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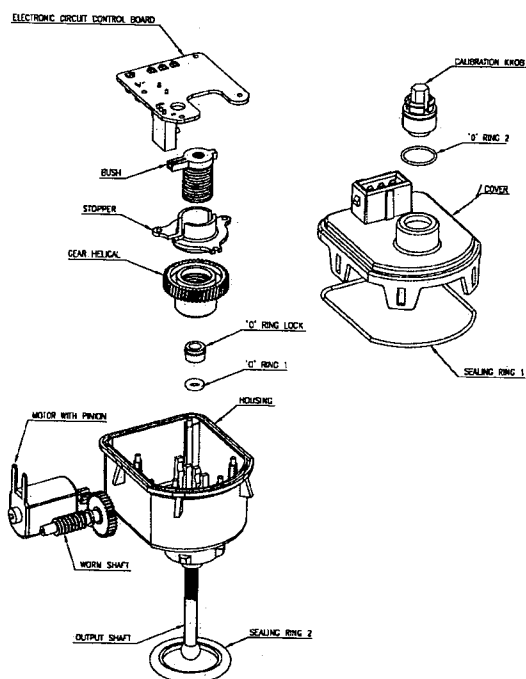
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(54) Title: HEADLAMP ADJUSTER FOR AUTOMOBILES



(57) Abstract: The present invention relates to an headlamp assembly (1) and more particularly to a motorized headlamp levelling device used to adjust the position of headlamps of vehicles/automobiles or other similar applications such as watchtowers, wherein the light beam is directed to the required direction. It is adapted to be driven by motor and worm/gear assembly means and controlled by an electronic circuit. The actuator mechanism comprises an adjuster output shaft extending from the housing and a control unit for controlling the drive of the motor. There is a sealing member adapted for said adjuster output shaft to seal with said housing and said housing is adapted to seal with the housing of the headlamp assembly.

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5                   **HEADLAMP ADJUSTER FOR AUTOMOBILES**

**FIELD OF THE INVENTION:**

10   The present invention relates to headlamp assembly and more particularly directed to a motorized adjustable headlamp leveling device used to adjust the position of headlamp, for required flexibility and direction of headlamp providing high quality lighting for the desired visibility. Thus the motorized headlamp adjuster is adapted for simple and easy adjusting of the headlamp beam vertically according to the user needs. Importantly, the  
15   motorized headlamp adjuster of the invention is sealed well with the headlamp housing when the headlamp adjuster is installed. As such, the headlamp adjuster is versatile and have an effective working life avoids problems such as reduced life due to moisture leakage into the assembly due to inadequate sealing between Calibration knob and the housing of headlamp adjuster. The adjustable headlamp of the present invention is  
20   therefore capable of advantageous industrial application in vehicles/automobiles or similar other applications such as watchtowers, wherein the light beam is directed to required direction adapted to be driven by motor and worm/gear assembly means, controlled by electronic circuit, free of any external use of tools for manual adjustments.

25   **BACKGROUND ART:**

It is well known in the art of assembly of headlamps for application in automobiles/vehicles that headlamp adjusters are used in the assembly for adjusting the position of the reflector. Before an automobile is released to the seller/customer, the  
30   movable reflectors of the headlamp assemblies are adjusted to a desired position so that the light beam from the headlamps are properly aimed in both the horizontal and the vertical directions. Headlamp adjusters are normally operated at the automobile assembly plant. Thereafter, if a movable reflector moves from its desired position due to vibration, jerking or the vehicle being subjected to any accident, a mechanic can operate the  
35   headlamp adjusters in order to properly realign the reflectors to direct the light beam as necessary. The adjusters conventionally used for the purpose is mounted outside the housing within which the headlamp with the movable reflector is held on pivot support such that the output shaft of the adjuster can be made to operate manually by using hand

5 tools externally by a mechanic to adjust the tilt or up and down position of the reflector according to the need of adjusting the beam of light emerging from the headlamp assembly.

10 While motorized headlamp adjusters are presently commercially available, many of those present certain disadvantages. For example, many of the motorized headlamp adjusters are not sealed well and do not seal well with the headlamp housing when the headlamp adjuster is installed. As such, these headlamp adjusters may have reduced life due to moisture leakage into the assembly due to inadequate sealing between Calibration knob and the housing of headlamp adjuster. Additionally, the life of the headlamp may also be  
15 reduced due to moisture leaking into the headlamp housing due to inadequate sealing between the headlamp adjuster and the housing of the headlamp assembly.

