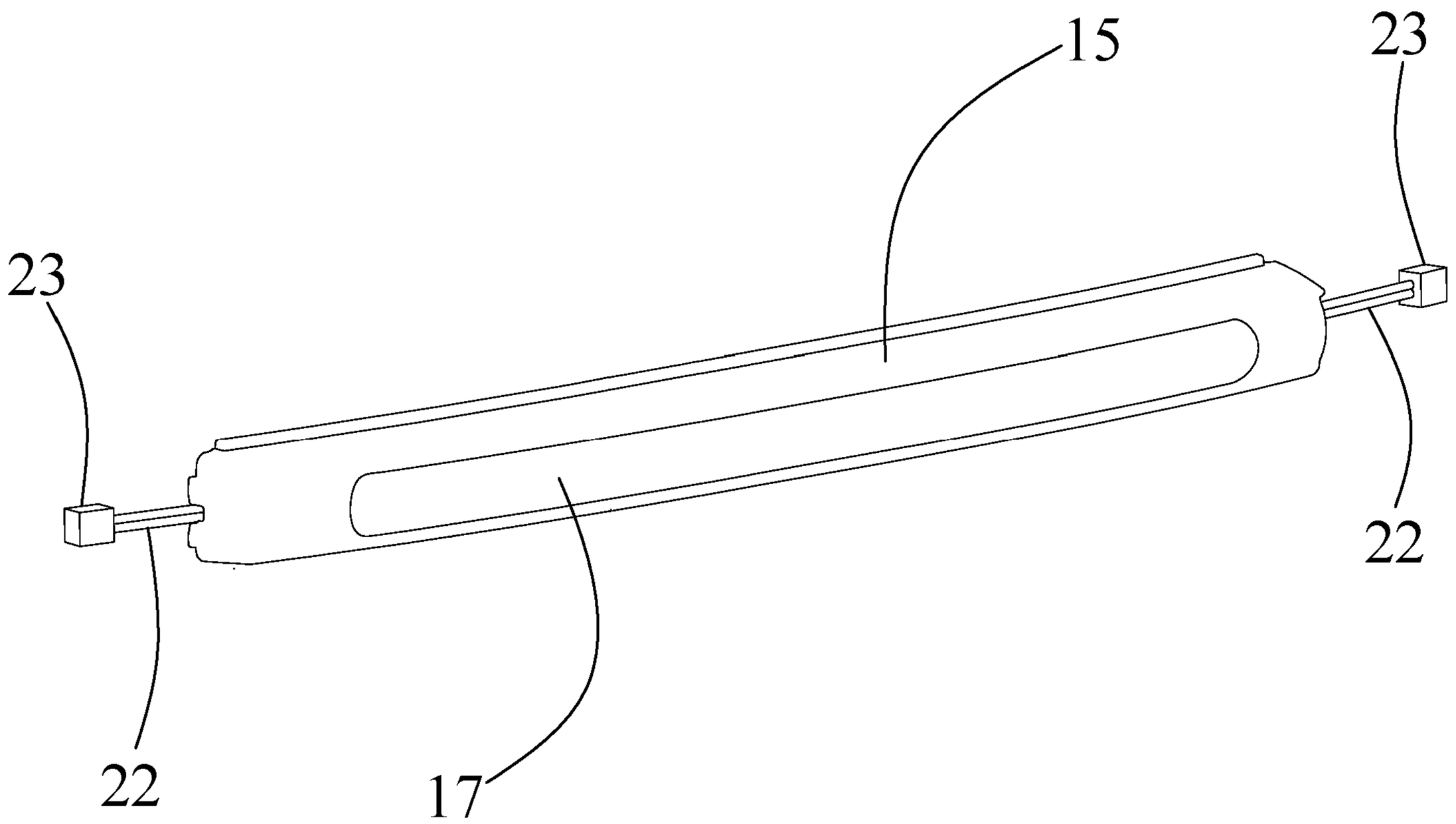

Figure 6

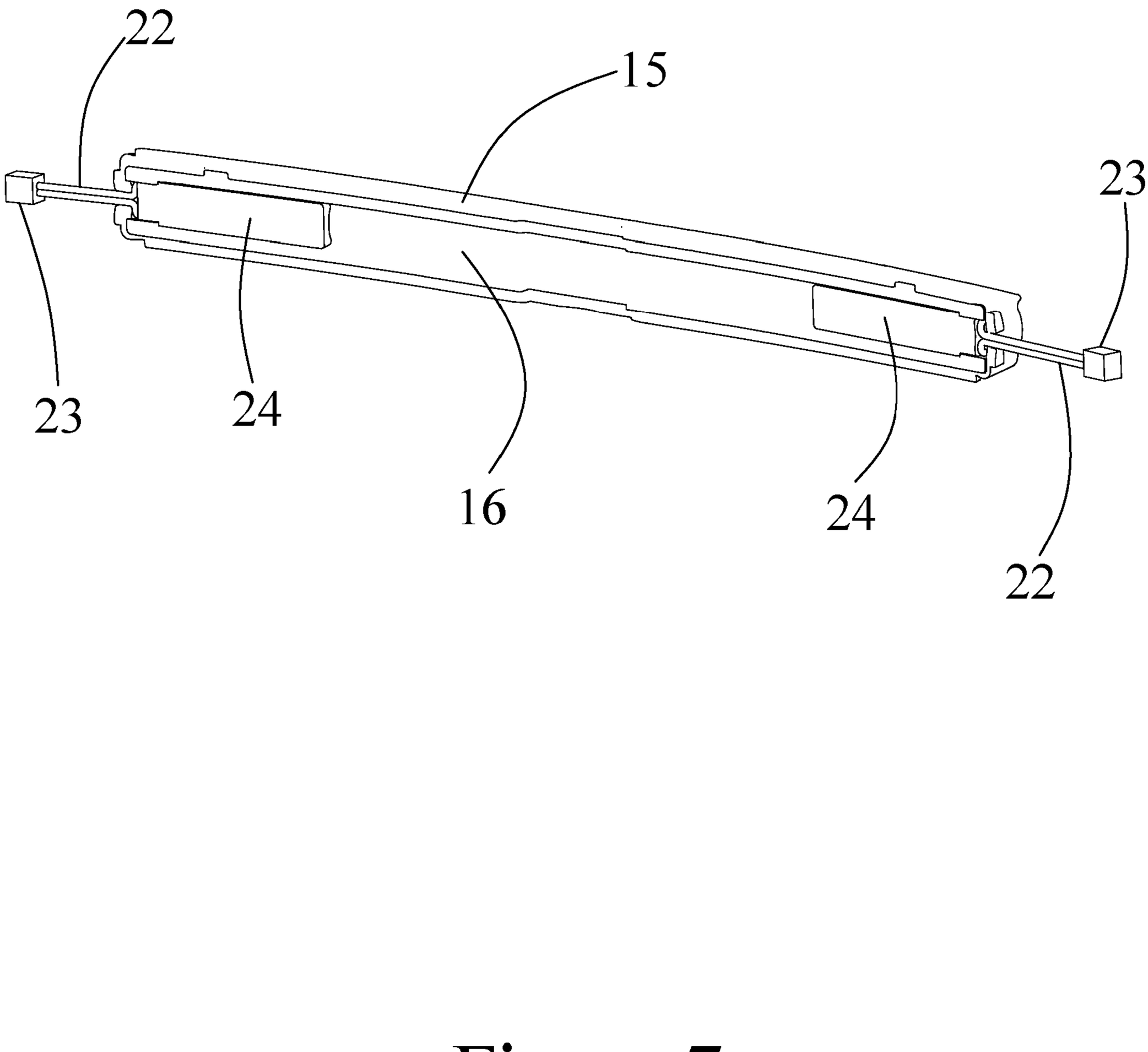

Figure 7

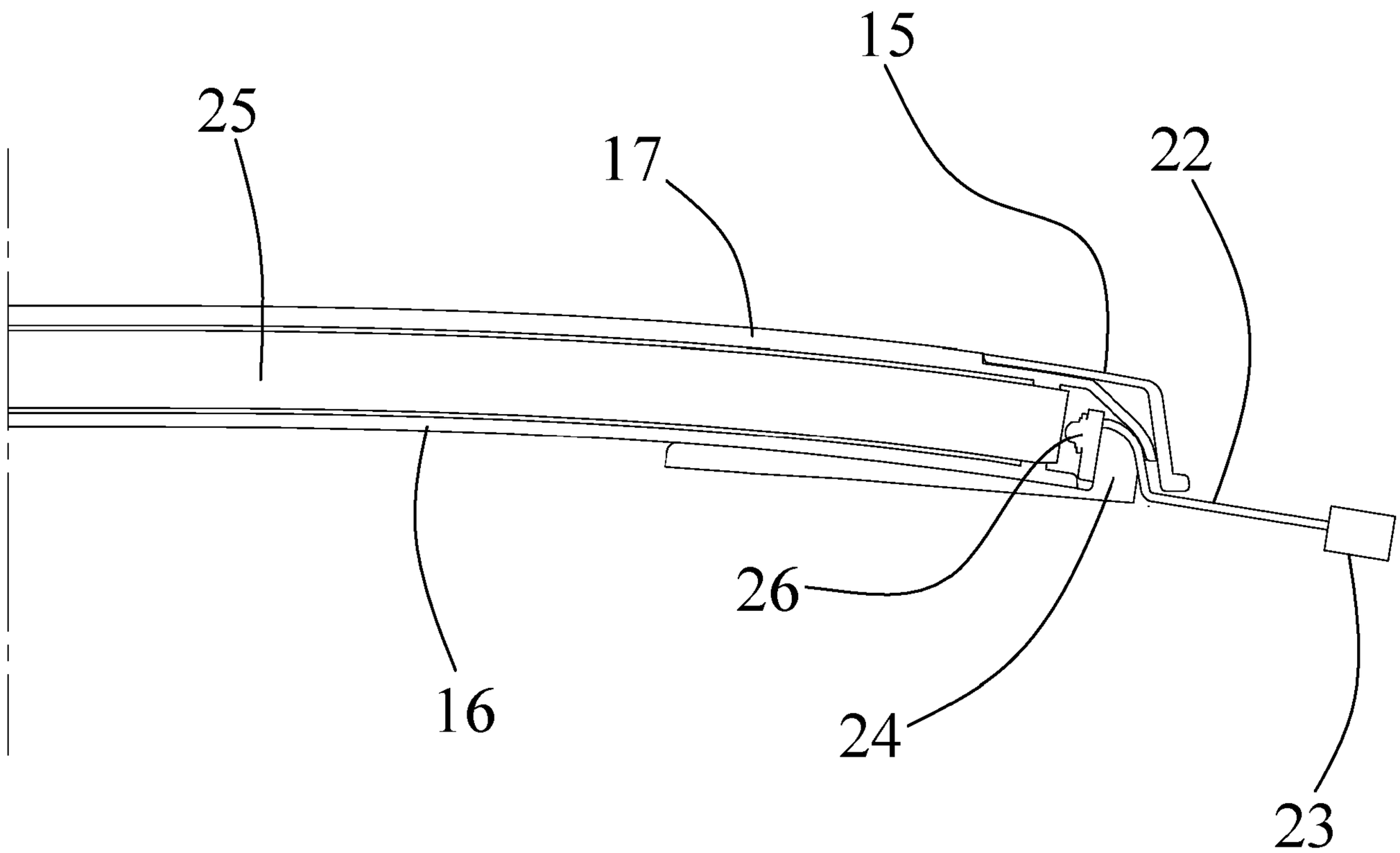

Figure 8

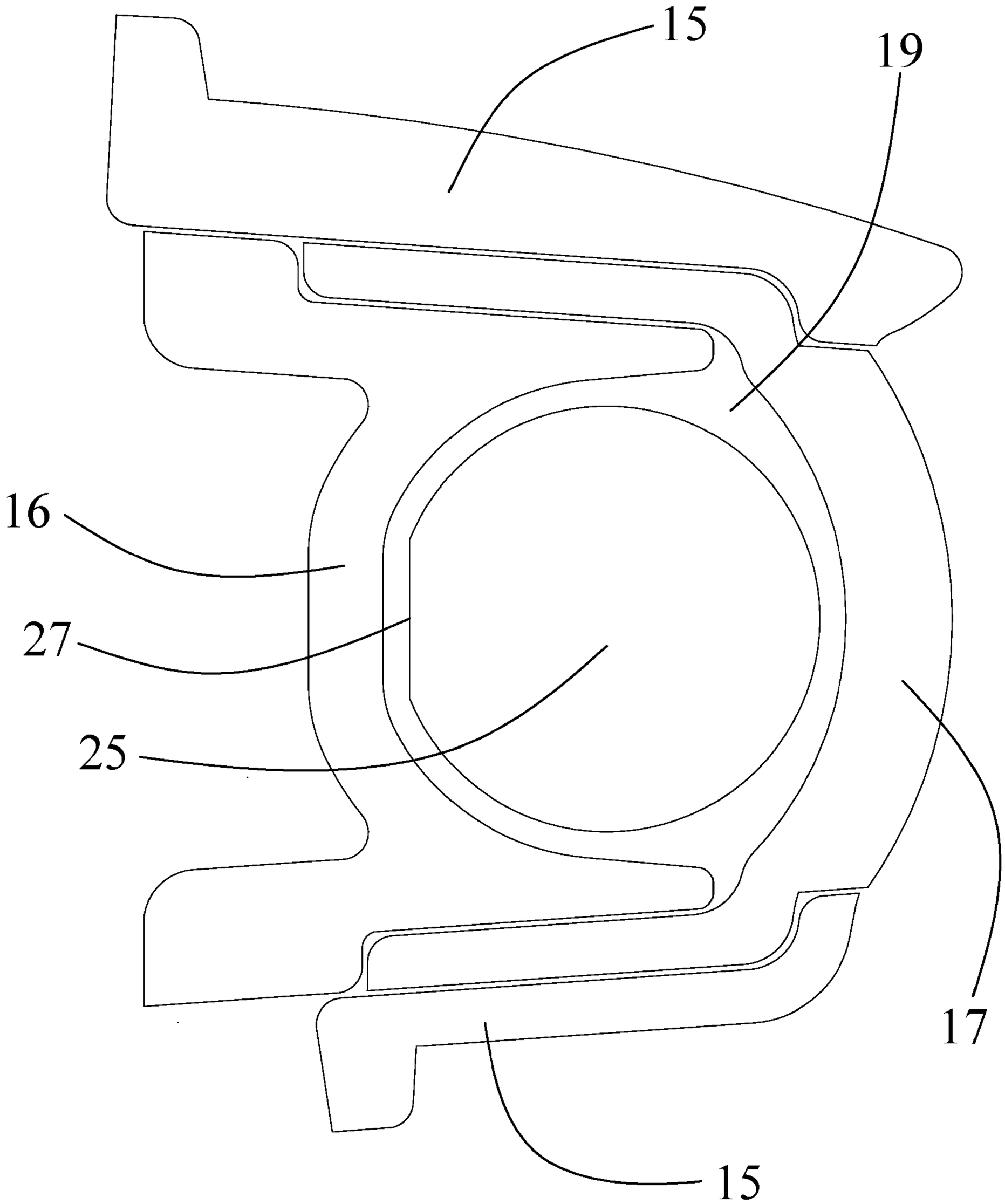

Figure 9

Handlebar Mountable Light Pipe Apparatus for a Bicycle

In the field of bicycles, there exist numerous types of handlebar mounted lights. Typically, handlebar mounted bicycle lights employ a light emitting diode (LED) to generate light. The LED is generally contained in an opaque metal or plastic housing that will shield light from the rider's eyes. The light housing will include a transparent portion in the front to allow light to be emitted generally forward. Some lights have more complex designs that include mirror and lens elements that reflect and focus the light into a specific direction, intensity, or pattern. The lens elements can be separate or included in the transparent portion of the light housing and the mirror