(54) Title: EXTERIOR REAR VIEW MIRROR ASSEMBLY HAVING AN ANGLE ADJUSTMENT RING

(57) Abstract: An exterior rear view mirror assembly for a motor vehicle having an angle adjustment ring to vary the angle of the mirror head with respect to the vehicle. The assembly comprises a reflective element, a head (18) for supporting the reflective element, a neck (12), and a retaining element (40). The retaining element interconnects a body and the neck. The assembly further comprises an adjustment member (16) disposed between the body and the neck and rotatable between a first and second position for varying an angle between the body and neck.
Declarations under Rule 4.17:
— as to applicant’s entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AI, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BE, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)
— as to the applicant’s entitlement to claim the priority of the earlier application (Rule 4.17(iii)) for all designations

Published:
— with international search report

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EXTERIOR REAR VIEW MIRROR ASSEMBLY
HAVING AN ANGLE ADJUSTMENT RING

BACKGROUND AND SUMMARY OF THE INVENTION

1. FIELD OF THE INVENTION

The present invention generally relates to an exterior rear view mirror assembly for a motor vehicle and, more particularly, to an exterior rear view mirror assembly having an angle adjustment ring for varying the angle of the exterior rear view mirror assembly.

2. DISCUSSION

Exterior rear view mirror assemblies are found on almost every motor vehicle, and they are typically located adjacent to lower forward corners of both the driver and passenger side windows. The vehicle driver is located farther away from the mirror assembly mounted on the passenger side than the mirror assembly mounted on the driver side. Thus, the exterior rear view mirror assembly on the passenger side is required to provide a wider field of view than is the mirror assembly mounted on the driver side.

Present exterior rear view mirror assemblies are manufactured for use on either the driver side or the passenger side of the motor vehicle, but typically not both. Manufacturing separate exterior mirrors creates
additional labor and cost. In some situations, exterior rear view mirror assemblies do not consider the preferred different view angles for mirror assemblies on different sides of a motor vehicle.

Therefore, it is highly desirable to provide an exterior rear view mirror assembly adaptable for different view angles required on different sides of the vehicle. It is also highly desirable to provide an exterior rear view assembly that can be easily and conveniently integrated with the existing motor vehicle so as to minimize labor and cost associated with its installation.

SUMMARY OF THE INVENTION

This invention is directed to an exterior rear view mirror assembly including a reflective element, a housing adapted to support the reflective element, and an arm to secure the housing to the motor vehicle. The arm includes a body, a neck, and a retaining element interconnecting the body and the neck. The arm further includes an adjustment member disposed between the body and the neck, and is rotatable between first and second positions. The adjustment member is adapted to vary an angle between the body and the neck. When the adjustment member is in the first position, the body is positioned relative to the neck at a first angle, and when the adjustment member is in the second position, the body is positioned relative to the neck at a second angle.
These and other advantages and features of the present invention will become readily apparent from the following detailed description, claims, and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention will now be described, by way of example, with reference to the accompany drawings, in which:

Figure 1 is a perspective view of an exterior rear view mirror assembly in accordance with a preferred embodiment of the present invention;

Figures 2 and 3 are partial sectional views taken along the line A-A of the exterior rear view mirror assembly of Figure 1 to provide a first view angle;

Figures 4 and 5 are partial sectional views taken along the Line A-A of the exterior rear view mirror assembly of Figure 1 to provide a second view angle;

Figure 6 is a sectional view of a first configuration for the angle adjustment ring;

Figure 7 is a top view of the angle adjustment ring of Figure 6;

Figure 8 is a sectional view of a second configuration for the angle adjustment ring; and
Figure 9 is a top view of the angle adjustment ring of Figure 8.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings and in particular to Figure 1, there is shown an exterior rear view mirror assembly indicated generally at 10 installed on the body 50 of a motor vehicle. Mirror assembly 10 is the typical breakaway design, and has a head 18 supporting a reflective element 20. Head 18 may be of any desired shape, and is pivotally supported on an arm extending outwardly from vehicle body 50. Reflective element 20 may be either of any suitable type such as flat, concave, convex, or of the type which automatically adjusts to reduce glare. In the preferred embodiment of the present invention, two mirror assemblies 10 will be mounted on a vehicle body 50, one on the driver side and the other one on the passenger side.

Mirror assembly 10 further includes an arm 11 which extends outwardly from vehicle body 50. As shown in Figures 2 and 3 of the drawings, arm 11 includes a body 14 for supporting head 18, a neck 12 providing a connection to vehicle body 50, a retainer 40, and a cam ring 16 interconnecting neck 12 and body 14 of arm 11. Neck 12 has an abutment surface 15 at one end which is shaped to abut against a complementary surface defined by outer body 50 of the motor vehicle. The other end of neck
12 has a suitable surface 13 to abut cam ring 16 and a bore 34 formed therein as further seen in Figure 3.

