MOTHERSON
EXHIBIT 1007

PTO/AIA/15 (03-13)
Approved for use through 01/31/2014. OMB 0651-0032
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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	DON01 P-2803
First Named Inventor	John T. Uken
Title	EXTERIOR REARVIEW MIRROR ASSEMBLY
Express Mail Label No.	

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. ☐ **Fee Transmittal Form** (PTO/SB/17 or equivalent)
2. ☐ **Applicant asserts small entity status.** See 37 CFR 1.27
3. ☐ **Applicant certifies micro entity status.** See 37 CFR 1.29. Applicant must attach form PTO/SB/15A or B or equivalent.
4. ☑ **Specification** [*Total Pages* 118] Both the claims and abstract must start on a new page. *(See MPEP § 608.01(a) for information on the preferred arrangement)*
5. ☑ **Drawing(s)** (35 U.S.C. 113) [*Total Sheets* 74]
6. **Inventor's Oath or Declaration** [*Total Pages* 7] *(including substitute statements under 37 CFR 1.64 and assignments serving as an oath or declaration under 37 CFR 1.63(e))*
   a. ☐ Newly executed (original or copy)
   b. ☑ A copy from a prior application (37 CFR 1.63(d))
7. ☑ **Application Data Sheet** ** See note below.* See 37 CFR 1.76 (PTO/AIA/14 or equivalent)
8. **CD-ROM or CD-R** in duplicate, large table, or Computer Program (*Appendix*)
   ☐ Landscape Table on CD
9. **Nucleotide and/or Amino Acid Sequence Submission** (*if applicable, items a. – c. are required*)
   a. ☐ Computer Readable Form (CRF)
   b. ☐ Specification Sequence Listing on:
      i. ☐ CD-ROM or CD-R (2 copies); or
      ii. ☐ Paper
   c. ☐ Statements verifying identity of above copies

ADDRESS TO:

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

ACCOMPANYING APPLICATION PAPERS

10. ☐ **Assignment Papers** (cover sheet & document(s))
    Name of Assignee _____
11. ☐ **37 CFR 3.73(c) Statement** (*when there is an assignee*) ☑ **Power of Attorney**
12. ☐ **English Translation Document** (*if applicable*)
13. ☑ **Information Disclosure Statement** (PTO/SB/08 or PTO-1449)
    ☐ Copies of citations attached
14. ☐ **Preliminary Amendment**
15. ☐ **Return Receipt Postcard** (*MPEP § 503*) (*Should be specifically itemized*)
16. ☐ **Certified Copy of Priority Document(s)** (*if foreign priority is claimed*)
17. ☐ **Nonpublication Request** Under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent.
18. ☐ **Other:** _____

***Note**: (1) Benefit claims under 37 CFR 1.78 and foreign priority claims under 1.55 **must** be included in an Application Data Sheet (ADS).
(2) For applications filed under 35 U.S.C. 111, the application must contain an ADS specifying the applicant if the applicant is an assignee, person to whom the inventor is under an obligation to assign, or person who otherwise shows sufficient proprietary interest in the matter. See 37 CFR 1.46(b).

19. CORRESPONDENCE ADDRESS

☑ The address associated with Customer Number: 15671 **OR** ☐ Correspondence address below

Name					
Address					
City		State		Zip Code	
Country		Telephone		Email	

Signature	/Timothy A. Flory/	Date	May 23, 2016
Name (Print/Type)	Timothy A. Flory	Registration No. (Attorney/Agent)	42540

PATENT
DON01 P-2803

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventors : John T. Uken, Darryl P. De Wind, Keith D. Foote, Joseph M. Mambourg, Rodney K. Blank, Mark L. Larson and Niall R. Lynam

For : EXTERIOR REARVIEW MIRROR ASSEMBLY

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

REQUEST FOR FILING CONTINUATION APPLICATION
UNDER 37 CFR 1.53(b)

This is a request for filing a continuation of U.S. patent application Serial No. 14/357,025, filed May 8, 2014, which will issue on May 24, 2016 as U.S. Patent No. 9,346,403, and which is a 371 national phase filing of PCT Application No. PCT/US2012/064398, filed November 9, 2012, which claims the filing benefit of U.S. provisional applications, Serial No. 61/705,876, filed September 26, 2012; Serial No. 61/697,554, filed September 6, 2012; Serial No. 61/665,509, filed June 28, 2012; Serial No. 61/664,438, filed June 26, 2012; Serial No. 61/647,179, filed May 15, 2012; Serial No. 61/614,877, filed March 23, 2012; Serial No. 61/601,756, filed February 22, 2012; Serial No. 61/590,578, filed January 25, 2012; Serial No. 61/565,541, filed December 1, 2011; and/or Serial No. 61/558,623, filed November 11, 2011. And U.S. patent application Serial No. 14/357,025 is a continuation-in-part of U.S. patent application Serial No. 13/879,481, filed April 15, 2013, which is a 371 national phase entry of PCT Application No. PCT/US2011/056295, filed October 14, 2011, which claims the filing benefits of U.S. provisional applications, Serial No. 61/490,375, filed May 26, 2011; Serial No. 61/452,789, filed March 15, 2011; Serial No. 61/449,364, filed March 4,

2011; Serial No. 61/448,916, filed March 3, 2011; Serial No. 61/409,346, filed November 2, 2010, and Serial No. 61/393,407, filed October 15, 2010. And U.S. patent application Serial No. 14/357,025 is a continuation-in-part of U.S. patent application Serial No. 13/498,597, filed March 28, 2012, which is a 371 national phase application of PCT Application No. PCT/US2010/051741, filed October 7, 2010, which claims the benefit of U.S. provisional applications, Serial No. 61/261,839, filed November 17, 2009, and Serial No. 61/249,300, filed October 7, 2009.

1. Copy of Prior Application as Filed Which is Attached

I hereby verify that the attached papers are a copy of what is shown in my records to be the above-identified prior application, including the Declaration as originally filed (37 CFR 1.53). No amendments referred to in any Declaration filed to complete the prior application introduced new matter in that application.

The attached copy of the papers of the parent application includes 108 pages of specification, 9 pages of claims (36 claims), 1 page of Abstract, 74 sheets of drawings, and signed Declaration (7 pages) and Power of Attorney (2 pages). The attached drawings are copies of the formal drawings filed in the parent application and correspond to the drawings originally filed with the parent application and as amended and/or approved during prosecution of the parent applications.

2. Amendments

The copy of the application includes any amendments made during prosecution of the parent applications and includes updates to any references to incorporated

patent applications that have issued as patents and includes a revised/updated Cross Reference to Related Applications and a new Abstract.

The attached copy includes new claims 1-36 which replace the claims of the parent patent application.

3. Notice Regarding Prosecution relative to Parent Application

This application is a continuation of U.S. patent application Serial No. 14/357,025, filed May 8, 2014, which is part of the continuation chain noted above. Applicant notes from controlling case law that disclaimer of subject matter made during an earlier prosecution can be rescinded, permitting recapture of the disclaimed scope, so long as sufficiently clear notice is given to the U.S. Patent and Trademark Office, so that the U.S. Patent and Trademark Office can consider any prior disclaimer and any previously cited relevant prior art *Hakim v. Cannon Avent Group, PLC et al.*, 47 F.3d 1313, 1398 (Fed. Cir. 2007) (affirming the district court grant of summary judgment of non-infringement based on a limiting claim construction per file wrapper estoppel in a parent application where the patentee had in the child application not expressly rescinded any disclaimer effect of prosecution in the parent application).

Therefore, this is to provide such clear notice to the U.S. Patent and Trademark Office that for purposes of the present application only, Applicant hereby rescinds any disclaimer and argument, express or implied, made during the prosecution of the above-referenced prior application. Accordingly, Applicant respectfully notes for the record that any arguments, disclaimers, and/or other actions taken with regard to the claims prosecuted in the above-referenced U.S. Patent Applications are not to be

imputed or otherwise applied to the claims in the present application unless expressly repeated by the Applicant during prosecution of the present application.

4. Patent Application Bibliographic Data Form

A copy of the Patent Application Bibliographic Data Form is enclosed.

5. Filing Fee and Calculation

Filing Fee:	
Basic Fee - $280	$280.00
Each independent claim in excess of three, -0- times $420.00	$0.00
Number of claims in excess of twenty, -16- times $80.00	$1,280.00
Filing multiple dependent claims per application $780.00	$0.00
Application size fee for each additional 50 sheets that exceeds 100 sheets (-1- times $400.00)	$400.00
Additional Fees:	
Search Fee - $600	$600.00
Examination Fee - $720	$720.00
Total Filing Fee	**$3,280.00**

The above fees will be paid by credit card. The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment, to Deposit Account No. 50-5553.

The Commissioner is hereby authorized to charge the following fees during the pendency of this application, or credit any overpayment to Deposit Account 50-5553.

a) Any filing fees under 37 CFR 1.16 for presentation of extra claims for which full payment has not been tendered.

b) Any patent application processing fees under 37 CFR 1.17 for which full payment has not been tendered.

6. Drawings

Seventy-Four (74) sheets of formal drawings are enclosed and are copies of those filed in the parent application. The formal drawings correspond to the drawings originally filed with the parent application and include any revisions made and approved during prosecution of the parent applications.

7. Disclosure Statement

Applicant respectfully requests that information cited in the prior parent application, Serial No. 14/357,025, be considered in the present application. An Information Disclosure Statement is included herewith that lists the cited references.

8. Inventorship Statement

With respect to the prior U.S. application from which this application claims benefit under 35 USC 120, the inventors in this application are the same, namely, John T. Uken, Darryl P. De Wind, Keith D. Foote, Joseph M. Mambourg, Rodney K. Blank, Mark L. Larson and Niall R. Lynam.

9. Assignment

The prior application is assigned to Magna Mirrors of America, Inc., a corporation of the State of Michigan, located and doing business at 49 W. Third Street, Holland,

Michigan 49423. That Assignment was recorded in the United States Patent and Trademark Office on May 8, 2014, at Reel 032851, Frame 0785.

10. Power of Attorney

The current Power of Attorney is to the attorneys associated with the customer number listed thereon.

