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(71) Applicant(s):
David Taylor
12 St Margarets, BROADWATER, Stevenage, Herts, SG2 8RG, United Kingdom

(72) Inventor(s):
David Taylor

(74) Agent and/or Address for Service:
Chapman Molony
Cardiff Business Technology Centre, Senghennydd Road, Cathays, CARDIFF, CF24 4AY, United Kingdom

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(56) Documents Cited:
GB 2089958 A **GB 2014716 A**
GB 1358128 A **DE 019648180 A1**
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(54) Title of the Invention: **Light assembly**
Abstract Title: **Cycle light reactive to suspension movement**

(57) A light assembly for a cycle suspension comprises a bracket 18a arranged for disposal upon the cycle suspension 13 at a first section 13a thereof and pivot means 19 for pivotally coupling a light 20 to the bracket 18a. The assembly further comprises means 22 for pivoting the light 20 about the pivot means 19 with respect to the bracket 18a, in dependence upon the relative separation of the first section 13a of the suspension 13 from a second section 13b of the suspension 13. The assembly serves to preserve the orientation of the light 20 during acceleration and deceleration of the cycle and thus during an elongation and contraction of the suspension 13 respectively, to illuminate the required section of road ahead of the cycle. The means 22 for pivoting the light 20 may be actuated by a series of levers 21, by cable (29, figure 3) or by pneumatic or hydraulic means (32, 33, figure 4). Electrical actuation is also envisaged.

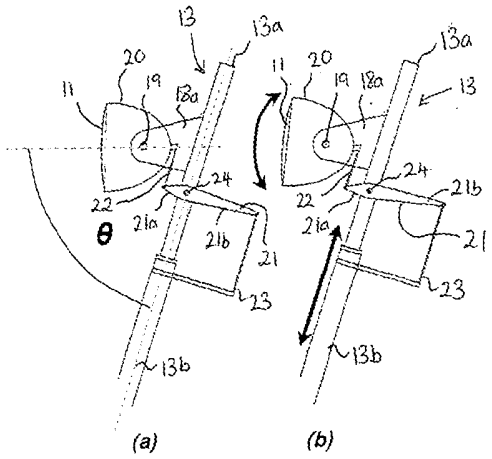

Figure 2

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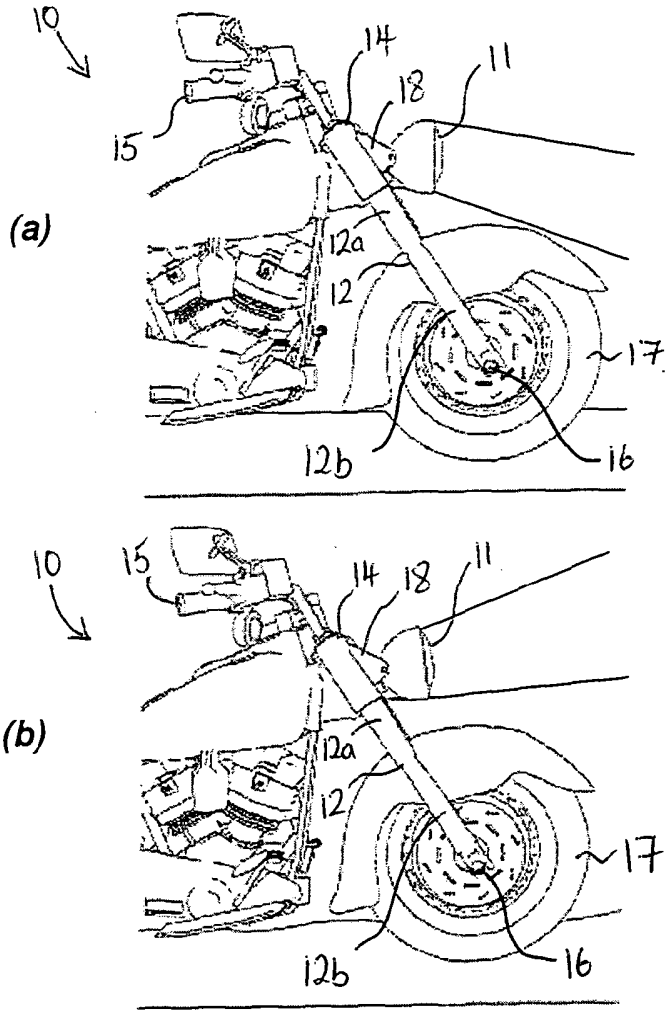