There had been therefore a persistent need felt by the service personnel in the field of automobiles that it would be undoubtedly advantageous in case the adjustment required  
20 for the headlamp for reorienting its reflectors for required direction of the light beam, could be achieved through automated means such as a motorized headlamp adjusters. In motorized adjuster system for headlamps in automobiles a motor is actuated to extend or retract an adjuster output shaft to adjust the headlamp instead of having to use a tool to adjust externally to the adjuster mounting on the headlamp housing. Moreover the sealing  
25 of the motorized adjuster with the housing to prevent the assembly from moisture/water leakage was also seemingly an important aspect needed to be taken care in the motor controlled headlamp adjuster systems.

### 30 **OBJECTS OF THE INVENTION:**

The basic object of the present invention is directed to a motorized headlamp adjuster for vehicles/automobiles and in particular a leveling apparatus, to provide system for adjusting the headlamp for proper adjusting the light beam in the desired direction, by  
35 simple and effective control mechanism installed in a housing and adapted such as to be free of problems of leakage and consequential damage of the adjuster mechanism.

5 A further object of the motorized headlamp leveling device of the present invention is to obtain desired light beam adjustment wherein said headlamp reflector which is driven by an actuator so that a light axis of the headlamp can be tilted up or down relative to a vehicle body, by providing motorized means for effective movement of the reflector in the vertical and horizontal planes, instead of having to use any tool to adjust manually.

10

A further object of the motorized headlamp adjuster system of the invention is to obtain said controlling movement of the reflector within the housing of the headlamp a control unit for controlling the motor drive operatively connected to the output shaft through worm wheel and pinion mechanisms, and the required movement of the ball rod/output shaft is effected based on position of the potentiometer slider in electronic circuit control board.

15

A still further object of the present invention is to obtain effective sealing between the headlamp with the reflector and the housing and the adjuster installed on it, such as to protect the reduction in life of headlamp adjusters and the calibration knob with housing due to moisture leakage as a result of inadequate sealing between the headlamp adjuster and the housing of the headlamp assembly.

20

A further object of the motorized headlamp adjuster system of the invention is to provide stopper mechanism for arresting the movement of the helical gear along the lateral direction, enabling the output shaft to generate the desired extension and retraction motion being actuated by the motor and with pinion transferring power to the gear helical.

25

### 30 **SUMMARY OF THE INVENTION:**

Thus according to the basic aspect of the present invention there is provided a motorized headlamp leveling apparatus for a vehicle headlamp, comprising:

5 a headlamp in an housing adapted to be driven by an actuator mechanism through a cooperative motor means such that the head lamp can be tilted up or down relative to a vehicle body;

10 said actuator mechanism comprising an adjuster output shaft extending from said housing and a control unit for controlling the drive of said motor , the forward and reverse movement of said output shaft providing for the desired level adjusting of the headlamp;

15 a sealing member for said adjuster output shaft adapted to seal with said housing preferably engage able with a reflector of the headlamp assembly ;

said housing adapted to engage and seal with the housing of the headlamp assembly.

20 According to a preferred aspect in the motorized headlamp leveling apparatus for a vehicle headlamp of the invention said actuator mechanism comprises an output shaft having an element disposed upon a free end thereof for connection to the vehicle headlamp housing;

25 said motor with pinion adapted to transfer the power to a worm shaft with said worm shaft adapted to transfer power to a helical gear ;

stopper means provided to arrest the axial play of the gear helical with said gear helical adapted to transfer power to said output shaft;

30 said forward and reverse movement of the output shaft based on the position of a potentiometer slider in an electronic circuit control board of said control unit.

According to another aspect of the invention there is provided motorized headlamp leveling apparatus for a vehicle headlamp comprising:

35 a housing,

a motor adapted to cooperate with a worm wheel rotatably supported by the housing, such that the worm wheel's position is fixed in the longitudinal direction and is rotated

5 by the motor through pinion and the worm wheel is snap fitted in the housing.

a output shaft screwed into bush means, which is guided by stopper for soothing axial movement and one end of the bush is connected to the potentiometer and the other end is coupled with the helical gear,

10

and

a stopper arrangement to restrict the movement of the helical gear in the longitudinal direction and the bush in the axial direction, and in turn facilitate the desired movement of the output shaft for desired headlamp leveling.