elements are usually situated rearward and to the sides of the LED in order to reflect and focus the light forward and out through the transparent portion or lens.

Generally, handlebar mounted light designs that have mirror and lens elements that reflect and focus the light are able to illuminate the road ahead so that the rider can see where he or she is going. These are known as so called "to see" lights. Handlebar mounted light designs that do not have mirror and lens elements to reflect and focus the light do not generally illuminate the road ahead effectively and are known as so called "to be seen" lights and have the primary purpose of increasing the visibility of the bicycle and rider to other road users.

There is another type of light design that is well known in the automotive industry which falls into the "to be seen" type of category. This category of light designs is generally referred to as "light pipe" type designs and they are used on modern cars for day time running lights. Light pipe designs consist of a single or plurality of LED light sources and a generally round and solid clear plastic pipe or light conduit. The LED light source is generally situation at the end of the clear plastic pipe. Along one side of the length of the plastic pipe there will be focus and reflecting elements moulded or machined into the surface of the plastic pipe. The physics of how the light pipe works is well known. Light from the LED source travels immediately into the light pipe at the ends and remains "trapped" in the pipe as it is reflected internally off the smooth polished surface of the pipe due to the shallow angle of incidence of the light direction and the internal surface of the light pipe. At the point that light interacts with the focal and reflecting element portion of the light pipe, which can be a series of angled facets protruding into the light pipe, the light will be reflected in the direction of the focal element orientation and escape out through the light pipe due to the high angle of incidence of the direction of the light and the internal wall of the light pipe. The overall effect of this and the physics of how a light pipe works is not dissimilar to well-known fibre optic cable technology and is a well-known and understood process. The effect of the light pipe design is an appearance of a glowing or lighted pipe not dissimilar to traditional neon type light bulbs. Due to the nature of how the light pipe effect works, designers are able to bend and curve the light pipe shape to match the aesthetics and features of the vehicle employing the light. The ability to vary the shape of the light pipe can aid the manufacturer and designer in offering a distinct visual shape and integrated to customers which can enhance the value of the product and brand distinction.