Figure 1

(PRIOR ART)

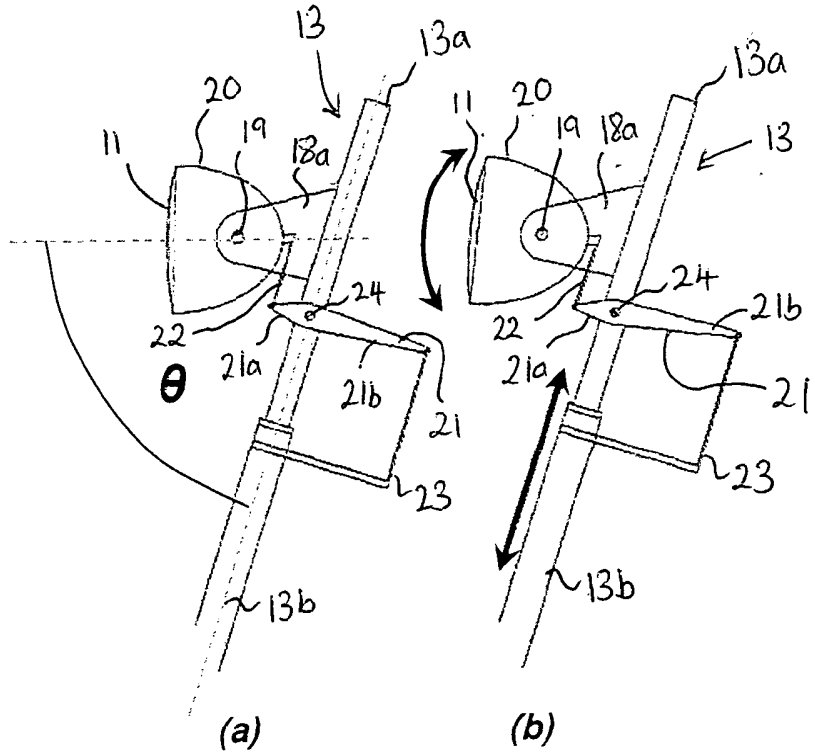

Figure 2

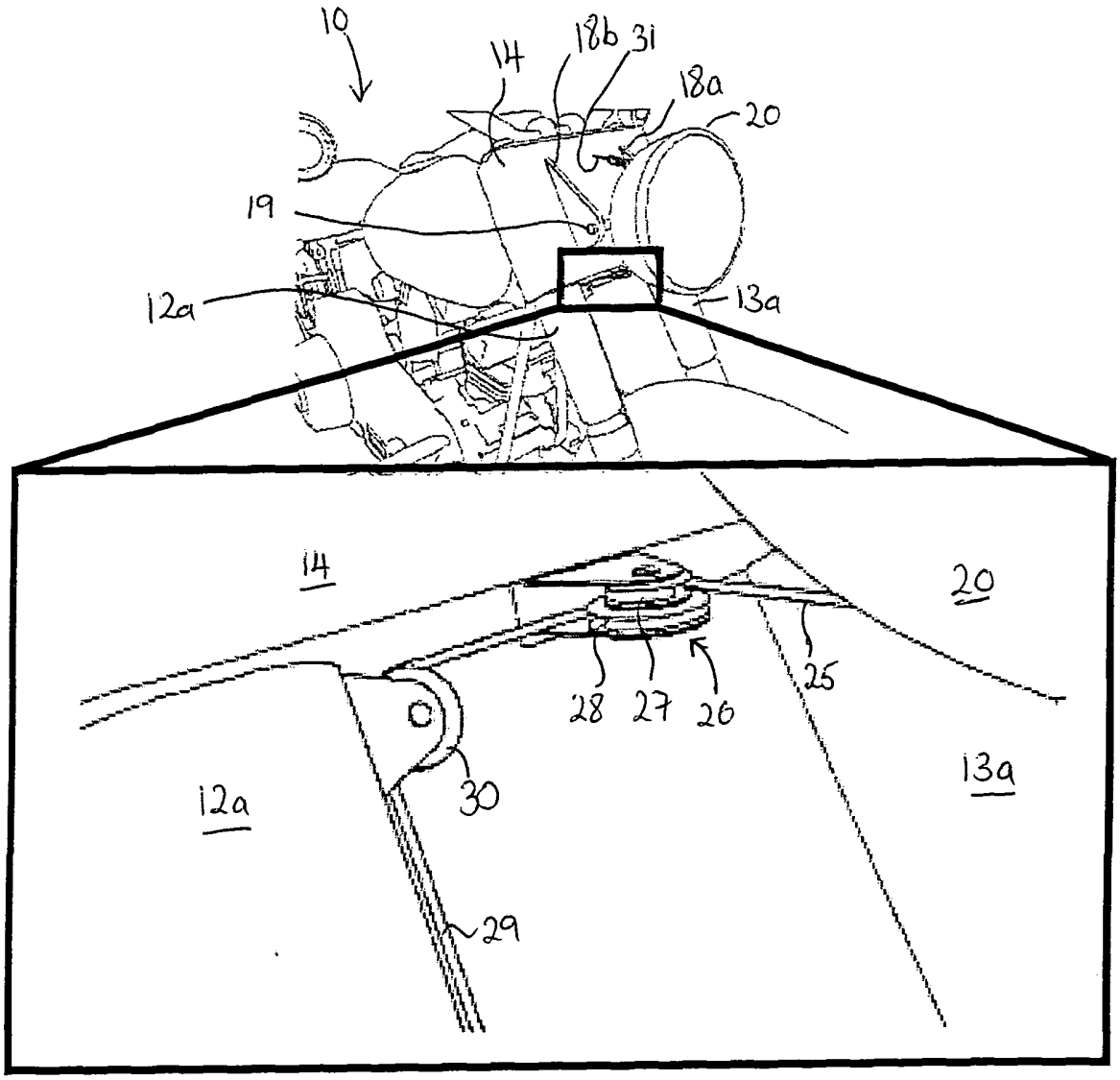

Figure 3

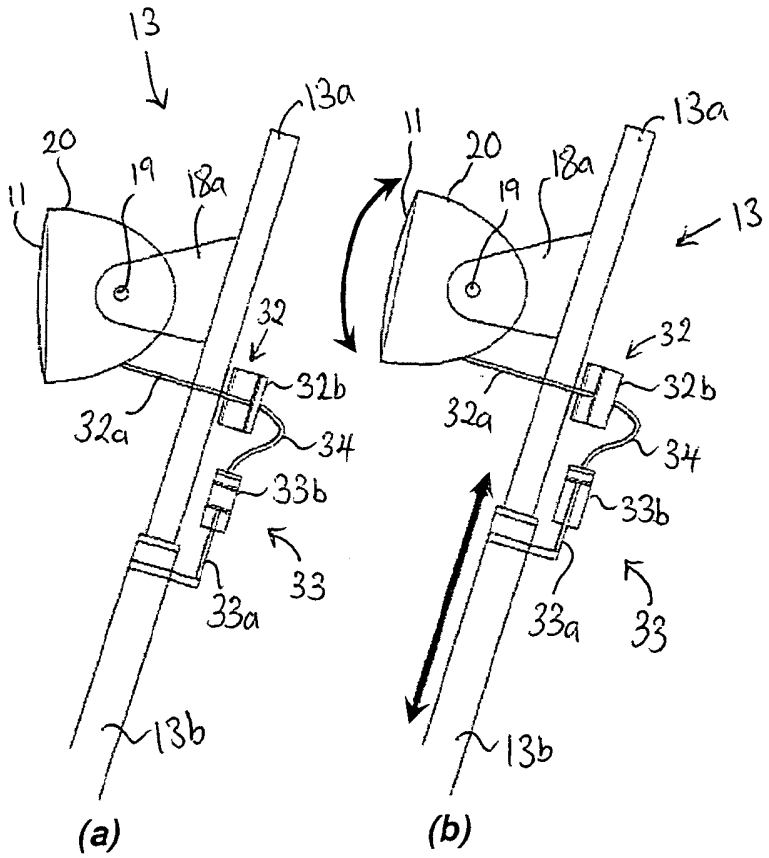

Figure 4

Light Assembly

The present invention relates to a light assembly and particularly but not exclusively to a cycle light assembly for a cycle suspension.