Please address all future correspondence to:

Timothy A. Flory
Gardner, Linn, Burkhart & Flory, LLP
2851 Charlevoix Drive, S.E., Suite 207
Grand Rapids, MI 49546
Ph: (616) 975-5500
Fax: (616) 975-5505

11. Verification

I hereby declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Respectfully submitted,

Date: May 23, 2016

Timothy A. Flory
Registration No. 42 540
Gardner, Linn, Burkhart & Flory, LLP
2851 Charlevoix Drive, S.E., Suite 207
Grand Rapids, Michigan 49546
(616) 975-5500

TAF/ars

PTO/AIA/14 (11-15)
Approved for use through 04/30/2017. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	DON01 P-2803
	Application Number	
Title of Invention	EXTERIOR REARVIEW MIRROR ASSEMBLY	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	John	T.	Uken	

Residence Information (Select One) ● US Residency Non US Residency Active US Military Service

City	State/Province	Country of Residence
Jenison	MI	US

Mailing Address of Inventor:

Address 1	8146 Midpark Dr.
Address 2	
City	Jenison
State/Province	MI
Postal Code	49428
Country	US

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Darryl	P.	De Wind	

Residence Information (Select One) ◉ US Residency Non US Residency Active US Military Service

City	State/Province	Country of Residence
West Olive	MI	US

Mailing Address of Inventor:

Address 1	8428 Hiawatha Drive
Address 2	
City	West Olive
State/Province	MI
Postal Code	49460
Country	US

Inventor 3 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Keith	D.	Foote	

Residence Information (Select One) ◉ US Residency Non US Residency Active US Military Service

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	DON01 P-2803
	Application Number	
Title of Invention	EXTERIOR REARVIEW MIRROR ASSEMBLY	

City	Grand Rapids	State/Province	MI	Country of Residence	US

Mailing Address of Inventor:

Address 1	7326 Azalea Avenue, S.E.		
Address 2			
City	Grand Rapids	State/Province	MI
Postal Code	49508	Country	US

Inventor 4 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Joseph	M.	Mambourg	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	Muskegon	State/Province	MI	Country of Residence	US

Mailing Address of Inventor:

Address 1	888 Jibe Rd., Apt. B		
Address 2			
City	Muskegon	State/Province	MI
Postal Code	49441	Country	US

Inventor 5 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Rodney	K.	Blank	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	Zeeland	State/Province	MI	Country of Residence	US

Mailing Address of Inventor:

Address 1	9346 Bluff Court		
Address 2			
City	Zeeland	State/Province	MI
Postal Code	49464	Country	US

Inventor 6 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Mark	L.	Larson	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	Grand Haven	State/Province	MI	Country of Residence	US

PTO/AIA/14 (11-15)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	DON01 P-2803
	Application Number	
Title of Invention	EXTERIOR REARVIEW MIRROR ASSEMBLY	

Mailing Address of Inventor:

Address 1	10500 Stump St.		
Address 2			
City	Grand Haven	**State/Province**	MI
Postal Code	49417	**Country** i	US

Inventor 7 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Niall	R.	Lynam	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	Holland	**State/Province**	MI	**Country of Residence** i	US

Mailing Address of Inventor:

Address 1	281 Norwood Ave.		
Address 2			
City	Holland	**State/Province**	MI
Postal Code	49424	**Country** i	US

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	15671		
Email Address	flory@glbf.com	Add Email	Remove Email

Application Information:

Title of the Invention	EXTERIOR REARVIEW MIRROR ASSEMBLY		
Attorney Docket Number	DON01 P-2803	**Small Entity Status Claimed**	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	74	**Suggested Figure for Publication (if any)**	

PTO/AIA/14 (11-15)
Approved for use through 04/30/2017. OMB 0651-0032
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	DON01 P-2803
	Application Number	
Title of Invention	EXTERIOR REARVIEW MIRROR ASSEMBLY	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	● Customer Number	US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	15671		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation of	14357025	2014-05-08

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	DON01 P-2803
	Application Number	
Title of Invention	EXTERIOR REARVIEW MIRROR ASSEMBLY	

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
14357025	a 371 of international	PCT/US2012/064398	2012-11-09
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
PCT/US2012/064398	Claims benefit of provisional	61705876	2012-09-26
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
PCT/US2012/064398	Claims benefit of provisional	61697554	2012-09-06
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
PCT/US2012/064398	Claims benefit of provisional	61665509	2012-06-28
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
PCT/US2012/064398	Claims benefit of provisional	61664438	2012-06-26
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
PCT/US2012/064398	Claims benefit of provisional	61647179	2012-05-15
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
PCT/US2012/064398	Claims benefit of provisional	61614877	2012-03-23
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
PCT/US2012/064398	Claims benefit of provisional	61601756	2012-02-22
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
PCT/US2012/064398	Claims benefit of provisional	61590578	2012-01-25

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	DON01 P-2803
	Application Number	
Title of Invention	EXTERIOR REARVIEW MIRROR ASSEMBLY	

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
PCT/US2012/064398	Claims benefit of provisional	61565541	2011-12-01
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
PCT/US2012/064398	Claims benefit of provisional	61558623	2011-11-11
Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
14357025	Continuation in part of	13879481	2013-04-15
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
13879481	a 371 of international	PCT/US2011/056295	2011-10-14
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
PCT/US2011/056295	Claims benefit of provisional	61490375	2011-05-26
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
PCT/US2011/056295	Claims benefit of provisional	61452789	2011-03-15
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
PCT/US2011/056295	Claims benefit of provisional	61449364	2011-03-04
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
PCT/US2011/056295	Claims benefit of provisional	61448916	2011-03-03
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
PCT/US2011/056295	Claims benefit of provisional	61409346	2010-11-02

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	DON01 P-2803
	Application Number	
Title of Invention	EXTERIOR REARVIEW MIRROR ASSEMBLY	

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
PCT/US2011/056295	Claims benefit of provisional	61393407	2010-10-15
Prior Application Status	Patented		Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
14357025	Continuation in part of	13498597	2012-05-30	8730553	2014-05-20

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
13498597	a 371 of international	PCT/US2010/051741	2010-10-07
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
PCT/US2010/051741	Claims benefit of provisional	61261839	2009-11-17
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
PCT/US2010/051741	Claims benefit of provisional	61249300	2009-10-07

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button. Add

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button. Add

PTO/AIA/14 (11-15)
Approved for use through 04/30/2017. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	DON01 P-2803
	Application Number	
Title of Invention	EXTERIOR REARVIEW MIRROR ASSEMBLY	

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	DON01 P-2803
	Application Number	
Title of Invention	EXTERIOR REARVIEW MIRROR ASSEMBLY	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

PTO/AIA/14 (11-15)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	DON01 P-2803
	Application Number	
Title of Invention	EXTERIOR REARVIEW MIRROR ASSEMBLY	

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1 — Remove

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

● Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor
Person to whom the inventor is obligated to assign.	Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	MAGNA MIRRORS OF AMERICA, INC.		
Mailing Address Information For Applicant:			
Address 1	49 W. Third Street		
Address 2			
City	Holland	**State/Province**	MI
Country	US	Postal Code	49423
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button. Add

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

PTO/AIA/14 (11-15)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	DON01 P-2803
	Application Number	
Title of Invention	EXTERIOR REARVIEW MIRROR ASSEMBLY	

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

Remove

If the Assignee or Non-Applicant Assignee is an Organization check here. ☐

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1			
Address 2			
City		**State/Province**	
Country i		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add

Signature:

Remove

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Timothy A. Flory/			Date (YYYY-MM-DD)	2016-05-23
First Name	Timothy	Last Name	Flory	Registration Number	42540

Additional Signature may be generated within this form by selecting the Add button. Add

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	DON01 P-2803
	Application Number	
Title of Invention	EXTERIOR REARVIEW MIRROR ASSEMBLY	

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1 The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3 A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent CooperationTreaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	REARVIEW MIRROR ASSEMBLY

As the below named inventor, I hereby declare that:

This declaration is directed to:

☐ The attached application, or

☑ United States application or PCT international application number PCT/US2012/064398 filed on November 9, 2012.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: Darryl P. De Wind Date (Optional) :

Signature: Darryl De Wind

Note: An application data sheet (PTO/AIA/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional PTO/SB/AIA01 form for each additional inventor.

PTO/AIA/01 (06-12)
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LEGAL NAME OF INVENTOR

Inventor: John T. Uken Date (Optional) :

Signature:

Note: An application data sheet (PTO/AIA/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional PTO/SB/AIA01 form for each additional inventor.

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LEGAL NAME OF INVENTOR

Inventor: Keith D. Foote Date (Optional): 1/3/13

Signature: Keith Foote

Note: An application data sheet (PTO/AIA/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional PTO/SB/AIA01 form for each additional inventor.

PTO/AIA/01 (08-12)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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LEGAL NAME OF INVENTOR

Inventor: Joseph R. Mambourg Date (Optional): 1/17/2013

Signature: [signature]

Note: An application data sheet (PTO/AIA/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional PTO/SB/AIA/01 form for each additional inventor.

PTO/AIA/01 (06-12)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

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LEGAL NAME OF INVENTOR

Inventor: Rodney K. Blank Date (Optional): 11-12-2012

Signature: Rodney K Blank

Note: An application data sheet (PTO/AIA/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional PTO/SB/AIA01 form for each additional inventor.

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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

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LEGAL NAME OF INVENTOR

Inventor: Mark L. Larson Date (Optional): 1-17-2013

Signature: _____

Note: An application data sheet (PTO/AIA/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional PTO/SB/AIA01 form for each additional inventor.

PTO/AIA/01 (06-12)
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LEGAL NAME OF INVENTOR

Inventor: Niall R. Lynam Date (Optional): Nov 9 2012

Signature: Niall Lynam

Note: An application data sheet (PTO/AIA/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional PTO/SB/AIA01 form for each additional inventor.