With regard to handlebar mounted light designs for bicycles, these are typically mounted on the handlebars of the bicycle with a round plastic or rubber strap or clamp suited to the standard diameter of the handlebars which is typically in the range of 22mm up to 35mm.

Generally, the benefits of light pipe type bicycle lights relate to the ability for designers to offer a practical "to be seen" light but with unique and distinctive visual appearance. Another benefit is that the light pipe is by nature long and slender which lends itself to integrating well with the form factor of bicycles – such as along the seat or handlebar or frame tubing. Another benefit of a light pipe style light for a bicycle is that the distinctive and unusual shape or appearance can aid in making the rider and bicycle more noticeable and visible to other road users.

Bicycle light manufacturers are starting to produce bicycle lights with light pipe technology. These designs have thus far been limited to adding a light pipe to an existing rear light design such as encircling the traditional rear square light with a light pipe. Audi(RTM) produced in 2013 an electric bicycle which employed a light pipe style front light system moulded into a bespoke multi(RTM) tubular handlebar structure. This integral moulded design was bespoke to the Audi bike prototype and therefore very expensive to produce. The design could not be used in conjunction with a normal and readily available bicycle handlebar and stem design and could not be retrofitted to existing bicycles.

There does not exist any light pipe design that can be seamlessly mounted to a bicycle handlebar and stem in a low cost and aesthetically pleasing way with the light pipe being roughly parallel and extending in line with the handlebar. In the case of the Audi(RTM) bicycle light pipe design, while the design of the light pipe followed the form of the handlebar, the solution was not compatible or mountable to a traditional bicycle handlebar and stem and required a complex and expensive moulded design of a special handlebar to accommodate the light pipe form and this design was not suitable for applications to be mounted on to bicycle handlebars in general.

The present invention provides a unique and distinctive light pipe design mountable to a bicycle handlebar and stem and positioned between the brake levers extending in line with the handlebar which can be made in a low cost and aesthetically pleasing way. Most all bicycle handlebars are connected to the front steering fork of a bicycle by a "stem." The stem is generally made from metal or carbon fibre and has a clamp arrangement at either end allowing the stem to connect rigidly the handlebar to the bicycle front fork steerer tube by the clamping arrangement. The form of the handlebar and stem connection is roughly and generally a "T" junction. On the handlebar is fitted either side of the stem brake levers, gear shift controls, and grips for the rider to hold. In between the brake levers is a region that exits on most all bicycles that lends itself to fitting of the present invention.

The invention consists of a forward facing light pipe assembly generally positioned horizontally and in line with the handlebar. This light pipe assembly includes two LEDs with attached heat sink elements made of metal or other suitable heat conductive material at opposing ends of the generally round section light pipe. The light pipe assembly comprises a generally white and opaque background surrounding the rear

facing portion of the light pipe and a clear and transparent forward facing shield through which light reflected and refocused forward by focus features of the light pipe can pass. The purpose of the clear and transparent forward facing shield is to allow light to pass through but to prevent dust, water and debris from entering the light pipe assembly. The purpose of the generally white and opaque background is to create a uniform intensity of light when the light pipe is viewed from the front with the light on or off. An opaque light pipe cover peak assembly is fitted over the light pipe assembly to prevent light being seen by the rider.