Retainer 40 of arm 11 includes a biasing member 32, such as a coil spring, and a cylindrical stem or shaft 38. Cylindrical shaft 38 passes through cam ring 16, thereby interconnecting body 14, neck 12, and cam ring 16. One end of cylindrical shaft 38 has a hemispherically shaped head 30 which seats into a complimentary shaped socket 28 of body 14. Socket 28 retains head 30 in order to interconnect retainer 40 to body 14. The other end of cylindrical shaft 38 has a radially, outwardsly projecting flange 36 which provides a seat for biasing member 32. At it other end, biasing member 32 seats against an outboard surface 35 of bore 34. Compression spring 32 is engaged between flange 36 of shaft 38 and outboard surface 35 of bore 34, thereby providing a biasing force to dispense shaft 38 inward toward neck 12. In operation, biasing member 32 applies a retaining force of about 400 Newtons (N) in order to maintain compressed engagement between body 14, cam ring 16, and neck 12.

Referring to Figures 2 and 3, wedge-shaped cam ring 16 is disposed between body 14 and neck 12. Cam ring 16 includes a plurality of protrusions 24 at one end and a cylindrical extension 26 on the other end. The plurality of protrusions 24 engage with slots 22 formed on body 14. Cylindrical extension 26 of cam ring 16 engages a cylindrical bore 28 formed
on neck 12 in order to enable cam ring 16 to rotate within neck 12. It should be understood that any locking mechanism can be used so long as body 14, neck 12 and cam ring 16 are retained in engagement with one another.

In a preferred embodiment of the present invention, cam ring 16 supports a plurality of protrusions 24 on top surface 15 adapted to abut body 14 of arm 11, and cylindrical extension 26 on surface 17 adapted to abut neck 12 as shown in Figures 6 and 7 depicting side and top views of cam ring 16 respectively. Figures 8 and 9 depict side and top views of an alternative embodiment of the present invention where cam ring 16 supports cylindrical extension 26 on top surface 15 and protrusions 24 on bottom surface 17.

It should be understood that cam ring 16 may support slots 22 while body 14 supports protrusions 24. Further, cylindrical extension 26 may be formed on an outboard end 35 of neck 12, while protrusions or slots are formed on the inboard end of cam ring 16 as long as body and neck are suitably adapted.

Exterior rear view mirror assembly 10 of the preferred embodiment incorporates cam ring 16 so as to allow an adjustment of body 14 and attached mirror head 18 between two positions with respect to neck 12. One angular position is defined by Figures 2 and 3, and the other angular position is defined by Figures 4 and 5. Typically, Figures 2 and 3 represent a typical angular orientation of the exterior rear view mirror assembly 10 and
assists the driver with a wider range of field of view than the mirror assembly of Figures 4 and 5. Thus, angle 46 of Figures 2 and 3 between neck 12 and body 14 on the driver side is typically 14 degrees. Angle 48 of Figures 4 and 5 between neck 12 and body 14 on the passenger side is typically 27 degrees.

Cam ring 16 of the present invention enables exterior rear view mirror assembly 10 to rotate between two predetermined angular positions 42 of Figures 4 and 5 and positions 44 of Figures 2 and 3 by varying an angle between body 14 and neck 12 of arm 11. When cam ring 16 is in the first position 42, body 14 and neck 12 define a first angle 46, which is preferred for an exterior rear view mirror assembly 10 mounted on the driver side. When cam ring 16 is in second position 44, body 14 and neck 12 define a second angle 48, which is preferred for an exterior rear view mirror assembly 10 located on passenger side 44. Body 14 and neck 12 can be adjusted by rotating cam ring 16 between positions 42 and 44 to yield first 46 and second 48 angles. When cam ring 16 is displaced, head 18 rotates with respect to the hemispherically shaped protrusion 30 of shaft 38, thereby forming an integral unit which acts as an unitary construction.

Cam ring 16 is disposed between body 14 and neck 12 of an exterior rear view mirror assembly 10 during the manufacturing process. First 46 and second 48 angles between body 14 and neck 12 are set as the mirror
10 is assembled. Rotating cam ring 16 between its operative positions provides a mirror adaptable for assembly on either the driver or passenger side. Because compression spring 32 applies a retaining force of about four hundred newtons to retain body 14, neck 12 and cam ring 16 are in engagement with one another. The large retaining force of the present invention prevents easy adjustment of the angle of cam ring 16.

The present invention is applicable for use in motor vehicles of any size. Typically, the driver is located farther away from the mirror assembly on the passenger side 44 when the driver is in a mid/large-sized motor vehicle compared to when the driver is in a compact/small-sized motor vehicle. Thus, the angular difference between two positions 42 and 44 or mirror assembly 10 for a mid/large-sized motor vehicle is generally larger than that for a small/compact-sized motor vehicle. Mirror assembly 10 of the present invention is adaptable to vehicle by varying the angle of cam ring.