PTO/SB/08A (07-05)
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Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

				Complete if Known	
				Application Number	
				Filing Date	May 23, 2016
				First Named Inventor	John T. Uken
				Art Unit	
				Examiner Name	
Sheet	1	of	12	Attorney Docket Number	DON01 P-2803

U. S. PATENT DOCUMENTS					
Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		9346403	05-24-2016	Uken et al.	
		8976439	03-10-2015	De Wind	
		8922867	12-30-2014	De Wind et al.	
		8730553	05-20-2014	De Wind et al.	
		8508831	08-13-2013	De Wind et al.	
		8465161	06-18-2013	De Wind et al.	
		8339526	12-25-2012	Minikey, Jr. et al.	
		8287164	10-16-2012	Fehn et al.	
		8277059	10-02-2012	McCabe et al.	
		8237909	08-12-2010	Ostreko et al.	
		8194133	06-05-2012	DeWind et al.	
		8179586	05-15-2012	Schofield et al.	
		8169684	05-01-2012	Bugno et al.	
		8154418	04-10-2012	Peterson et al.	
		8050551	11-01-2011	Peterson et al.	
		8049640	11-01-2011	Uken et al.	
		8048085	11-01-2011	Peterson et al.	
		8047667	11-01-2011	Weller et al.	
		8018440	09-13-2011	Townsend et al.	
		8004741	08-23-2011	Tonar et al.	
		7980711	07-19-2011	Takayanagi et al.	
		7978094	07-12-2011	Uken et al.	
		7944371	05-17-2011	Foote et al.	
		7926960	04-19-2011	Skiver et al.	
		7864399	01-04-2011	McCabe et al.	
		7855755	12-21-2010	Weller et al.	
		7826123	11-02-2010	McCabe et al.	
		7821697	10-26-2010	Varaprasad et al.	
		7817020	10-19-2010	Turnbull et al.	
		7748856	07-06-2010	Zhao	
		7722199	05-25-2010	DeWard et al.	
		7720580	05-18-2010	Higgins-Luthman	
		7719750	05-18-2010	Tonar et al.	
		7710631	05-04-2010	McCabe et al.	
		7706046	04-27-2010	Bauer et al.	
		7626749	12-01-2009	Baur et al.	
		7612929	11-03-2009	Tonar et al.	

Examiner Signature		Date Considered	

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				First Named Inventor	John T. Uken
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Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
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		7599108	10-06-2009	Lawlor et al.	
		7581859	09-01-2009	Lynam	
		7570413	08-04-2009	Tonar et al.	
		7542193	06-02-2009	McCabe et al.	
		7532149	05-12-2009	Banko et al.	
		7526367	04-28-2009	Schofield et al.	
		7510311	03-31-2009	Romas et al.	
		7492281	02-17-2009	Lynam et al.	
		7420756	09-02-2008	Lynam	
		7372611	05-13-2008	Tonar et al.	
		7370983	05-13-2008	De Wind et al.	
		7360932	04-22-2008	Uken et al.	
		7338177	03-04-2008	Lynam	
		7334922	02-26-2008	Bonardi et al.	
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		7274501	09-25-2007	McCabe et al.	
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		7249860	07-31-2007	Kulas et al.	
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		7159992	01-09-2007	Foote	
		7126456	10-24-2006	Boddy et al.	
		7110156	09-19-2006	Lawlor et al.	
		7104663	09-12-2006	Whitehead	
		7093965	08-22-2006	Veldman	
		7093946	08-22-2006	Barve et al.	
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		7073914	07-11-2006	Pavao	
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		7012729	03-14-2006	Tonazzi et al.	
		7004593	02-28-2006	Weller et al.	
		6916100	07-12-2005	Pavao	
		6882287	04-19-2005	Schofield	
		6877709	04-12-2005	March et al.	
		6870656	03-22-2005	Tonar et al.	
		6832848	12-21-2004	Pastrick	
		6781738	08-24-2004	Kikuchi et al.	
		6774810	08-10-2004	DeLine et al.	
		6755544	06-29-2004	Schnell et al.	
		6717712	04-06-2004	Lynam et al.	
		6717109	04-06-2004	Macher et al.	
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		6690268	02-10-2004	Schofield et al.	
		6685864	02-03-2004	Bingle et al.	
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		6540193	04-01-2003	DeLine	
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		6499850	12-31-2002	Waldmann	
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		6467920	10-22-2002	Schnell et al.	
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		6396397	05-28-2002	Bos et al.	
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		6176602	01-23-2001	Pastrick et al.	
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		6002511	12-14-1999	Varaprasad et al.	
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		5497306	03-05-1996	Pastrick	
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		5005797	04-09-1991	Maekawa et al.	
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		D661234	06-05-2012	De Wind	
		D660208	05-22-2012	De Wind	
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		D633423	03-01-2011	De Wind	
		D633019	02-22-2011	De Wind	
		D493394	07-27-2004	Lawlor et al.	
		D493131	07-20-2004	Lawlor et al.	

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation it not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

				Complete if Known	
				Application Number	
				Filing Date	May 23, 2016
				First Named Inventor	John T. Uken
				Art Unit	
				Examiner Name	
Sheet	9	of	12	Attorney Docket Number	DON01 P-2803

U. S. PATENT DOCUMENTS					
Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		D430088	08-29-2000	Todd et al.	
		D429202	08-08-2000	Todd et al.	
		D428842	08-01-2000	Todd et al.	
		D428373	07-18-2000	Todd et al.	
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		D425466	05-23-2000	Todd et al.	
		D409540	05-11-1999	Muth	
		D394833	06-02-1998	Muth	
		D363920	11-07-1995	Roberts et al.	
		2002/0057494	05-16-2002	Lang	
		2003/0007261	01-09-2003	Hutzel et al.	
		2004/0196578	10-07-2004	Dumont et al.	
		2005/0195488	09-08-2005	McCabe et al.	
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		2006/0050018	03-09-2006	Hutzel et al.	
		2006/0061008	03-23-2006	Karner et al.	
		2006/0164230	07-27-2006	DeWind et al.	
		2007/0002477	01-04-2007	Whitehead	
		2007/0081350	04-12-2007	Huang et al.	
		2007/0139751	06-21-2007	Kuiper et al.	
		2007/0285812	12-13-2007	Foote et al.	
		2008/0042938	02-21-2008	Cok	
		2008/0043354	02-21-2008	Fukai et al.	
		2008/0087797	04-17-2008	Turnbull et al.	
		2009/0015736	01-15-2009	Weller et al.	
		2009/0040306	02-12-2009	Foote et al.	
		2009/0213480	08-27-2009	Li	
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		2009/0251785	10-08-2009	Bruhnke et al.	
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		2010/0182143	07-22-2010	Lynam	
		2010/0238570	09-23-2010	Reedman et al.	

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				Application Number	
				Filing Date	May 23, 2016
				First Named Inventor	John T. Uken
				Art Unit	
				Examiner Name	
Sheet	10	of	12	Attorney Docket Number	DON01 P-2803

U. S. PATENT DOCUMENTS					
Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		2010/0290141	11-18-2010	Huang	
		2010/0321758	12-23-2010	Bugno et al.	
		2011/0096427	04-28-2011	Uken et al.	
		2011/0176323	07-21-2011	Skiver et al.	
		2011/0194203	08-11-2011	Foote et al.	
		2011/0317242	12-29-2011	Tonar et al.	
		2012/0026571	02-02-2012	Uken et al.	
		2012/0026616	02-02-2012	Rawlings	
		2013/0088884	04-11-2013	Brummel et al.	
		2014/0022390	01-23-2014	Blank et al.	
		2015/0097955	04-09-2015	De Wind et al.	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Art Unit	
Examiner Name	
Attorney Docket Number	DON01 P-2803

Sheet 11 of 12

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] Number[4]-Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
		CA2028461	11-08-1994	K.W. Muth Co., Inc.		
		DE2254511	05-09-1971	Reitter & Schefenacker KG		X
		DE3049169	07-15-1982	Zipperle		X
		EP0450162	10-12-1994	K.W. Muth Co., Inc.		X
		EP0744321	11-27-1996	Donnelly Corp.		
		EP1103420	06-21-2006	Donnelly Corp.		
		EP1345071	09-17-2003	National Inst. Of Advanced Industrial Science and Technology		X
		EP2106970	10-07-2009	SMR Patents S.a.r.l		
		FR1525709	05-17-1968	Wingard Ltd.		X
		GB2161440	01-15-1986	Cooke		
		JP 6-81836	03-04-1997			X
		WO2001001192	01-04-2001	Gentex Corporation		
		WO2003004245	01-16-2003	Schfenacker Vision Systems UDS Inc.		
		WO2004026633	04-01-2004	Donnelly Corporation		
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		WO2005096069	10-13-2005	Koninklijke Philips Electronics N.V.		
		WO2008013499	01-31-2008	Chromogenics Sweden AB		

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Substitute for form 1449/PTO **INFORMATION DISCLOSURE STATEMENT BY APPLICANT** ***(Use as many sheets as necessary)***				***Complete if Known***	
				Application Number	
				Filing Date	May 23, 2016
				First Named Inventor	John T. Uken
				Art Unit	
				Examiner Name	
Sheet	12	of	12	Attorney Docket Number	DON01 P-2803

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		International Search Report and Written Opinion dated March 19, 2013 for corresponding PCT Application No. PCT/US2012/064398.	

Examiner Signature		Date Considered	

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Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	EXTERIOR REARVIEW MIRROR ASSEMBLY
First Named Inventor/Applicant Name:	John T. Uken
Filer:	Timothy A. Flory/Amanda Sytsma
Attorney Docket Number:	DON01 P-2803

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Utility application filing	1011	1	280	280
Utility Search Fee	1111	1	600	600
Utility Examination Fee	1311	1	720	720
Pages:				
Utility Appl Size fee per 50 sheets >100	1081	1	400	400
Claims:				
Claims in Excess of 20	1202	16	80	1280
Miscellaneous-Filing:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**3280**

Electronic Acknowledgement Receipt

EFS ID:	25852519
Application Number:	15161708
International Application Number:	
Confirmation Number:	8364
Title of Invention:	EXTERIOR REARVIEW MIRROR ASSEMBLY
First Named Inventor/Applicant Name:	John T. Uken
Customer Number:	15671
Filer:	Timothy A. Flory/Amanda Sytsma
Filer Authorized By:	Timothy A. Flory
Attorney Docket Number:	DON01 P-2803
Receipt Date:	23-MAY-2016
Filing Date:	
Time Stamp:	14:55:51
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$3280
RAM confirmation Number	1222
Deposit Account	
Authorized User	

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal of New Application	P2803-Transmittal.pdf	205413 99c0cb421e18279dc9b05211030a81eba789d506	no	1
Warnings:					
Information:					
2	Miscellaneous Incoming Letter	P2803-RequestForContinuation.pdf	41284 64aa6675a1abc8978023362c0c25ed0c3a998858	no	7
Warnings:					
Information:					
3	Application Data Sheet	P2803-ApplicationDataSheet.pdf	1794356 c3c5189038ddc5c57546d82694a1795ef3dd7662	no	13
Warnings:					
Information:					
4	Oath or Declaration filed	P2803-Declarations.pdf	508388 cb7fa77ba6af4e70bf5c713b68f82294068a7374	no	7
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5	Power of Attorney	P2803-POA.pdf	336145 4466b3bdcacb2d33a08f33c2e8daa7b44207eaa9	no	2
Warnings:					
Information:					
6		P2803-Specification.pdf	581886 89c1f66eabc2857d79a64f7ba75cf6f094633ba0	yes	118

Multipart Description/PDF files in .zip description

Document Description	Start	End
Specification	1	108
Claims	109	117

	Abstract		118	118	
Warnings:					
Information:					
7	Drawings-only black and white line drawings	P2803-Drawings.pdf	14648793 5953ca6404a206aed4992074f1d3dc967cefa037	no	74
Warnings:					
Information:					
8	Transmittal Letter	P2803-IDSLetter.pdf	37404 cdb68255802c5be1a34884d78c1abf409bc5c6fb	no	1
Warnings:					
Information:					
9	Information Disclosure Statement (IDS) Form (SB08)	P2803-IDSForms.pdf	176140 ac0610266d0752cf9a28dc6b765eb9422cf31f0e	no	12
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
10	Fee Worksheet (SB06)	fee-info.pdf	38617 1f44782671eea7472693cf2607df86875f49ed88	no	2
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		Total Files Size (in bytes):	18368426		

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New Applications Under 35 U.S.C. 111

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National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B or equivalent) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5. If the Power of Attorney by Applicant form is not accompanied by this transmittal form or an equivalent, the Power of Attorney will not be recognized in the application.