15

In accordance with another aspect of the invention the motorized headlamp leveling apparatus for a vehicle headlamp comprises:

20 electronic means provided to cooperate with said motor for said motorized headlamp adjusting.

Moreover, in the above disclosed motorized headlamp leveling apparatus for a vehicle headlamp preferably the output shaft and the bush are screwed together by thread ridges provided on an inner side of the bush and thread ridges provided on an outer periphery of the output shaft.

25

According to another important aspect of the present invention directed to said motorized headlamp leveling apparatus for a vehicle headlamp, wherein a Calibration knob is assembled with cover in a snap fit arrangement and an 'O' ring is provided in Calibration knob to arrest Dust and Water entry;

30

wherein said Calibration knob is provided with a Square hole which aids the engageable with Square profile on Output shaft and also has a hexagonal portion for calibration purpose with help of standard spanner.

35

- 5 According to yet another preferred aspect of the motorized headlamp leveling apparatus for a vehicle headlamp wherein the headlamp adjuster is adapted to completely seal with respect to the headlamp housing particularly with complete sealing between the calibration knob and the housing of the headlamp adjuster.
- 10 A still further aspect of said motorized headlamp leveling apparatus for a vehicle headlamp wherein said electronic control comprises electronic circuit control board cooperatively disposed with respect to said housing.

The present invention and its objectives and advantages are described in greater details  
15 with particular reference to the non-limiting exemplary illustrations of the invention as per the following accompanying illustrative figures.

#### **BRIEF DESCRIPTION OF THE ACCOMPANYING FIGURES:**

- 20 **Figure 1:** Is the illustration of conventional automobile headlamp adjuster with provision for movable reflector, mounted in housing, to move the reflector up and down to adjust/direct the beam of light by manual adjustments using tools.

**Figure 2:** Is the illustration of the general assembly and its longitudinal sectional view  
25 along A-A on a plane passing normally through the longitudinal axis of the assembly, of the motorized headlamp adjuster/levelling system for automobiles according to the present invention.

**Figure 3:** Is the exploded view of the motorized headlamp adjuster/leveling apparatus  
30 according to the invention, providing the details of its constituent components and their positional relationship in the assembly.

#### **DETAILED DESCRIPTION OF THE INVENTION WITH REFERENCE TO THE ACCOMPANYING FIGURES:**

35 A typical headlamp assembly 1 with adjustment provision for its reflectors for desired orientation of the light beam, conventionally used in modern automobiles or similar other

5 application, is illustrated in a plan view seen as **FIG. 1**, that normally includes: a fixed housing **2**, to which an outer headlamp lens **3** is affixed; a movable reflector **4**, which is mounted within the fixed housing **2**; and a stationary headlamp bulb (not shown), which is positioned within the movable reflector **4**. Typically, the movable reflector **4** is mounted to the housing **2** by a universal or ball-type pivot **5** which is stationary, or fixed,  
10 on the housing **2**.

A first pivot point **6** is disposed generally vertical of the fixed pivot **5**, and a second pivot point **7** is disposed generally horizontal of the fixed pivot **5**. As such, the movable reflector **4** may be pivoted about the fixed pivot **5** in the vertical and horizontal planes to  
15 aim/direct the headlamp beam. The actual mechanism of adjustment, or headlamp adjuster **8** and **9** are typically provided at the first and second pivot points **6** and **7**, normally termed the vertical pivot and the horizontal pivot, and the headlamp adjuster **8** can be operated to effective movement of the reflector **4** in the vertical and horizontal planes. The headlamp adjuster **8** are typically mounted to the housing **2** of the headlamp  
20 assembly **1** and have adjuster output shaft **9** operatively connected to the movable reflector **4** by ball and socket type pivots, such that linear movement of the adjuster output shafts **9** produces pivoting of the movable reflector in the vertical and horizontal planes. Specifically, Headlamp adjuster **8** typically includes drive structure **10** for receiving a tool, and typically the drive structure **10** is precision geared to the adjuster  
25 output shaft **9**. The gearing provides that using the tool to rotate the drive structure **10** causes linear translation of the adjuster output shaft **9** and therefore adjustment of the position of the headlamp reflector **4**. Such headlamp adjuster assemblies, however needed manual adjustment and control, without use of any mechanized or motor controlled operation for reorienting the reflectors.