The light pipe assembly is held central and longitudinally in line with the handlebar by an upper and lower cover. The lower cover has a generally "T" section so as to be able to be fitted to a standard bicycle stem and handlebar connection and the upper cover is generally a mating half of the lower visor so as when fitted enclose the stem and handlebar between the brake levers comprehensively. The upper and lower covers are moulded plastic in general and have fitted a plurality of holes for fixings such as screws of the self-tapping variety. When fitted, said screws hold the upper and lower visor rigidly around the handlebar and form a clamping arrangement that fixes firmly the light pipe assembly. The upper and lower covers have at each end a generally round section mated to fit the handlebar so that when clamped together, they are located appropriately and concentrically around the handlebar which can be aided to reduce vibration and aid mounting by implementing an O-ring interface between the handlebar and the upper and lower covers. There exists a space between the upper and lower covers and the handlebar sufficient to house an LED driver printed circuit board (pcb) that is used to power and control the LEDs of the light pipe.

Once fitted to a traditional bicycle handlebar and stem, the handlebar mountable light pipe for a bicycle provides an innovative, low cost, and aesthetically pleasing mounting arrangement for a light pipe design type of handlebar light and a light pipe design handlebar light that is distinctive being generally longitudinally oriented with the handlebar.

A preferred embodiment of the invention will now be described with reference to the accompanying drawing in which:

FIGURE 1 is a side view of the invention mounted to a bicycle;
FIGURE 2 is a perspective view showing the various parts of the invention mounted to a handlebar;
FIGURE 3 is a top cutaway view showing the various parts of the invention mounted to a handlebar;
FIGURE 4 is a side view cross section showing the various parts of the invention mounted to a handlebar and handlebar stem;
FIGURE 5 is a perspective view showing an alternative mounting arrangement of the invention to a handlebar and handlebar stem;
FIGURE 6 is a front perspective view showing the various parts of the light pipe assembly;
FIGURE 7 is a rear perspective view showing the various parts of the light pipe assembly;

FIGURE 8 is a top view centreline cross section showing the various parts of the light pipe assembly;
FIGURE 9 is a side view centreline cross section showing the various parts of the light pipe assembly;

As shown in FIGURE 1, the invention comprises a handlebar light pipe mounting assembly 1 mounted to a bicycle 2.

FIGURE 2 shows the invention in more detail mounted to a handlebar 3 and positioned between brake levers 4. The invention comprises an upper cover 5 and a lower cover 6 which are likely made from injection moulded plastics and of a clam shell type arrangement able to receive handlebar 3 and rigidly retain light pipe assembly 7 with cover screws 8. Cover screws 8 could be of the self-tapping variety. Lower cover 6 contains an aperture 14 made to receive a standard bicycle handlebar stem 9.

FIGURE 3 shows a top cut away view of the invention fitted to handlebar 3 and positioned between brake levers 4. The invention comprises an upper cover 5 and a lower cover 6 which are likely made from injection moulded plastics and of a clam shell type arrangement able to receive handlebar 3 and rigidly retain light pipe assembly 7 with cover screws 8. Lower cover 6 contains an aperture 14 made to receive a standard bicycle handlebar stem. An LED driver board 10 is shown which is of the printed circuit board variety and well known art. The function of LED driver board 10 is to electronically control light pipe assembly 7. Upper cover 5 and lower cover 6 are formed to receive o-ring 11 which acts to seal from moisture and debris and compliantly interface with handlebar 3.

FIGURE 4 shows a side view cross section showing bicycle handlebar stem 9 which clamps around handlebar 3 with stem screw 12. LED driver board 10 is shown encapsulated between upper cover 5 and handlebar 3. LED driver board 10 ideally is retained by well-known silicone or similar adhesive. Upper cover 5 and lower cover 6 are shown with light pipe retention channels 13 which is of a well-known tongue and groove variety. Light pipe retention channels 13 are made to receive light pipe cover peak 15 which is shaped to receive and fix with glue or similar plastic joining method such as ultrasonic welding opaque background 16 and transparent shield 17. Encapsulated within opaque background 16 and transparent shield 17 is light pipe 18 such that there exists air gap 19 between opaque background 16 and transparent shield 17.

FIGURE 5 is a perspective view showing an alternative mounting arrangement of the invention. Handlebar clamps 20 and clamp screws 21 which are shown to mount light pipe assembly 7 to handlebar 3. Handlebar 3 is shown with brake levers 4 fitted and handlebar 3 is mounted to handlebar stem 9 with stem screws 12. Handlebar clamps 20 and with clamp screws 21 allow for light pipe assembly 7 to be adjustable in angle with respect to handlebar 3 and generally adaptable to a wide range of well-known bicycle handlebar variations. Handlebar clamps 20 are preferred to be made of the plastic moulded variety and could be integral with light pipe assembly 7.