Application Number	
Filing Date	May 23, 2016
First Named Inventor	John T. Uken
Title	EXTERIOR REARVIEW MIRROR ASSEMBLY
Art Unit	
Examiner Name	
Attorney Docket Number	DON01 P-2803

SIGNATURE of Applicant or Patent Practitioner

Signature	/Timothy A. Flory/	Date	May 23, 2016
Name	Timothy A. Flory	Telephone	(616) 975-5500
Registration Number	42540		

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications.

■ *Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in the attached transmittal letter.

☒ I hereby appoint Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A or equivalent):

15671

OR

☐ I hereby appoint Practitioner(s) named below as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A or equivalent):

Name	Registration Number	Name	Registration Number

Please recognize or change the correspondence address for the application identified in the attached transmittal letter to:

☐ The address associated with the above-mentioned Customer Number.

OR

☐ The address associated with Customer Number:

OR

☐ Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant:

☐ Inventor or Joint Inventor

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor

☒ Assignee or Person to Whom the Inventor is Under an Obligation to Assign

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (*e.g.*, a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document)

SIGNATURE of Applicant for Patent

Signature	Niall Lynam	Date	Oct 30 2012
Name	Dr. Niall R. Lynam	Telephone	(616) 786-5148
Title and Company	Senior Vice President and Chief Technical Officer/Magna Mirrors of America, Inc.		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms for more than one signature, see below *.

☒ *Total of 1 forms are submitted.

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EXTERIOR REARVIEW MIRROR ASSEMBLY

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] The present application is a continuation of U.S. patent application Ser. No. 14/357,025, filed May 8, 2014, now U.S. Pat. No. 9,346,403, which is a 371 national phase filing of PCT Application No. PCT/US2012/064398, filed Nov. 9, 2012, which claims the filing benefit of U.S. provisional applications, Ser. No. 61/705,876, filed Sep. 26, 2012; Ser. No. 61/697,554, filed Sep. 6, 2012; Ser. No. 61/665,509, filed Jun. 28, 2012; Ser. No. 61/664,438, filed Jun. 26, 2012; Ser. No. 61/647,179, filed May 15, 2012; Ser. No. 61/614,877, filed Mar. 23, 2012; Ser. No. 61/601,756, filed Feb. 22, 2012; Ser. No. 61/590,578, filed Jan. 25, 2012; Ser. No. 61/565,541, filed Dec. 1, 2011; and/or Ser. No. 61/558,623, filed Nov. 11, 2011, which are hereby incorporated herein by reference in their entireties, and U.S. patent application Ser. No. 14/357,025 is a continuation-in-part of U.S. patent application Ser. No. 13/879,481, filed Apr. 15, 2013, which is a 371 national phase entry of PCT Application No. PCT/US2011/056295, filed Oct. 14, 2011, which claims the filing benefits of U.S. provisional applications, Ser. No. 61/490,375, filed May 26, 2011; Ser. No. 61/452,789, filed Mar. 15, 2011; Ser. No. 61/449,364, filed Mar. 4, 2011; Ser. No. 61/448,916, filed Mar. 3, 2011; Ser. No. 61/409,346, filed Nov. 2, 2010, and Ser. No. 61/393,407, filed Oct. 15, 2010, and U.S. patent application Ser. No. 14/357,025 is a continuation-in-part of U.S. patent application Ser. No. 13/498,597, filed Mar. 28, 2012, now U.S. Pat. No. 8,730,553, which is a 371 national phase application of PCT Application No. PCT/US2010/051741, filed Oct. 7, 2010, which claims the benefit of U.S. provisional applications, Ser. No. 61/261,839, filed Nov. 17, 2009, and Ser. No. 61/249,300, filed Oct. 7, 2009.

FIELD OF THE INVENTION

[0002] The present invention relates generally to the field of rearview mirror assemblies for vehicles and, more particularly, to an interior rearview mirror assembly that has user inputs, such as for a telematics system or the like.

BACKGROUND OF THE INVENTION

[0003] Typically, an interior rearview mirror assembly may include user inputs, such as buttons or the like, at a mirror bezel portion of the mirror casing, whereby actuation of the

user inputs activates or adjusts or controls a telematics feature, such as a hands free telephone feature or the like.

SUMMARY OF THE INVENTION

[0004] The present invention provides an interior rearview mirror assembly that includes user inputs or touch or proximity sensors disposed behind the reflective element of the mirror assembly and operable to sense the presence of a user's finger at or near the front surface of the reflective element and in the vicinity of the touch or proximity sensor. The touch sensor comprises a backlit sensor element that comprises a plurality of electrically conductive traces disposed or established at a transparent or translucent substrate, with the electrically conductive traces being established as a pattern that allows for light emanating from the backlighting device or element to pass through the sensor for backlighting an icon established in front of the sensor for viewing through the reflective element by a person viewing the mirror assembly when the mirror assembly is normally mounted in a vehicle.

[0005] According to an aspect of the present invention, an interior rearview mirror assembly for a vehicle includes a mirror reflective element comprising at least one glass substrate and a mirror reflector established at a surface of the glass substrate. A touch sensor is disposed behind the mirror reflective element and is operable to sense the presence of a person's finger at a touch zone at the front surface of the mirror reflective element and proximate to the touch sensor. An iconistic element or appliqué is disposed in front of the touch sensor and between the touch sensor and the glass substrate of the mirror reflective element. A backlighting device is operable to backlight the touch sensor and the appliqué, and, when backlit, the touch sensor transmits light through a touch sensing element of the touch sensor to backlight the appliqué so that an icon established at the appliqué is backlit and is viewable through the mirror reflective element by a driver of the vehicle when the interior rearview mirror assembly is normally mounted in the vehicle. The touch sensor is substantially light transmissive at least at the touch sensing element.

[0006] Optionally, the touch sensing element may comprise a substantially non-light-transmissive electrically conductive trace established at a generally transparent or translucent substrate, with the electrically conductive trace established at the substrate in a manner that allows light emanating from the backlighting device to pass through the substrate and the touch sensing element. For example, the touch sensing element may

comprise a patterned electrically conductive trace comprising multiple spaced apart traces and wherein light emanating from the backlighting device passes through gaps between the spaced apart traces to backlight the icons established at the appliqué.

[0007] According to another aspect of the present invention, an exterior rearview mirror assembly configured for mounting at an exterior portion of a vehicle includes a base configured for attachment at an exterior portion of a vehicle and a mirror head attached at the base and pivotable relative to the base. The mirror head includes a mirror reflective element. A first actuator is operable to pivot the base relative to the exterior portion of the vehicle about a first pivot axis, and a second actuator operable to pivot the mirror head relative to the base about a second pivot axis. The first and second actuators are cooperatively operable to pivot the base about the first pivot axis and to pivot the mirror head about the second pivot axis to adjust the mirror reflective element relative to the exterior portion of the vehicle to adjust the rearward field of view of a driver of the vehicle. The first and second actuators may be operable at different rotational speeds to adjust the rearward field of view of the driver of the vehicle. The first and second pivot axes may be angled relative to one another at an angle of between about 15 degrees and about 90 degrees.

[0008] These and other objects, advantages, purposes and features of the present invention will become apparent upon review of the following specification in conjunction with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. 1 is a front elevation of a mirror reflective element assembly in accordance with the present invention;

[0010] FIG. 2 is another front elevation of the mirror reflective element assembly of FIG. 1;

[0011] FIG. 3 is a front elevation of a mirror reflective element assembly of the present invention, showing the perimeter seal in phantom;

[0012] FIG. 4A is a side elevation of the mirror reflective element assembly of FIG. 3;

[0013] FIG. 4B is a sectional view of the mirror reflective element assembly taken along the line B-B in FIG. 3;

[0014] FIG. 5 is a rear elevation of the mirror reflective element assembly of FIG. 3;

[0015] FIG. 6A is an exploded perspective view of a mirror assembly of the present invention;

[0016] FIG. 6B is another exploded perspective view of the mirror assembly of FIG. 6A;

[0017] FIG. 6C is an enlarged exploded perspective view of the mirror assembly of FIGS. 6A and 6B, showing the components of the touch sensor;

[0018] FIG. 7 is a plan view of a touch sensor circuit element for the mirror assembly of FIG. 6A;

[0019] FIG. 8 is an enlarged plan view of the area VIII of FIG. 7;

[0020] FIG. 9 is another enlarged plan view of a touch sensor circuit of the present invention;

[0021] FIG. 10 is a plan view of the touch sensor circuit of FIG. 9, shown with an appliqué disposed thereat;

[0022] FIG. 11 is an enlarged plan view of a portion of the touch sensor circuit and appliqué of FIG. 10;

[0023] FIG. 12 is a plan view of another touch sensor circuit similar to FIG. 10, with finer conductive traces at the touch sensor areas;

[0024] FIG. 13 is a front elevation of another mirror reflective element assembly in accordance with the present invention;

[0025] FIG. 14 is another front elevation of the mirror reflective element assembly of the present invention, shown with the icons and sensors backlit;

[0026] FIG. 15 is a plan view of another touch sensor circuit of the present invention;

[0027] FIGS. 15A, 15B and 15C are enlarged plan views of the respective areas A, B and C of FIG. 15;