Motorcycles generally comprise a light rigidly secured at the front of the motorcycle for illuminating the road ahead of the motorcycle, so that the operator can safely navigate the motorcycle when travelling during the night, for example. The light is typically secured near the handlebar of the motorcycle, above the front suspension system. The front suspension of a motorcycle typically comprises a pair of hydraulic arms which extend from a position near the handlebar, to an axle supporting the front wheel of the motorcycle. The arms are arranged to extend and contract to absorb undulations in the road surface and thus improve rider comfort.

The light is arranged to illuminate a section of the road at a suitable distance in front of the motorcycle. However, as the motorcycle accelerates and decelerates, the dynamic forces acting upon the motorcycle cause the arms of the suspension to become extended and shortened, respectively. This causes the light to become directed upwardly from the road and downwardly onto the road very close to the front of the motorcycle, respectively. As a result, when accelerating and decelerating, the motorcycle operator can loose visibility of the traffic and the road ahead and as such, it can be difficult to navigate the motorcycle at night.

I have now devised a light assembly which alleviates the above mentioned problems.

In accordance with the present invention as seen from a first aspect, there is provided a light assembly for a cycle suspension, the assembly comprising a bracket arranged for disposal upon the cycle suspension at a first section thereof and pivot means for pivotally coupling a light to the bracket, the assembly further comprising means for pivoting the light about the pivot means with respect to the bracket, in dependence upon the relative separation of the first section of the suspension from a second section of the suspension.

The orientation of the light is thus preserved during acceleration and deceleration of the cycle and thus during an elongation and contraction of the suspension respectively, to illuminate the required section of road ahead of the cycle.

Preferably, the light is arranged to pivot in a first direction about the pivot means as the relative separation of the bracket from the second section of the suspension increases and a second direction as the relative separation of the bracket from the second section of the suspension decreases.

Preferably, the pivot means comprises a rod that is coupled to the bracket, and which extends through an aperture disposed upon the light. Preferably, the light can rotate about the rod.

The means for pivoting the light about the pivot means preferably comprises a lever that is arranged for pivotal movement about a pivot point upon the first section of the suspension. Preferably, a first end of the lever is arranged for coupling to the light and a second end of the lever is arranged for coupling to the second section of the suspension. In this manner, as the first section of the suspension moves relative to the second section, the lever pivots about the pivot point to cause the light to pivot about the pivot means.

In an alternative embodiment, the means for pivoting the light about the pivot means comprises a cable system. The cable system preferably comprises a cable that is arranged for coupling between the light and the second section of the suspension. Alternatively, the cable system preferably comprises a first cable that is coupled to the light and a second cable that is arranged for coupling to the second section of the suspension. Preferably, the first and second cables are coupled by a wheel that is rotatably coupled to the bracket.

Preferably, the assembly further comprises a spring that is coupled between the light and the bracket. Preferably the spring and cable are coupled to the light at opposite sides of the pivot means such that the spring biases the light to pivot about the pivot means in a first direction and the cable is arranged to rotate the light about the pivot means in a second direction.

In a further alternative embodiment, the means for pivoting the light about the pivot means preferably comprises, a hydraulic or pneumatic system comprising a first plunger and a second plunger. The first and second plungers preferably comprise an arm and a respective housing within which the respective arm can extend and retract. The housing of the first and second plunger are preferably secured with respect to the first section of suspension.

Preferably, the arm of the first plunger is coupled to the light and the arm of the second plunger is secured to the second section of the suspension.

Preferably, the housing of the first and second plungers are arranged in fluid communication by a duct.

Preferably, the arm of the first plunger and the arm of the second plunger are arranged to move in opposite directions with respect to the housing of the first and second plungers, respectively, such that as one arm moves into its respective housing, the other arm moves out of the other housing.

In a further alternative embodiment, the means for pivoting the light about the pivot means comprises an electrically operated actuator. The actuator preferably comprises sensing means which is arranged to sense the relative separation of the first and second sections of the suspension and output a signal in dependence on the relative separation. The actuator preferably causes the light to pivot about the pivot means by an amount that is dependent on the signal output by the sensing means.