30 Reference is now invited to the accompanying **figure 2** illustrating the motorized adjuster of the present invention comprising an assembly of the motor and drive mechanism along with the adjuster output shaft as an integral unit for mounting on the headlamp adjuster/leveling system and the other view illustrates the longitudinal section along A-A  
35 of the said assembly. A motorized headlamp adjuster is suited for adjusting the headlamp



5 beam vertically according to user needs. A Motorized headlamp leveling device is provided for a headlamp which is driven by an actuator so that a light axis of the headlamp can be tilted up or down relative to a vehicle body. Headlamp for controlling movement thereof comprises a housing and the adjuster output shaft extends from the housing and a control unit for controlling the drive of the motor. The adjuster output shaft  
10 has a sealing member which seals with the housing, which is engageable with a reflector of a headlamp assembly. An external surface of the housing also has a sealing member for engaging and sealing with the housing of the headlamp assembly when the headlamp adjuster is installed. Headlamp adjustment mechanism comprises a ball rod having a ball element disposed upon a free end thereof for connection to a vehicular headlamp housing.  
15 The Motor with Pinion transfers the power to the Worm shaft. The Worm shaft transfers the power to the Gear helical. Stopper is provided to arrest the axial play of the Gear helical. The Gear helical transfers the power to the Output shaft. The forward and reverse movement of the ball rod (output shaft) based on the position of the Potentiometer slider in electronic circuit control board.

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Attention is now invited to the accompanying **figure 3** that illustrates the exploded view of the headlamp adjuster device according to the present invention, showing the various components, their locations and their functional relationship in the system to obtain the desired controlled adjustment of the light beam of the head lamp by adjusting the reflector and also to achieve the desired sealing of any leakage of moisture or water to  
25 enhance the life of the adjuster assembly by providing selectively sealing 'O' ring at the intervening sliding contacts in between either the Calibration knob(13) or the Output shaft(3) with respect to the housing(1) of the headlamp. As illustrated in said accompanying **figure 3**, the adjuster/leveling apparatus comprises a housing(1) within  
30 which the drive motor(2) with pinion that transfers the power to the worm shaft(8) for imparting operatively desired forward and retraction motion to the output shaft required to favored adjustment and leveling of the light beam by controlled movements of the reflector of the headlamp assembly. Said housing(1) of the adjuster assembly of the present system of motorized adjustment/leveling of light beam, is sealed with covers  
35 from bottom(4) as well as top(5) provided with proper sealing rings-1 (6) & sealing ring-

5 2(7) from top and bottom respectively, to achieve total water tight assembly. The calibration knob(13) is assembled with cover in a snap fit arrangement and an 'O' ring-2 (14) is provided in said calibration knob(13) fitment and a 'O' ring-1 (15) for fitting of output shaft with housing, such as to prevent entry of dust, moisture or water into the housing/adjuster system. Said calibration knob(13) snap fitted on the top cover(5) of the  
10 housing(1), has square hole at one end which favors engaging with respective matching square profile of the end projection of the output shaft(3) for effecting desired calibration when needed to adjust the operable range of forward/retraction motion of the output shaft to functionally favor desired adjustment/leveling of headlamp light beam/reflector. The other end of the calibration knob also have a hexagonal portion such as to facilitate  
15 gripping and adjusting with a standard spanner for desired calibration when needed.

As already described, the Motor with Pinion(2) mounted securely inside the housing(1), transfers the power to the Worm shaft(8). The Worm shaft (8) in turn, transfers the power to the Gear helical(9). Said output shaft is screwed into the bush(11), which is locked by  
20 stopper(10) for arresting axial movement; one end of said bush(11) is connected to the potentiometer mounted on the electronic circuit control board(12) and the other end is coupled with the helical gear(9). Said bush(11) provided with a projection on top end is placed inside the stopper(10) provided to arrest the axial play of the Gear helical(9), wherein the output shaft(3) and the bush(11) are screwed together by thread ridges  
25 provided on an inner side of the bush and thread ridges provided on an outer periphery of the output shaft(3); the bush, helical gear and the stopper-all being mounted along the longitudinal axis of the output shaft such that the restrained gear helical(9) being rotated receiving power from the worm shaft(8) operatively connected to the motor with pinion(2), provides for the forward and retraction motion of the output shaft(3). Thus the  
30 stopper(10) arrangement with snap fit adapted to restrict the movement of the helical gear(9) in the longitudinal direction and the bush(11) in the axial direction, and these two in turn facilitate the movement of the output shaft for desired headlamp leveling or tilting or vertical adjustment of the light axis.