[0028] FIG. 16 is a plan view of another touch sensor circuit of the present invention;

[0029] FIGS. 16A, 16B and 16C are enlarged plan views of the respective areas A, B and C of FIG. 16;

[0030] FIGS. 17-19 are front, side and rear elevations of another electrochromic reflective element assembly of the present invention;

[0031] FIG. 20 is an enlarged rear view of the lower touch sensor area of the reflective element of FIG. 19;

[0032] FIGS. 21-23 are front, side and rear elevations of another prismatic reflective element assembly of the present invention;

[0033] FIG. 24 is an enlarged rear view of the lower touch sensor area of the reflective element of FIG. 23;

[0034] FIG. 24A is another enlarged view of a lower touch sensor area of the reflective element of the present invention;

[0035] FIG. 25 is a front elevation of a prismatic mirror reflective element assembly in accordance with the present invention;

[0036] FIG. 26A is an exploded perspective view of a prismatic mirror assembly having the prismatic mirror reflective element assembly of FIG. 25;

[0037] FIG. 26B is another exploded perspective view of the prismatic mirror assembly of FIG. 26A;

[0038] FIG. 26C is an enlarged exploded perspective view of the prismatic mirror assembly of FIGS. 26A and 26B, showing the components of the touch sensor;

[0039] FIG. 27 is a sectional view of another rearview mirror assembly of the present invention, with a transparent cover or substrate disposed at the front surface of the reflective element;

[0040] FIG. 28 is a plan view of another reflective element assembly of the present invention, showing an optional busbar configuration for electrically powering the second and third surface coatings;

[0041] FIG. 29 is a perspective and partial sectional view of the reflective element assembly of FIG. 28;

[0042] FIGS. 30-39 are sectional views of mirror assemblies showing beveled glass and/or bezels at the perimeter of the reflective elements in accordance with the present invention;

[0043] FIG. 40 is a sectional view of another mirror assembly showing a flat bezel that slightly overlaps the front surface of the glass mirror substrate;

[0044] FIG. 41A is a front perspective view of an interior rearview mirror assembly with an attachment element that is exposed at side regions of the reflective element in accordance with the present invention;

[0045] FIG. 41B is a rear perspective view of the mirror assembly of FIG. 41A;

[0046] FIG. 42 is an enlarged front perspective view of a side region of the reflective element and attachment element of the mirror assembly of FIGS. 41A and 41B;

[0047] FIG. 43 is a perspective view of another interior rearview mirror assembly, shown with a perimeter lighting feature in accordance with the present invention;

[0048] FIG. 44 is another perspective view of the mirror assembly of FIG. 43;

[0049] FIG. 45 a front elevation of the mirror assembly of FIG. 43;

[0050] FIG. 45A is a sectional view of the mirror assembly, taken generally along the line A-A in FIG. 45;

[0051] FIG. 45B is another sectional view of the mirror assembly of FIGS. 43-45;

[0052] FIGS. 46-49 are sectional views of other mirror assemblies, showing display systems for displaying images and/or information through the reflective elements in accordance with the present invention;

[0053] FIGS. 50A-D are plan view schematics of other mirror assemblies, showing different types of display systems for displaying images and/or information through the reflective elements in accordance with the present invention;

[0054] FIG. 51 is an exploded perspective view of an interior rearview mirror assembly, with an energy absorbing device in accordance with the present invention;

[0055] FIG. 52A is a side elevation of a mirror back plate and pivot element having energy absorbing capabilities in accordance with the present invention;

[0056] FIG. 52B is a side elevation of another mirror back plate and pivot element having energy absorbing capabilities in accordance with the present invention;

[0057] FIG. 52C is a side elevation of another mirror back plate and pivot element having energy absorbing capabilities in accordance with the present invention;

[0058] FIG. 52D is a side elevation of a mirror mounting arm or tube having energy absorbing capabilities in accordance with the present invention;

[0059] FIG. 52E are images of springs for use in a mounting assembly in accordance with the present invention;

[0060] FIG. 53 is a perspective view of a mirror mounting assembly for pivotally attaching a mirror head at an interior portion of a vehicle via a pivot joint at an upper region of the mirror head in accordance with the present invention;

[0061] FIG. 54 is a schematic of a mirror inspection system for inspecting mirror reflective elements in accordance with the present invention;

[0062] FIG. 55 is a schematic of a reflected image captured by the camera of the mirror inspection system of claim 54;

[0063] FIG. 56 is an exploded perspective view of an exterior rearview mirror assembly in accordance with the present invention;

[0064] FIGS. 56A and 56B are exploded perspective views of the exterior rearview mirror assembly of FIG. 56;

[0065] FIG. 57 is a rear perspective view of the exterior rearview mirror assembly of FIG. 56, showing the tip/tilt of the mirror head via pivotal movement about a second pivot axis of the mirror assembly;

[0066] FIG. 58A is a top perspective view of the exterior rearview mirror assembly of FIG. 56, showing the rotation of the mirror head via pivotal movement about a first pivot axis of the mirror assembly;

[0067] FIG. 58B is a rear perspective view of the exterior rearview mirror assembly of FIG. 56, showing the rotation of the mirror head via pivotal movement about the first and second pivot axes of the mirror assembly, in order to laterally adjust the rearward field of view of the mirror reflective element while limiting vertical adjustment of the rearward field of view of the mirror reflective element;

[0068] FIG. 58C is a schematic of a control system for controlling operation of the actuators of the exterior rearview mirror assembly of the present invention;

[0069] FIG. 59 is a plan view of an exterior rearview mirror assembly that incorporates two actuators in accordance with the present invention;

[0070] FIGS. 60A-C are perspective views of an actuator for the exterior rearview mirror assembly of FIG. 59;

[0071] FIG. 61 is an exploded perspective view of the actuator of FIGS. 60A-C;

[0072] FIG. 62 is a sectional view of the actuator of FIGS. 60A-C;

[0073] FIG. 63 is an enlarged sectional view of a clutch element of the actuator of FIG. 62;

[0074] FIG. 63A is another enlarged sectional view of a clutch element of the actuator, showing optional clutch engaging surfaces for the actuator;

[0075] FIG. 64 is an enlarged perspective view of a memory element of the actuator of FIGS. 60A-C;

[0076] FIG. 64A is an exploded perspective view of a memory device of the mirror assembly of the present invention;

[0077] FIG. 64B is a plan view of the contact rings of the memory device of FIG. 64A established at the circuit element of the mirror assembly, shown with the contacts disposed thereat;

[0078] FIG. 65A is a plan view of another exterior rearview mirror assembly in accordance with the present invention;

[0079] FIG. 65B is a plan view of another exterior rearview mirror assembly in accordance with the present invention;

[0080] FIGS. 66A-D are views of another exterior rearview mirror assembly in accordance with the present invention;

[0081] FIGS. 67A-D are views of another exterior rearview mirror assembly in accordance with the present invention;

[0082] FIG. 68 is a schematic of an exterior rearview mirror system in accordance with the present invention;

[0083] FIG. 68A is a side view schematic of the exterior rearview mirror system of FIG. 68;

[0084] FIG. 68B is a side view schematic of a known construction of an exterior rearview mirror assembly;

[0085] FIG. 68C is a side view schematic of another exterior rearview mirror system of the present invention;

[0086] FIG. 68D is a side view schematic of another exterior rearview mirror system of the present invention;

[0087] FIG. 69A is a plan view of an exterior rearview mirror assembly with an indicator established thereat in accordance with the present invention;

[0088] FIG. 69B is a sectional view of the exterior rearview mirror assembly of FIG. 69A;

[0089] FIG. 70 is a perspective view of a glass sheet that is scored at a surface thereof to score the shapes of the mirror substrates into the surface of the glass sheet;

[0090] FIG. 71A is a perspective view of a front glass substrate formed from a scored sheet similar to that of FIG. 70;

[0091] FIG. 71B is a perspective view of a rear glass substrate formed from a scored sheet similar to that of FIG. 70;

[0092] FIG. 72 is a sectional view of a mirror reflective element formed with the front glass substrate of FIG. 71A and the rear glass substrate of FIG. 71B;

[0093] FIG. 73 is a table and diagram of a bend strength test and test results of such testing on mirror substrates formed in accordance with the present invention;

[0094] FIGS. 74A-E are plan views of another interior rearview mirror assembly having a compass display in accordance with the present invention; and

[0095] FIG. 74F is a schematic showing exemplary compass display characters for each of sixteen directional headings in accordance with the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0096] Referring now to the drawings and the illustrative embodiments depicted therein, an interior rearview mirror assembly 10 for a vehicle includes a reflective element 14 positioned at a front portion of a mirror housing or casing 12 (FIGS. 1-6). Mirror assembly 10 is adjustably mounted to an interior portion of a vehicle (such as to an interior surface of a vehicle windshield or a headliner of a vehicle or the like) via a mounting structure or mounting configuration or assembly 18. The mirror assembly 10 includes touch or proximity sensitive user inputs 20 and associated icons or the like so a user can readily identify the purpose or function of the user inputs and actuate the appropriate or desired or selected user input. In the illustrated embodiment, the user inputs 20 are disposed at a lower region of the mirror reflective element 14, with indicators or icons 22 at an area above the respective inputs (and at the principal reflecting portion of the reflective element), so that, when a user touches or actuates one of the user inputs 20, the respective icon 22 is backlit so as to be illuminated for viewing by the user through the reflective element to confirm to the user that the input was actuated (optionally, the mirror assembly may provide a haptic feedback, such as a vibration or the like, to indicate to the user that a user input was touched or activated). The reflective element assembly and user inputs and icons may utilize aspects of the mirror assemblies shown and/or described in U.S. Des. Pat. Nos. D633,423; D633,019; D638,761 and/or D647,017, and/or PCT Application No. PCT/US2011/056295, filed Oct. 14, 2011 and published Apr. 19, 2012 as International Publication No. WO 2012/051500, and/or PCT Application No. PCT/US2010/032017, filed Apr. 22, 2010 and published Oct. 28, 2010 as International Publication No. WO 2010/124064, and/or PCT Application No. PCT/US10/51741, filed Oct. 7, 2010 and published Apr. 14, 2011 as International Publication No. WO 2011/044312, and/or U.S. Pat. No. 7,253,723 and/or 8,154,418, which are hereby incorporated herein by reference in their entireties. As shown in FIGS. 6A-11, the user inputs 20 comprise a circuit pad 24 with substantially non-light-transmissive electrically conductive traces 26 established at the circuit pad for sensing a touch or proximity at the sensor or input. As shown in FIGS. 8-11, the electrically conductive traces 26 are established at each touch input area or region 21a, 21b, 21c in a manner that allows light to pass through the touch pad and touch sensor areas to backlight icons at an appliqué 28 disposed over or at or in front of the circuit pad 24, as discussed below.