According to a second aspect of the present invention, there is provided a cycle suspension, the suspension comprising a bracket disposed at a first section thereof for supporting a cycle light, the bracket comprising pivot means for pivotally coupling the light to the bracket, the suspension further comprising means for pivoting the light about the pivot means with respect to the bracket, in dependence upon the relative separation of the first section of the suspension from a second section of the suspension.

Preferably, the cycle comprises a motorcycle or bicycle.

Embodiments of the present invention will now be described by way of example only and with reference to the accompanying drawings, in which:

Figure 1a is a side view of a motorcycle illustrating the direction illuminated by a known motorcycle light assembly during motorcycle deceleration;

Figure 1b is a side view of a motorcycle illustrating the direction illuminated by a known motorcycle light assembly during motorcycle acceleration;

Figure 2a is a side view of a first embodiment of the light assembly of the present invention secured to a motorcycle suspension;

Figure 2b is a side view of the light assembly of figure 2a illustrating the relative movement of the light and suspension during a deceleration of the motorcycle;

Figure 3 is a magnified view of the light assembly according to a second embodiment of the present invention;

Figure 4a is a side view of a third embodiment of the light assembly of the present invention secured to a motorcycle suspension; and,

Figure 4b is a side view of a third embodiment of the light assembly of the present invention secured to a motorcycle suspension during a deceleration of the motorcycle.

Referring to Figure 1 of the drawings, there is shown a motorcycle 10 comprising a light 11 which illuminates the road ahead of the motorcycle 10 when travelling at night, for example. The motorcycle 10 comprises a front suspension 12 which comprises a first and second arm 12, 13 (only one of which is shown in Figure 1) that are secured to a frame (not shown) of the motorcycle 10 via a yolk 14. The yolk 14 is rotatably coupled to the frame and comprises a handlebar 15 that is rigidly secured to an upper region thereof, for steering the motorcycle 10 during use.

Each arm 12, 13 of the suspension comprises an upper section 12a, 13a that is secured to the yolk 14, and a lower section 12b, 13b that is coupled to an axle 16 about which the front wheel 17 of the motorcycle can rotate. The upper section 12a, 13a of

the first and second arms 12, 13 are arranged to extend into and out of the lower section 12b, 13b of the first and second arms 12, 13, respectively, in dependence upon undulations in the road surface to absorb the undulations and thus improve rider comfort.

Referring to figure 1a of the drawings there is shown a known light assembly that is rigidly mounted to the yolk 14 of a motorcycle 10. As the motorcycle 10 decelerates under braking, the forces acting upon the motorcycle 10 will cause the length of the arms 12, 13 of the suspension to shorten, as the upper section 12a, 13a of each arm 12, 13 move into the lower section 12b 13b. This causes the light 11 to be directed downwardly near to the front of the motorcycle 10. Conversely, during an acceleration of the motorcycle 10, the arms 12, 13 of the suspension will extend which will cause the light 11 to become directed upwardly away from the road surface. In both cases, the motorcycle operator will loose visibility of the road ahead.

The light assembly of the present invention is secured to the yolk 14 via a bracket 18 that may be formed integrally with the yolk 14 or which may be removably coupled to the yolk 14 using fasteners (not shown), for example. The bracket 18 comprises a pair of walls 18a, 18b (only one of which is shown in the drawings) arranged substantially parallel to each other, which are spaced apart upon the yolk 14. The walls 18a, 18b extend in substantially the same plane as the motorcycle 10 and are connected by a rod 19 that is removably mounted between the bracket walls 18a, 18b, substantially perpendicularly thereto. The light 11 is rotatably coupled between the bracket walls 18a, 18b by passing the rod 19 through an aperture (not shown) arranged at the rear of a light housing 20 and then mounting the rod 19 to the bracket walls 18a, 18b. Accordingly, the light 11 is arranged to rotate to direct light forwardly of the motorcycle 10 in a plane substantially comprising the plane of the motorcycle 10.

According to a first embodiment of the invention as shown in figure 2, the inclination of the light 11 relative to the road surface is maintained during an extension or contraction of the suspension arms 12, 13, by a lever 21 that is pivotally coupled near the mid-point thereof to the upper section 12a, 13a of one of the first or second suspension arms 12, 13. The lever 21 extends either side of the respective arm (illustrated as arm 13 in Figure 2), in a direction that is substantially forwardly and rearwardly of the arm 13. The forward end 21a of the lever 21 is coupled to the rear of a light housing 20 via a

coupling arm 22, whereas the rearward end 21b of the lever 21 is coupled to the lower section 13b of the respective arm 13 via a further coupling member 23.