5 The Gear helical(9) thus prevented from axial shift by said stopper(10) means, operatively transfers the power to the Output shaft(3) to transform rotation motion in to reversible linear motion to favor desired adjustment of the tilt/leveling of the light beam of automobile headlamp and the like. The forward and reverse movement of the ball rod or the output shaft(3) is controlled based on the position of the Potentiometer slider in  
10 electronic circuit control board(12), co-operatively disposed over the top cover(5) of the housing(1).

It is thus possible by way of this invention to obtain a motorized headlamp adjuster and in particular a headlamp leveling apparatus, such that the light beam emerging from the  
15 headlamp can either be tilted or directed to a preferred direction or adjusted for vertically leveling of the light axis of automobile headlamp, free of any human interference for adjusting with any tool externally. The system of motorized adjuster/leveling apparatus for automobile headlamp also eliminates the limitation of leakage of moisture, dust or rain water into the housing for the headlamp and thereby enhancing its life and reliability  
20 of performance as compared to the conventional similar devices in use.

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5 **We claim:**

1. A motorized headlamp leveling apparatus for a vehicle headlamp, comprising:

10 a headlamp in an housing adapted to be driven by an actuator mechanism through a cooperative motor means such that the head lamp can be tilted up or down relative to a vehicle body;

15 said actuator mechanism comprising an adjuster output shaft extending from said housing and a control unit for controlling the drive of said motor , the forward and reverse movement of said output shaft providing for the desired level adjusting of the headlamp;

a sealing member for said adjuster output shaft adapted to seal with said housing preferably engage able with a reflector of the headlamp assembly

20 said housing adapted to engage and seal with the housing of the headlamp assembly.

2. A motorized headlamp leveling apparatus for a vehicle headlamp as claimed in claim 1 wherein said actuator mechanism comprises an output shaft having an element disposed upon a free end thereof for connection to the vehicle headlamp housing;

25 said motor with pinion adapted to transfer the power to a worm shaft with said worm shaft adapted to transfer power to a helical gear ;

30 stopper means provided to arrest the axial play of the gear helical with said gear helical adapted to transfer power to said Bush

said forward and reverse movement of the output shaft based on the position of a potentiometer slider in an electronic circuit control board of said control unit.

35 3. A motorized headlamp-leveling apparatus for a vehicle headlamp as claimed in anyone of claims 1 or 2 comprising:

a housing,

40 a motor disposed within the housing,

5 a motor adapted to cooperate with a worm wheel rotatably supported by the housing, such that the worm wheel's position is fixed in the longitudinal direction and is rotated by the motor through pinion and the worm wheel is snap fitted in the housing.

10 a output shaft screwed into bush means , which is guided by stopper for soothing axial movement and one end of the bush is connected to the potentiometer and the other end is coupled with the helical gear,

and

15 a stopper arrangement to restrict the movement of the helical gear in the longitudinal direction and the bush in the axial direction ,and in turn facilitate the desired movement of the output shaft for desired headlamp leveling.

20 4. A motorized headlamp leveling apparatus for a vehicle headlamp as claimed in anyone of claims 1 or 2 comprising:

electronic means provided to cooperate with said motor for said motorized headlamp adjusting.

25

5. A motorized headlamp leveling apparatus for a vehicle headlamp as claimed in claim 3 comprising:

30 wherein the output shaft and the bush are screwed together by thread ridges provided on an inner side of the bush and thread ridges provided on an outer periphery of the output shaft.

35 6.A motorized headlamp leveling apparatus for a vehicle headlamp as claimed in anyone of claims 1 to 5 wherein a Calibration knob is assembled with cover in a snap fit arrangement and an 'O' ring is provided in Calibration knob to arrest Dust and Water entry.

40 7. A motorized headlamp leveling apparatus for a vehicle headlamp as claimed in claim 6, wherein the Calibration knob is provided with a Square hole which aids the engageable with Square profile on Output shaft.