[0097] In the illustrated embodiment, the user input circuit pad 24 is disposed at a lower region of the reflective element and is positioned or located at an area that is devoid of any metallic mirror reflector coatings or the like at the mirror substrate or substrates. In the illustrated embodiment, the reflective element 14 comprises an electro-optic reflective element, such as an electrochromic reflective element, and includes a front substrate 30 having a front or first surface 30a (the surface that generally faces the driver of a vehicle when the mirror assembly is normally mounted in the vehicle) and a rear or second surface 30b opposite the front surface 30a, and a rear substrate 31 having a front or third surface 31a and a rear or fourth surface 31b opposite the front surface 31a, with an electro-optic medium disposed between the second surface 30b and the third surface 31a and bounded by a perimeter seal 32 of the reflective element (such as is known in the electrochromic mirror art). The second surface 30a of front substrate 30 has a transparent electrically conductive coating established thereat, while the third surface 31a of rear substrate 31 has a metallic reflector coating established thereat. The mirror reflector may comprise any suitable coatings or layers, such as a transflective coating or layer, such as described in U.S. Pat. Nos. 7,626,749; 7,274,501; 7,255,451; 7,195,381; 7,184,190; 6,690,268; 5,140,455; 5,151,816; 6,178,034; 6,154,306; 6,002,544; 5,567,360; 5,525,264; 5,610,756; 5,406,414; 5,253,109; 5,076,673; 5,073,012; 5,117,346; 5,724,187; 5,668,663; 5,910,854; 5,142,407 and/or 4,712,879, which are hereby incorporated herein by reference in their entireties, disposed at the front surface of the rear substrate (commonly referred to as the third surface of the reflective element) and opposing the electro-optic medium, such as an electrochromic medium disposed between the front and rear substrates and bounded by the perimeter seal (but optionally, the mirror reflector could be disposed at the rear surface of the rear substrate (commonly referred to as the fourth surface of the reflective element), while remaining within the spirit and scope of the present invention).

[0098] For example, the coating may comprise ruthenium or chromium or aluminum or aluminum alloy materials or the like. Optionally, the coatings may be sputter deposited on the substrate surface via a target. Typically, when the targets are expended, ruthenium is repressed onto the target (to save recycling costs) rather than regrinding the expended base of the target. Optionally, the targets may comprise chromium bases instead of ruthenium bases to reduce the inventory carrying costs of the targets. Thus, the target may comprise a low cost base material (such as chromium or the like), with a higher cost

material (such as ruthenium or the like) pressed onto the base, so that the target uses less of the high cost material and thus ties up a reduced amount of high cost material in the mirror manufacturer's inventory.

[0099] As shown in FIG. 5, electrical connections 36a, 36b may be established at connection areas to provide electrical connection to busbars or electrically conductive traces at a respective one of the front and rear substrates to provide electrical current to the electrically conductive coatings at the rear surface of the front substrate and the front surface of the rear substrate for powering and dimming or varying the reflectance of the reflective element. Optionally, for example, and with reference to FIGS. 28 and 29, two or more (such as three or more) conductive epoxy patches 37a may be disposed along an upper (or lower) perimeter region of the reflective element to facilitate connection of solderless clips to provide electrical power to the transparent conductive coating at the second surface (the rear surface of the front substrate 30') of the reflective element. The clips may be connected to tabs 37b established at a conductive busbar 37c at the rear substrate (such as by laser ablating an isolation line 37d through the conductive coating or coatings at the rear substrate, such as at the front or third surface of the rear substrate 31', and so that the isolation line is disposed at and along the perimeter seal 37e of the reflective element) so that the clips are spaced apart and electrically connected to an electrically conductive busbar 37c to provide electrical power to the second surface conductive coating and to reduce the conductive epoxy required to provide sufficient connectivity and conductivity at the second surface conductive coating. Optionally, another electrical connector or clip may be connected to a tab 37f of the third surface reflector coating to provide electrical power to the third surface conductive coatings at the front surface of the rear substrate.

[00100] As can be seen with reference to FIGS. 4B and 5, rear substrate 31 includes a cutout region 31c at its lower generally central region. As also shown in FIGS. 3 and 5, the perimeter seal 32 is established around a perimeter region of the rear substrate (and inboard of the perimeter region of the front substrate so that the front substrate overhangs the perimeter regions of the rear substrate around the reflective element, such as shown in FIGS. 4A and 4B), with a portion 32a of the seal 32 being disposed along the cutout region 31c of rear substrate 31 and thus around or along the upper boundary of the user input area 21 of the reflective element 14. The electro-optic medium thus is disposed within the

principal reflecting region of the reflective element and is not disposed at the user input area 21 that is outboard of the perimeter seal. The reflective element 14 includes a perimeter hiding layer or band 34 (such as an opaque or substantially non-light-transmitting metallic layer or band or the like) that is disposed around the perimeter region of the front substrate 30 (such as at the rear surface of the front substrate) to hide or substantially conceal or render covert the perimeter seal 32 from a person viewing the perimeter seal through the front substrate when the reflective element and mirror assembly are normally mounted at a vehicle (such as by utilizing aspects of the mirror assemblies described in U.S. Pat. Nos. 5,066,112; 7,626,749; 7,360,932; 7,274,501; 7,184,190 and/or 7,255,451, and/or PCT Application No. PCT/US2010/032017, filed Apr. 22, 2010 and published Oct. 28, 2010 as International Publication No. WO 2010/124064, and/or PCT Application No. PCT/US10/51741, filed Oct. 7, 2010 and published Apr. 14, 2011 as International Publication No. WO 2011/044312, and/or U.S. pat. application Ser. No. 11/226,628, filed Sep. 14, 2005 and published Mar. 23, 2006 as U.S. Pat. Pub. No. US-2006-0061008, which are all hereby incorporated herein by reference in their entireties).

[00101] The user input area 21 of the reflective element includes a window 34b established through the perimeter band 34 (such as at a wider or waisted portion 34a of the perimeter band or hiding layer 34) at the rear surface of the front substrate 30 so that the front substrate is substantially devoid of hiding layer or other conductive or metallic layers or coatings at the user input area. Likewise, the rear substrate 31 is cut-away at the user input area 21 so that the user input area is devoid of the rear glass substrate and thus devoid of the conductive mirror reflector coating or coatings. Thus, the user input area is substantially devoid of metallic and/or conductive coatings that may be present elsewhere at the front and rear substrates, such that the conductive coatings of the mirror reflective element are not at the user input area and do not interfere with the touch sensor or circuit pad 24 sensing a touch or presence of a person's finger at the front surface 30a of the front substrate 30 and at one or more of the user inputs 20a, 20b, 20c.

[00102] The user inputs or circuitry or switches are disposed behind the reflective element 14 and behind the touch zone 21 (having one or more individual inputs or touch sensors 20a, 20b, 20c disposed behind respective icons 21a, 21b, 21c of appliqué 28), with the user input circuitry or switches, such as touch or proximity sensing circuitry or capacitive switches (such as projection capacitance sensing circuitry or proximity sensing circuitry or

capacitive switches or user inputs that utilize aspects of the mirror assemblies described in U.S. Pat. No. 8,154,418, and/or PCT Application No. PCT/US10/51741, filed Oct. 7, 2010 and published Apr. 14, 2011 as International Publication No. WO 2011/044312, which are hereby incorporated herein by reference in their entireties) disposed at a lower perimeter region and behind the reflective element and below or outboard of the perimeter seal and at a window area formed through the perimeter band (and at a wider or waisted or broadened portion of the perimeter band). The individual touch sensors thus comprise individual electrically isolated touch pads formed at the circuit element or substrate 24 (such as a generally rigid substrate and/or a flexible substrate, such as a Mylar material or the like) and comprise the sensing elements and/or circuitry and/or switches disposed at or behind the individual icons of the touch zone 21 (with the user input icons creating or providing a cognitive association between the icons and the individual touch pads at the respective icons). The front glass substrate of the mirror reflective element (behind which the sensing pads and sensing circuitry are disposed) typically may have a thickness of about 3.2 mm or thereabouts, such that the perimeter edge portions can have a full 2.8 mm radius of curvature to meet the requirements of at least a 2.5 mm minimum radius of curvature. It is also desirable that the front substrate is devoid of electrically conductive coatings at the touch zone or area 21 (and that the rear substrate is removed or cut-away at the touch zone or area).

[00103] As shown in FIG. 6C, touch sensor or circuit 24 has appliqué 28 disposed thereat (and optionally adhered thereto via an adhesive 38), with appliqué 28 providing an opaque or substantially opaque or non-light-transmitting layer with graphics established thereat to provide the desired appearance at the touch area or input area 21. Another appliqué 40 may be disposed at or near or above the input area 21 to provide icons 22 that, when backlit, are viewable through the reflective element and through the mirror reflector of the reflective element (such as responsive to a user touching a respective one of the user inputs 20a, 20b, 20c). The appliqué 40 may be disposed at the rear of the reflective element 14 and at a foam tape 42 adhered thereto or disposed thereat. As shown in FIGS. 6A-C, foam tape 42 includes a cutout region at the user input area 21 and includes apertures that generally correspond to the icons 22 of the appliqué 40. The touch sensor or circuit pad 24 and appliqué 28 are disposed at the cutout region of the foam tape 42 and an attachment plate 44 is attached at the rear of the reflective element via the foam tape

42, with a circuit board 46 disposed at the attachment plate and having circuitry for controlling functions (such as telematics functions and backlighting functions and the like) responsive to the user inputs detecting a touch or proximity at a respective input or touch pad (with the circuitry of the circuit board electrically connected to wiring or leads or circuitry of the sensor or sensor substrate when the mirror is assembled). Optionally, the attaching surface of the attachment plate 44 may be plasma treated to enhance the adhesion of the attachment plate at the rear surface of the mirror reflective element.