As the suspension arms 12, 13 extend and retract during an acceleration or deceleration of the motorcycle 10, or when travelling over a bumpy road surface for example, the lever 21 will rotate about the pivot point 24. In particular, as the upper section 13a of the arm 13 to which the lever 21 is coupled moves into the lower section 13b, as shown in figure 2b of the drawings, the lever 21 will rotate in an anti-clockwise direction, as viewed in figure 2b of the drawings, thereby causing the light 11 to pivot in a clockwise direction. This has the effect of increasing the angle θ of inclination of the light with respect to the suspension arms 12, 13.

Similarly, as the upper section 13a of the arm 13 to which the lever 21 is coupled moves out of the lower section 13b, for example during an acceleration of the motorcycle 10, the lever 21 will rotate in a clockwise direction, as viewed in figure 2 of the drawings, thereby causing the light 11 to pivot about the rod 19 in an anti-clockwise direction. This has the effect of decreasing the angle θ of inclination of the light 11 with respect to the suspension arms 12, 13. The lever system thus maintains the orientation of the light 11 with respect to the road surface to suitably illuminate the road ahead of the motorcycle 10.

According to a second embodiment of the present invention as shown in figure 3 of the drawings, the orientation of the light 11 relative to the road surface is maintained during an extension or contraction of the suspension arms 12, 13, by a cable system. The cable system comprises a first cable 25 that is coupled at one end to the rear of the light housing 20, at a position that is below the rod 19. The opposite end of the first cable 25 is secured to a coupling wheel 26 that is rotatably coupled to the yolk 14. The coupling wheel 26 comprises a first recess 27 that extends along the outer periphery of the wheel at an upper region thereof. The lower region of the wheel 25 comprises a second recess 28 that also extends along the outer periphery of the coupling wheel 25.

The cable system further comprises a second cable 29 that is rigidly secured at one end to the lower section of one of the suspension arms (illustrated as suspension arm 12). The opposite end of the second cable 29 is passed around a guidance wheel 30 which guides the second cable 29 along the suspension arm 12 onto the second

recess 28 of the coupling wheel 26, and is coupled thereto. The first and second cables 25, 29 are wrapped around the coupling wheel 26 in opposite directions, such that as one of the first 25 or second cable 29 unwinds from the coupling wheel 26, the other cable becomes wrapped thereon.

The cable system further comprises an extension spring 31 which is coupled between the yolk 14 or bracket 18, and the rear of the light housing 20, at a position upon the housing that is above the rod 19. The combined length of the first and second cables 25, 29 and the bias on the extension spring 31 is such that when there is no relative extension of the arms 12, 13 of the suspension, the light 11 is directed at a suitable position ahead of the motorcycle 10.

As the suspension arms 12, 13 extend and retract during an acceleration or deceleration of the motorcycle 10, or when travelling over a bumpy road surface, for example, the first and second cables 25, 29 and the extension spring 31 will maintain the orientation of the light 11 with respect to the road. In particular, as the upper section 12a of the arm 12 moves into the lower section 12b, this will cause the tension in the cables 25, 29 to be released. However, the extension spring 31 will act to maintain the tension in the cables 25, 29 by causing the light 11 to pivot about the rod 19 in an anti-clockwise direction, as viewed in figure 3. Conversely, as the upper section 12a of the suspension arms 12 move out of the respective lower sections 12b, for example during an acceleration, the end of the second cable 29 that is secured at the lower section 12b of the suspension arm 12 will move downwardly with respect to the upper section 12a of the suspension arm 12. This will cause the second cable 29 to unwind from the coupling wheel 26 which in turn causes the first cable 25 to wind upon the coupling wheel 26 and thus cause the light 11 to pivot in a clockwise direction about the rod 19. The cable system thus maintains the orientation of the light 11 with respect to the road surface to suitably illuminate the road ahead of the motorcycle 10.