- 5 8. A motorized headlamp-leveling apparatus for a vehicle headlamp as claimed in claim 6, wherein the Calibration knob also has a Hexagonal portion for calibration purpose with help of standard spanner.
- 10 9. A motorized headlamp leveling apparatus for a vehicle headlamp as claimed in anyone of claims 1 to 8 wherein the headlamp adjuster is adapted to completely seal with respect to the headlamp housing particularly with complete sealing between the calibration knob and the housing of the headlamp adjuster.
- 15 10. A motorized headlamp leveling apparatus for a vehicle headlamp as claimed in anyone of claims 2 to 9 wherein said electronic control comprises electronic circuit control board cooperatively disposed with respect to said housing.

Figure 1

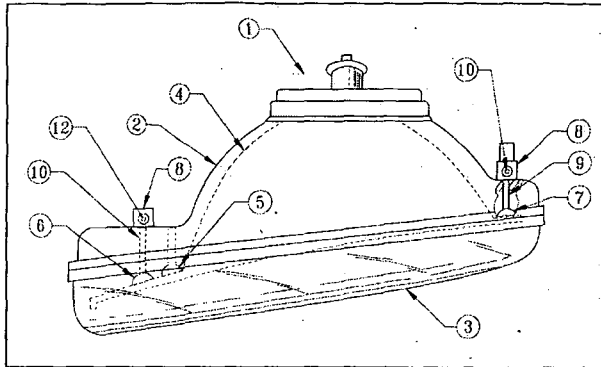


Figure 2:

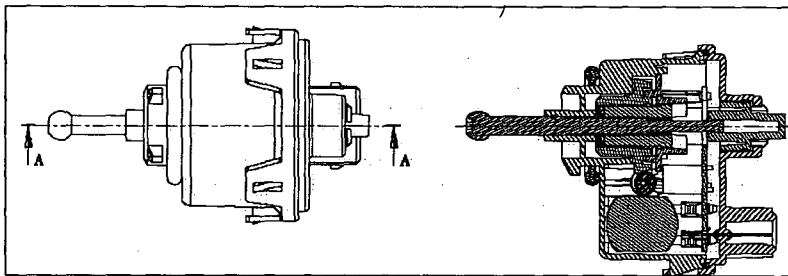
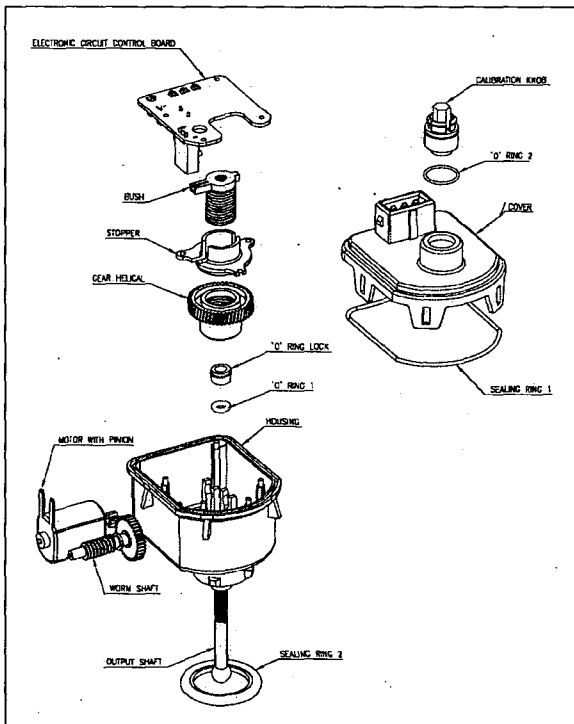


Figure 3:



## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/IN 2007/000272

A. CLASSIFICATION OF SUBJECT MATTER IPC <sup>8</sup> : <b>B60Q 1/115 (2006.01)</b> According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC <sup>8</sup> : B60Q 1/115 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPODOC, WPI		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2 089 958 A (BOSCH GMBH ROBERT) 30 June 1982 (30.06.1982) <i>Abstract, Claim 1, Fig. 1-3, Pages 1-2</i> --	1-10
A	US 4 916 587 A (HIROSE HITOSHI) 10 April 1990 (10.04.1990) <i>Abstract</i> ----	1-10
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
<p>* Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&amp;" document member of the same patent family</p>		
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# INTERNATIONAL SEARCH REPORT

Information on patent family members

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