[00104] As can be seen in FIGS. 6A-C, the attachment plate 44 and/or the circuit board or element 46 include or support a plurality of illumination sources 48 (such as individual light emitting diodes established at the circuit board or element 46) that are arranged at and aligned with the apertures of the attachment plate 44 and apertures of the foam tape and with the icons established at the appliqué 40. Thus, when a user touches the touch area or input area 21, the circuitry determines a touch at one of the user inputs 20a, 20b, 20c and may actuate a respective illumination source 48 to backlight a respective one of the icons 22a, 22b, 22c of appliqué 40, such that the backlit respective icon is illuminated and viewable by the user to confirm to the user that the touch was detected and the selected feature or function was activated or adjusted accordingly. Optionally, a fourth icon 22d may be provided at appliqué 40 that is not associated with any touch pad or input and that may be illuminated or backlit to indicate that the mirror accessory (such as a telematics system) is not in use or a line of communication is unavailable or disconnected or the like.

[00105] As shown in FIG. 6C, mirror assembly 10 includes a rubber or silicone or elastomeric or resilient gasket or pad 41, which is disposed at the rear of the touch sensor 24 and between the touch sensor 24 and the attachment plate 44 when the mirror assembly is assembled together. The gasket 41 is formed with apertures that generally align with the illumination sources 48 and the user inputs 20a, 20b, 20c to allow light to pass therethrough. The gasket 41 also includes apertures that receive the electrical connectors 25 (the circuit pad of the touch sensor includes electrical circuitry and connectors at the rear surface of the substrate for electrically connecting to circuitry of and in the mirror assembly that supports the reflective element assembly, as discussed below with respect to FIG. 20). Thus, when the connectors 25 (such as a multi-pin socket type of connector) are received in the apertures of the gasket, electrical connection may be made (via insertion of pins or terminals at the circuit board 46 into the respective sockets of the

connectors 25) as the touch sensor and reflective element are attached at the attachment plate. Thus, the mirror assembly provides a board-to-board connection between the touch circuit element and the mirror circuit element or board, such as when the reflective element is attached at the attachment plate or such as when the mirror circuit element is attached at the rear of the attachment element (with the reflective element and sensor and gasket already assembled to the attachment plate).

[00106] The gasket 41 comprises a compressible or resilient material that, when the reflective element and touch sensor are attached at the attachment plate, presses the appliqué 28 and sensor 24 against the rear glass surface of the front substrate of the reflective element so that the appliqué is substantially flat against the glass and there is reduced air at the appliqué and sensors. The gasket thus functions to provide a substantially uniform or constant pressure at the sensor and appliqué, thereby providing a flat appliqué for enhanced appearance and for providing enhanced performance of the touch sensors due to the reduced air at the sensor locations. Optionally, and less desirably, an optical adhesive may be disposed at the appliqué to couple the appliqué to the rear glass surface to provide a flat appliqué at the rear glass surface.

[00107] The user input icons and/or the display icons may comprise any suitable coloring and/or design and/or backlighting. It has been found that the color white for icons works well for viewing by the driver of the vehicle in high ambient lighting conditions, even and especially when using a transflective mirror reflective element. The white characters or icons (preferably displayed as white characters or icons through the transflective mirror reflector, to be viewed and seen by the driver of the vehicle as white characters or icons without a black background or surrounding display area) have been found to provide enhanced viewability and discernibility to a driver of the vehicle, particularly when viewing the displayed white characters or icons in high ambient lighting conditions, and such as described in PCT Application No. PCT/US2011/056295, filed Oct. 14, 2011 and published Apr. 19, 2012 as International Publication No. WO 2012/051500, which is hereby incorporated herein by reference in its entirety.

[00108] Referring now to FIGS. 7-11, the touch sensor or circuit pad 24 comprises a substrate 24a (such as a transparent or translucent substrate that allows light to pass therethrough) that has electrically conductive traces 26 established thereat. For example, the touch PCB substrate 24a may comprise a white substrate comprising an FR408

material or the like. Such a material is white or whitish in color and is conducive for backlighting and for generally white light passing therethrough for backlighting the icons of the appliqué (other non-white substrates may be yellow tinted or colored and may shift or affect the light passing therethrough). The substrate material preferably does not include UV blockers, with such UV blockers potentially causing the substrate to have a yellow hue, such that the substrate is substantially white and not yellowed or yellow tinted. Also, the substrate material may be non-UV effected (and/or the substrate may be disposed in the mirror assembly and not substantially exposed to UV light, so the substrate won't yellow or discolor over time and exposure to light throughout the life of the vehicle and mirror assembly.

[00109] As shown in FIGS. 8-11, the electrically conductive traces 26 include mesh traces or trace portions 26a that are established in a spaced apart mesh or grid or crossing pattern at the backlit portions of the respective touch pads or inputs 20a, 20b, 20c. The touch input trace 26 may have a substantially solid or continuous or non-meshed or less-meshed conductive trace 26b (such as a copper trace or the like) over a user input or touch sensitive area or touch pad, with patterned traces or trace portions 26a (made of the same material as the less-meshed or non-meshed trace, such as a copper trace or the like, and optionally established during the same screen printing process or the like) established at the touch sensors or inputs 20a, 20b, 20c and behind the respective icons of the appliqué 28, with the patterned traces 26a allowing for light emanating from the illumination sources of the circuit pad to pass through the substrate 24a and through the gaps between the patterned traces 26a to backlight or illuminate the respective icons of the appliqué 28. The pattern or thickness of the traces and thickness of the gaps between the traces is selected to provide sufficient light to pass therethrough for backlighting the icons of the appliqué while also providing sufficient conductivity and thus sensing sensitivity so as to be able to sense or detect a touch or proximity at the respective touch pad or input when a person's finger approaches and/or touches the appropriate location at the touch area 21 of the reflective element.

[00110] The appliqué 28 substantially hides the traces and the substrate from view by the driver of the vehicle, while the icons formed thereat may be backlit or illuminated by light emanating from the illumination source or sources and through the respective meshed trace regions. In the illustrated embodiment, the appliqué comprises a thin film or

substrate that is disposed in front of the touch sensor substrate and behind the mirror reflective element substrate. Optionally, the appliqué may be established as a thin film or coating at the rear surface of the mirror reflective element substrate, such as via depositing a non-conductive opaque coating at the touch sensor region and establishing the desired icons thereat, such as via etching or masking the icons through the coating to provide light transmissive portions of the opaque coating at the touch zones and in the shape of the desired icons.

[00111] In the illustrated embodiment of FIG. 8, the electrically conductive traces 26 are established as a mesh or grid pattern 26a on the substrate 24a as about 0.005 inch thick traces with about 0.010 inch gap between the parallel traces. However, other trace thicknesses and gap dimensions may be implemented depending on the particular application, with thicker or more densely disposed traces increasing the touch sensitivity of the touch pad while reducing the light-transmissivity of the touch pad. For example, and with reference to FIG. 9, the trace width "A" may be selected to be 0.005 inches, while the gap dimension "B" may be selected to be around 0.005 inches or 0.010 inches or 0.020 inches, depending on the desired or appropriate light transmissivity at the touch pads. Optionally, the trace width and gap dimensions may be otherwise selected, such that a user input or touch pad (such as a touch pad having a touch area of around 24 mm^2 or thereabouts) may have, for example, a fine trace pattern may have a trace width of about 0.13 mm (about 0.005 inches) and a gap dimension of about 0.25 mm (about 0.01 inches), or a medium trace pattern may have a trace width of about 0.2 mm (about 0.008 inches) and a gap dimension of about 0.4 mm (about 0.016 inches), or a coarse trace pattern may have a trace width of about 0.3 mm (about 0.012 inches) and a gap dimension of about 0.6 mm (about 0.024 inches), or other selections or combinations to provide the desired touch sensitivity and/or light transmissivity at the touch pads or inputs. Clearly, other trace widths and/or gap dimensions or pitches may be selected for the conductive traces of the touch pads or user inputs while remaining within the spirit and scope of the present invention. The selected dimensions may vary depending on the particular application and/or desired light passing through the traces for backlighting the icons. Optionally, the sheet resistance of the material (such as copper) of the conductive traces may be preferably less than about 10 ohms per square, more preferably less than about 5 ohms per square and more preferably less than about 1 ohm per square.

[00112] For example, and with reference to FIGS. 10-12, the user input traces 26 (FIG. 10) may have a touch or input area of about 60 mm^2 to about 80 mm^2 or more (for the SOS or emergency input) and about 65 mm^2 to about 85 mm^2 or more (for the hands free calling input) and about 75 mm^2 to about 105 mm^2 or more (for the telematics or ONSTAR® input), with the patterned traces or trace portion 26a comprising a trace thickness or width of about 0.005 inches and a gap dimension of about 0.017 inches. Optionally, and as shown in FIG. 12, the user input traces 26' may have patterned trace portions 26a' that comprise a trace thickness or width of about 0.005 inches and a gap dimension of about 0.008 inches, thereby providing a finer mesh that allows less light to pass therethrough (as compared to patterned trace portions 26a of FIGS. 10 and 11), while providing increased touch sensing sensitivity at the touch pad or input. Other gap dimensions and trace widths may be implemented (for example, a larger gap dimension may be selected or provided that is up to about 0.023 inches or up to about 0.034 inches or thereabouts) depending on the particular application and desired backlighting and touch sensitivity, while remaining within the spirit and scope of the present invention. Although shown as a generally grid or square-crossing pattern, clearly the conductive traces may be established at the user inputs in any suitable pattern or mesh pattern that allows for light to pass therethrough to backlight or illuminate the icons 21a, 21b, 21c at the appliqué 28 and that provides the desired or suitable conductivity for suitable detection sensitivity, while remaining within the spirit and scope of the present invention.

[00113] The trace pattern may comprise any spaced or gapped trace pattern, which need not comprise evenly spaced traces or unevenly spaced traces or intersecting or crossing traces. Optionally, the trace pattern may comprise non-intersecting or non-crossing spaced apart traces which may or may not be custom shaped to best fit around an icon shape or the like. For example, and with reference to FIGS. 15 and 15A-C, the electrically conductive traces may comprise customized patterns to reduce light blockage while providing enhanced or sufficient or desired sensitivity at the center region of the touch area or input (which may enhance sensitivity at the touch input for smaller diameter fingers and the like). In the illustrated embodiment of FIGS. 15 and 15A-C, the conductive traces 126 include traces or trace portions 126a that are established across or partially across the backlit portions of the respective touch pads or inputs 120a, 120b, 120c and between opposite portions of the solid or continuous conductive trace 126 of the respective touch

pads or inputs. Similar to the touch sensors discussed above, the touch input trace 126 has a substantially solid or continuous conductive trace 126b (such as a copper trace or the like) over a user input or touch sensitive area or touch pad, with the patterned traces or trace portions 126a established at the touch sensors or inputs 120a, 120b, 120c and behind the respective icons 121a, 121b, 121c of the appliqué, with the patterned traces 126a allowing for light emanating from the illumination sources of the circuit pad to pass through the substrate 124a and through the gaps between the patterned traces 126a to backlight or illuminate the respective icons of the appliqué. As can be seen in FIGS. 15A-C, the patterned traces 126a comprise generally horizontal traces that span the gap or opening established in the solid trace portion 126b, and may include an enlarged portion 126c (such as at the center of the "O" in the ONSTAR® icon or the SOS icon or the like) to further enhance the touch sensitivity of the sensors.