While it will be apparent that the preferred embodiments of the invention disclosed are well calculated to provide the advantages and features above stated, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the proper scope or fair meaning of the subjoined claims.
CLAIMS

In the Claims:

1. A mirror assembly for a vehicle comprising:
   a reflective element;
   a head for supporting the reflective element;
   a neck;
   a retaining element, the retaining element interconnecting the body and the neck; and
   an adjustment member disposed between the body and the neck and rotatable between a first and second position, the adjustment member varying an angle between the body and the neck, wherein when the adjustment member is in the first position, the body is positioned relative to the neck at a first angle, and when the adjustment member is in the second position, the body is positioned relative to the neck at a second angle.

2. The apparatus of claim 1 further comprising:
   a first keyed section in the adjustment member; and
   a second keyed section in one of the body and the neck, the first and second keyed sections engaging to retain the adjustment member in the first and second positions.

3. The apparatus of claim 2 wherein the first keyed section comprises a protrusion and the second keyed section comprises a slot,
wherein the protrusion engages the slot to maintain the adjustment member in the selected position.

4. The apparatus of claim 2 wherein the first keyed section comprises a slot and the second keyed section comprises a protrusion, wherein the protrusion engages the slot to maintain the adjustment member in the selected position.

5. The apparatus of claim 1 wherein the adjustment member is formed in the shape of a wedge.

6. The apparatus of claim 1 wherein the retaining element comprises:

   a stem operatively connected to the neck at a first end and operatively connected to the body at a second end; and

   a biasing member, the biasing member urging the stem and the body toward the other.

7. The apparatus of claim 6 wherein the stem passes through the adjustment member, thereby interconnecting the body, the adjustment member, and the neck.

8. The apparatus of claim 6 wherein the body rotates with respect to the second end of the stem when displacing the adjustment member.

9. The apparatus of claim 6 wherein the biasing member comprises a spring.
10. A mirror assembly for a vehicle having a driver side and a passenger side comprising:

a reflective element;

a head for supporting the reflective element;

a neck mounted to the vehicle and supporting the head;

a retaining element, the retaining element interconnecting a body and the neck; and

a wedge-shaped adjustment member, the adjustment member rotatable between a first and second position for varying the angle between the body and the neck, wherein when adjustment member is in a first position, the body and neck define the first angle and when the adjustment member is in the second position, the body and neck define the second angle, wherein the neck is configured to mount the mirror to either the driver side or the passenger side, wherein when mounted to one of the driver side and passenger side, the head and neck form a first angle and when mounted to the other of the driver side and passenger side, the head and neck form a second angle, the angle between the head and neck being adjustable to yield the first and second angles.

11. The apparatus of claim 10 further comprising:

a first keyed section in the adjustment member; and
a second keyed section in one of the body and the neck, the first
and second keyed sections engaging to retain the adjustment member in the
first and second positions.

12. The apparatus of claim 11 wherein the first keyed section
comprises a protrusion and the second keyed section comprises a slot,
wherein the protrusion engages the slot to maintain the adjustment member in
the selected position.

13. The apparatus of claim 11 wherein the first keyed section
comprises a slot and the second keyed section comprises a protrusion,
wherein the protrusion engages the slot to maintain the adjustment member in
the selected position.

14. The apparatus of claim 10 wherein the adjustment member is
rotated about a predetermined angle to change between the first and second
positions.

15. The apparatus of claim 10 wherein the retaining element
comprises:

    a stem operatively connected to the neck at a first end and
operatively connected to the body at a second end; and

    a biasing member, the biasing member urging the stem and the
body toward the other.
16. The apparatus of claim 15 wherein the stem passes through the adjustment member, thereby interconnecting the body, the adjustment member, and the neck.

17. The apparatus of claim 15 wherein the body rotates with respect to the second end of the stem when displacing the adjustment member.

18. A mirror assembly for a vehicle having a driver side and a passenger side comprising:

   a reflective element;

   a head for supporting the reflective element;

   a neck mounted to the vehicle and a supporting the head;

   a stem operatively connected to the neck at a first end and operatively connected to a body at a second end;

   a biasing member, the biasing member urging the stem and the body toward the other; and

   a disk-shaped adjustment member for varying an angle between the body and the neck, the adjustment member being displaced to vary the angle between a first and second angle,

   wherein the neck is configured to mount the mirror to either the driver side or the passenger side, wherein when mounted to one of the driver side and passenger side, the head and neck form one of the first and second angles and when mounted to the other of the driver side and passenger side, the head and neck form the other of the first and second angles.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
IPC(7) :G02B 7/182
US CL :359/871
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)
U.S. : 359/871, 841, 872, 873, 881; 248/477, 478, 483

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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category*</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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<tbody>
<tr>
<td>X</td>
<td>US 5,844,733 A (RAVANINI) 01 December 1998 (01/12/98), see fig. 1 and 3.</td>
<td>1-4,6-9</td>
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Further documents are listed in the continuation of Box C. See patent family annex.

Date of the actual completion of the international search: 18 SEPTEMBER 2001
Date of mailing of the international search report: 02 OCT 2001

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Form PCT/ISA/210 (second sheet) (July 1998) *