FIGURE 6 is a front perspective view showing the various parts of the light pipe assembly. Light pipe cover peak 15 is shown encapsulating transparent shield 17. Extending outboard from light pipe cover peak 15 are LED wires 22 connected to LED wire connectors 23. LED wires 22 and LED wire connectors 23 are of well-known variety and made to interface to LED driver board 10 for the purpose of transmitting electrical signals.

FIGURE 7 is a rear perspective view showing the various parts of the light pipe assembly. Opaque background 16 is shown connected to light pipe cover peak 15. Extending outboard from light pipe cover peak 15 are LED wires 22 connected to LED wire connectors 23. Also shown in Figure 7 are LED heat sinks 24 which are ideally metal such as aluminium or other suitable material able to effectively absorb heat from the light pipe assembly. The form of LED heat sinks 24 is such that when fitted to a bicycle handlebar heat can transfer from LED heat sinks 24 into said bicycle handler by conduction.

FIGURE 8 is a top view cross section showing the various parts of the light pipe assembly. Light pipe cover peak 15 is shown encapsulating transparent shield 17. Opaque background 16 is shown connected to light pipe cover peak 15 such that light pipe 25 is encapsulated within. At opposing ends of light pipe 25 are LED pcb assemblies 26 connected to LED wires 22 and connected to LED wire connectors 23. LED pcb assemblies 26 are of the well-known variety readily available and positioned such that light emitted from LED pcb assemblies 26 is directed substantially into the ends of light pipe 25. LED pcb assemblies 26 are shown mounted to LED heat sinks 24. The means for mounting can be by glue or other well-known heat transfer adhesive such that heat from LED pcb assemblies 26 is transferred into LED heat sinks 24 such that LED pcb assemblies 26 are able to operate without overheating.

FIGURE 9 is a side view centreline cross section showing the various parts of the light pipe assembly. Light pipe cover peak 15 is shown mating to opaque background 16 so as to encapsulate transparent shield 17 which in turn encapsulates light pipe 25 with transparent shield 17. The means for connection for opaque background 16, light pipe cover peak 15 and transparent shield 17 is with glue or similar plastic joining method such as ultrasonic welding. Light pipe 25 is held in place by connection to opaque background 16 substantially outboard and towards opposing ends of light pipe 25 such that air gap 19 exists substantially around light pipe 25. Air gap 19 is ideally on the order of .2-1mm and exists to assist with uniform appearance of light intensity. Light pipe 25 is shown to have a generally round cross section made to include a reflective face feature 27. Reflective face feature 27 is formed such that light travelling within light pipe 25 is reflected away from reflected face feature 27 and is emitted through transparent shield 17. The physics and working method of light pipe 25 and the reflective face feature 27 are well-known.

Claims:

1. A bicycle light for mounting to a bicycle handlebar, comprising:
an elongate light pipe (25);
mounting means (20, 21) for mounting the light pipe generally parallel to the bicycle handlebar, with a reflective rear face (27) of the light pipe adjacent to the handlebar so that light reflected from the reflective rear face exits the light pipe in a direction away from the handlebar;
an LED (26) mounted to emit light into one end of the light pipe (25);
a heat sink (24) associated with the LED (26) and arranged such that, when the bicycle light is mounted to a bicycle handlebar by the mounting means (20, 21), the heat sink (24) is in thermal contact with the handlebar and can transfer heat into the bicycle handlebar by conduction.

2. A bicycle light according to claim 1, further comprising a housing (5, 6) adapted to surround the light pipe and at least a portion of the handlebar, the housing comprising a transparent shield (17) through which light emitted by the light pipe may pass.

3. A bicycle light according to claim 2, wherein the housing is adapted to surround the entire length of the light pipe and a corresponding length of the handlebar.

4. A bicycle light according to claim 2 or claim 3, wherein the housing further comprises an opaque cover peak (15) extending forwardly above the transparent shield, such that light emitted by the bicycle light when mounted on a bicycle is not seen by a rider of the bicycle

5. A bicycle light according to any preceding claim, wherein the reflective rear face (27) of the light pipe comprises focus and reflecting elements for directing light out of the light pipe.

6. A bicycle light according to claim 5, wherein the focus and reflecting elements comprise a series of angled facets protruding into the light pipe.

7. A bicycle light according to any preceding claim, in which the light pipe is a generally round and solid clear plastics component.

8. A bicycle including a handlebar, and having mounted thereto a bicycle light according to any preceding claim.