According to a third embodiment of the present invention as shown in figure 4 of the drawings, the orientation of the light relative to the road surface is maintained during an extension or contraction of the suspension arms, by a hydraulic system which comprises a first 32 and second plunger 33. The first and second plungers 32, 33 separately comprise an arm 32a, 33a and a housing 32b, 33b within which the respective arm can extend and retract. The housing 32b of the first plunger 32 is

coupled to the upper section 13a of one of the suspension arms (illustrated as suspension arm 13 in Figure 4) and the distal end of the arm 32a of the first plunger 32 is secured to the rear of the light housing 20 at a position which is below the rod 19. The housing 33b of the second plunger 33 is rigidly coupled with respect to the upper section 13a of suspension arm 13. The arm 33a of the second plunger 33 is coupled to the lower section 13b of the same suspension arm 13.

The housing 32b, 33b of the first and second plungers 32, 33 are in fluid communication by a duct 34. When there is no relative extension or contraction of the suspension arms 12, 13, the light 11 is arranged to illuminate a section of the road at a suitable position ahead of the motorcycle 10. However, as the upper and lower sections 12a, 13a and 12b, 13b respectively, of the suspension arms 12, 13 move relative to one another, the arm 33a of the second plunger 33 will move into and out of the housing 33b, to increase and reduce respectively, the pressure of the fluid within the housing 33b of the second plunger 33. This pressure is communicated to the housing 32b of the first plunger 32 via the duct 34, and causes the arm 32a of the first plunger 32 to extend from and retract into, respectively, the housing 32b of the first plunger 32. Accordingly, the arm 32a of the first plunger 32 moves in the opposite sense to the arm 33a of the second plunger 33 to maintain the orientation of the light 11 with respect to the road surface.

According to a fourth embodiment of the present invention, which is not illustrated, the orientation of the light 11 relative to the road surface is maintained during an extension or contraction of the suspension arms 12, 13, by an electronically operated actuator (not shown). The actuator comprises an arm (not shown) that extends between an arm housing (not shown) and the rear of the light housing 20. The arm (not shown) is coupled to the light housing 20 at a position which is below the rod 19 and is arranged to extend from and retract into the arm housing (not shown) in dependence upon signals received from a sensor (not shown).

The sensor (not shown) comprises an electrically resistive pathway (not shown) extending along a portion of the length of one of the suspension arms 12, 13 at the lower section 12b, 13b thereof. The sensor (not shown) further comprises electronic circuitry (not shown) which creates a voltage difference across the pathway (not shown). The circuitry (not shown) further comprises a contact arm (not shown) that is

rigidly secured with respect to the upper section 12a, 13a of the suspension arm 12, 13 to which the electrically resistive pathway (not shown) is secured and is arranged to contact the pathway substantially at the centre thereof when there is no relative separation of the upper 12a, 13a and lower sections12b, 13b of the suspension arms 12, 13. When the contact arm (not shown) is arranged in this position, the arm of the actuator (not shown) is arranged to position the light 11 about the rod 19 such that the light illuminates a section of the road at a suitable distance ahead of the road.

However, as the suspension arms 12, 13 extend and retract as the motorcycle 10 accelerates and decelerates respectively, for example, the contact arm (not shown) will move along the electrically resistive pathway (not shown) and will thus deliver a voltage signal to the actuator (not shown) in dependence upon its position along the pathway (not shown). The actuator (not shown) is calibrated to extend and retract the arm of the actuator (not shown) with respect to the arm housing (not shown) by an amount corresponding to the voltage signal and thus maintain the orientation of the light 11 with respect to the road surface.

From the foregoing therefore, it is evident that the light assembly of the present invention maintains the orientation of the motorcycle light with respect to the road surface independently of the acceleration and deceleration of the motorcycle.

Claims

1. A light assembly for a cycle suspension, the assembly comprising a bracket arranged for disposal upon the cycle suspension at a first section thereof and pivot means for pivotally coupling a light to the bracket, the assembly further comprising means for pivoting the light about the pivot means with respect to the bracket, in dependence upon the relative separation of the first section of the suspension from a second section of the suspension.

2. A light assembly according to claim 1, wherein the light is arranged to pivot in a first direction about the pivot means as the relative separation of the bracket from the second section of the suspension increases and a second direction as the relative separation of the bracket from the second section of the suspension decreases.

3. A light assembly according to claim 1 or 2, wherein the pivot means comprises a rod that is coupled to the bracket, and which extends through an aperture disposed upon the light.

4. A light assembly according to claim 3, wherein the light can rotate about the rod.

5. A light assembly according to any preceding claim, wherein the means for pivoting the light about the pivot means comprises a lever that is arranged for pivotal movement about a pivot point upon the first section of the suspension.

6. A light assembly according to claim 5, wherein a first end of the lever is arranged for coupling to the light and a second end of the lever is arranged for coupling to the second section of the suspension.

7. A light assembly according to any of claim 1 to 4, wherein the means for pivoting the light about the pivot means comprises a cable system.

8. A light assembly according to claim 7, wherein the cable system comprises a cable that is arranged for coupling between the light and the second section of the suspension.

9. A light assembly according to claim 7, wherein the cable system comprises a first cable that is coupled to the light and a second cable that is arranged for coupling to the second section of the suspension.

10. A light assembly according to claim 9, wherein the first and second cables are coupled by a wheel that is rotatably coupled to the bracket.

11. A light assembly according to any of claims 7 to 10, wherein the assembly further comprises a spring that is coupled between the light and the bracket.

12. A light assembly according to claim 11, wherein the spring and cable are coupled to the light at opposite sides of the pivot means such that the spring biases the light to pivot about the pivot means in a first direction and the cable is arranged to rotate the light about the pivot means in a second direction.

13. A light assembly according to any of claims 1 to 4, wherein the means for pivoting the light about the pivot means comprises, a hydraulic or pneumatic system comprising a first plunger and a second plunger.

14. A light assembly according to claim 13, wherein the first and second plungers comprise an arm and a respective housing within which the respective arm can extend and retract.

15. A light assembly according to claim 14, wherein the housing of the first and second plunger are secured with respect to the first section of suspension.

16. A light assembly according to any of claims 14 or 15, wherein the arm of the first plunger is coupled to the light and the arm of the second plunger is secured to the second section of the suspension.

17. A light assembly according to any of claims 14 to 16, wherein the housing of the first and second plungers are arranged in fluid communication by a duct.

18. A light assembly according to any of claims 14 to 17, wherein the arm of the first plunger and the arm of the second plunger are arranged to move in opposite directions with respect to the housing of the first and second plungers, respectively, such that as one arm moves into its respective housing, the other arm moves out of the other housing.

19. A light assembly according to any of claims 1 to 4, wherein the means for pivoting the light about the pivot means comprises an electrically operated actuator.

20. A light assembly according to claim 19, wherein the actuator comprises sensing means which is arranged to sense the relative separation of the first and second sections of the suspension and output a signal in dependence on the relative separation.

21. A light assembly according to claim 20, wherein the actuator causes the light to pivot about the pivot means by an amount that is dependent on the signal output by the sensing means.

22. A cycle suspension, the suspension comprising a bracket disposed at a first section thereof for supporting a cycle light, the bracket comprising pivot means for pivotally coupling the light to the bracket, the suspension further comprising means for pivoting the light about the pivot means with respect to the bracket, in dependence upon the relative separation of the first section of the suspension from a second section of the suspension.

23. A cycle suspension according to claim 22, wherein the cycle comprises a motorcycle or bicycle.

Application No:	GB0900694.1	**Examiner:**	Mr Philip Osman
Claims searched:	1-23	**Date of search:**	8 December 2009

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1, 2, 13-17, 22, 23	US4024387 A (CIBIE) See abstract and figures
X	1, 2, 7, 8, 11, 22, 23	DE2617765 A1 (GNIRSS) See English language abstract and figures
A	-	DE19648180 A1 (SCHUSTER) See English language abstract and figures
A	-	GB2014716 A (BMW) See abstract and figures
A	-	JP56071640 A (KOMIYAMA) See English language abstract and figures
A	-	GB1358128 A (DAIMLER BENZ) See figures
A	-	GB2089958 A (BOSCH) See abstract and figures

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X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^{X} :

Worldwide search of patent documents classified in the following areas of the IPC

B60Q; B62J

The following online and other databases have been used in the preparation of this search report

EPODOC, WPI

International Classification:

Subclass	Subgroup	Valid From
B62J	0006/02	01/01/2006
B60Q	0001/10	01/01/2006