[00114] Optionally, and with reference to FIGS. 16 and 16A-C, the patterned electrically conductive traces comprise generally horizontal traces 126a' that span the gap or opening established in the solid trace portion 126b' at the substrate 124a' and generally vertical traces 126d' that may span or partially span the gap or opening established in the solid trace portion 126b' at the respective touch areas 120a', 120b', 120c'. As shown in FIGS. 16A-C, the horizontal traces 126a' may include an enlarged portion 126c' (such as at the center of the "O" in the ONSTAR® icon 121b' or at the telephone icon 121a' or the like), and/or the vertical traces 126d' may include an enlarged portion 126e' (such as above and/or below the ONSTAR® icon 121b' or above and below the emergency or "SOS" icon 121c' or the like) to further enhance the touch sensitivity of the sensors.

[00115] Optionally, and with reference to FIGS. 17-20, an electrochromic reflective element 14' includes touch or proximity sensitive user inputs 20' and associated icons or the like so a user can readily identify the purpose or function of the user inputs and actuate the appropriate or desired or selected user input. In the illustrated embodiment, the user inputs 20' are disposed at a lower region of the mirror reflective element 14' (such as via a touch pad or sensor disposed at the rear of the front substrate at an area where the rear substrate is cut out or recessed), with indicators or icons 22' at an area above the respective inputs (and at the principal reflecting portion of the reflective element), so that, when a user touches or actuates one of the user inputs 20', the respective icon 22' is backlit so as to be illuminated for viewing by the user through the reflective element to

confirm to the user that the input was actuated. As best shown in FIG. 20, the user inputs 20' comprise a circuit pad 24' with electrically conductive traces 27' established at the circuit pad for sensing a touch or proximity at the sensor or input. The conductive traces 27' are established at each touch input area or region 20a', 20b', 20c' in a manner that allows light to pass through the touch pad and touch sensor areas to backlight icons 28' at an appliqué disposed over or at or in front of the circuit pad 24', such as in a similar manner as discussed above.

[00116] Optionally, and as shown in FIG. 20, the patterned traces comprise generally horizontal traces or grid lines 27a' that span the gap or opening established in the solid trace portion 27b' at the substrate 24a' at the respective touch areas 20a', 20b', 20c'. The circuit pad 24' includes electrical circuitry and connectors 25' at the rear surface of the substrate 24a' for electrically connecting to circuitry of and in the mirror assembly that supports the reflective element assembly 10'. The reflective element assembly and user inputs may be otherwise similar to the reflective element assemblies and user inputs discussed above, such that a detailed discussion of the reflective element assemblies and user inputs need not be repeated herein.

[00117] For a human machine interface (HMI) provided at the likes of an interior rearview mirror assembly, it is useful and preferred that an icon (such as shown in FIG. 12 for a SOS icon and/or ONSTAR® icon and/or phone icon and/or the like) be provided that is readily recognizable by a driver of the vehicle, and especially where touch sensing is involved at and/or near the icon. It is useful and preferable that the icon and the touch sensitive area/region to be touched by the driver to access or activate the feature (or deactivate the feature) coincide or at least be closely adjacent or coincident with one another. However, it is also useful and preferred that a driver of a vehicle viewing the likes of such a touch sensitive input at the interior rearview mirror assembly is not able to readily see through or view through the touch input area or region or zone into the interior of the interior mirror head (such as viewing through the reflective element to within the cavity of the mirror casing). Thus, it is useful and preferred that the likes of the backlighting and other circuitry/mechanicals of the mirror assembly (and internal to the mirror assembly) be at least substantially covert and be substantially hidden or masked from view by the driver, whether or not the icon/touch region is illuminated. By utilizing the interlocking mesh/matrix of electrically conductive, substantially non-light transmitting, traces of the

present invention (where a substantial net portion of the touch sensitive region is coated with the likes of a conducting light absorbing metal thin film layer and where at least a significant other portion of the touch sensitive region remains uncoated to allow for light to pass therethrough), the mirror assembly allows that the touch sensitive region be functional and operative as a capacitive sensing / projection touch region while simultaneously allowing and enabling backlighting coincident with and at that same touch sensitive region where the icon that attracts and guides the driver's touch is itself also coincidently disposed thereat.

[00118] As indicated in the likes of FIGS. 8 and 11, the plurality of electrically conductive traces that constitute the mesh or grid or array or matrix of conductive traces are themselves electrically conductively interlinked by reason of any one of the traces being in electrical conductivity with all or most all of the other traces at that touch sensitive region (and conductively interlinked with a solid or unmeshed conductive trace at a perimeter region or adjacent to the meshed region), so that a touch by the driver even at a subregion of the electrically conductive trace matrix/array/mesh region enables and causes capacitive touch effectively across the entire electrically conductive matrix/array/mesh trace touch sensitive region. As shown in FIGS. 24 and 24A, each individual trace has electrical conductivity (either directly or indirectly) via electrical connection with other traces (such as solid or unmeshed or less meshed traces) typically disposed or established at either or both sides of the meshed electrically conductive trace region, and the likes of electrical connection (such as via an electrical connector for electrically connecting the respective touch sensitive region to circuitry of the mirror assembly) is made out of view of the driver.

[00119] The glass substrates of the mirror reflective element may be formed via any suitable means. Optionally, and desirably, multiple glass shapes or substrates are cut from a larger sheet of glass (for inside mirrors, typically a larger sheet or lite of flat transparent glass). For example, and with reference to FIG. 70, a large sheet or lite of glass 50 has a first surface 50a and a second surface 50b. In order to cut out individual glass shapes or substrates, the first surface 50a is scored or scribed (such as via any scoring or scribing means, such as a diamond tip scoring device or the like) in the shape desired for the glass shapes or forms 52 for the front or rear glass substrates of a mirror reflective element, and

then individual shapes are broken out from the scored large glass sheet or lite by breaking the glass along the scored or scribed lines, as is known in the glass arts.

[00120] For example, and with reference to FIG. 71A, a front glass substrate 54 for a mirror reflective element is formed via scoring or scribing a glass sheet, such as discussed above, and breaking out the glass shape or form 52, and optionally at least one of grinding/seaming/polishing one or both of the cut edges of the shapes to establish or form the finished mirror front glass substrate 54. As can be seen in FIG. 71A, the first or front surface 54a of the front glass substrate is the surface that corresponds to the scored surface of the sheet of glass 50 from which front substrate 54 is formed, and thus has a scored edge 54c (that may be ground and polished to provide a desired radius of curvature having water clear transparency) while the second or rear surface 54b of the front glass substrate 54 is the surface that corresponds to the non-scored surface of the sheet of glass 50 and thus has a non-scored edge 54d. The second surface 54b of the front substrate 54 is coated with a transparent conductive coating 56, such as an indium tin oxide (ITO) coating or layer that is sputter deposited onto the second surface 54b of the front substrate 54. The second surface ITO coating may be established at the second surface of the formed shape or substrate or may be established at the surface of the larger sheet or lite of glass before the scribing or scoring process.

[00121] Note, it is optional and may be preferable that the larger sheet or lite of flat transparent glass be transparent conductive coated (such as, for example, coated with an ITO coating or the like) on one of its surfaces before the multiple glass shapes or forms 52 are cut therefrom. In such circumstances, it is the non-ITO coated surface or side of the large sheet or lite of glass (typically a bare glass surface) that is scored during the scoring/breakout of the individual glass shapes or forms. This assures that the ITO coated side of the front substrates (i.e., the second surface of the reflective element assembly) has the non-scored edges.

[00122] Likewise, and with reference to FIG. 71B, a rear glass substrate 58 for a mirror reflective element is formed from scoring or scribing another glass sheet, such as discussed above, and breaking out the glass shape or form 52, and optionally at least one of grinding/seaming/polishing one or both of the cut edges of the shapes to establish or form the finished mirror rear glass substrate 58. As can be seen in FIG. 71B, the third or front surface 58a of the rear glass substrate is the surface that corresponds to the scored

surface of the sheet of glass 50 from which rear substrate 58 is formed, and thus has a scored edge 58c, while the fourth or rear surface 58b of the rear glass substrate 58 is the surface that corresponds to the non-scored surface of the sheet of glass 50 and thus has a non-scored edge 58d. The third surface 58a of the rear substrate 58 is coated with a mirror reflector coating 60, such as metallic reflector coating or layer that is sputter deposited onto the third surface 58b of the rear substrate 58. The third surface reflector coating may be established at the third surface of the formed shape or substrate or may be established at the surface of the larger sheet or lite of glass before the scribing or scoring process.

[00123] Note, it is optional and may be preferable that the larger sheet or lite of flat transparent glass be mirror reflector coated (such as coated with a metallic mirror reflector coating or the like) on one of its surfaces before the multiple glass shapes or forms 52 are cut therefrom. In such circumstances, it is the reflector coated surface or side of the large sheet or lite of glass that is scored during the scoring/breakout of the individual glass shapes or forms. This assures that the non-reflector coated side of the rear substrates (i.e., the rear or fourth surface of the reflective element assembly) has the non-scored edges.

[00124] Thus, when a mirror reflective element 62 (FIG. 72) is assembled with front substrate 54 and rear substrate 58 joined together by a perimeter seal 64 that surrounds and bounds an electro-optic medium 66 (such as an electrochromic medium or the like), the scored edges 54c, 58c of the substrates 54, 58 are at the front surfaces of the substrates (the surfaces of each substrate that is closer to the driver of the vehicle when the mirror reflective element is normally mounted in a vehicle), and the non-scored edges 54d, 58d of the substrates 54, 58 are at the rear surfaces of the substrates. Such a scoring and assembly process provides both substrates with the scored edges at the front surfaces of the respective substrates (in other words, the first surface and the third surface of the laminate reflective element assembly). This is beneficial because, if there is an impact against the mirror reflective element (such as during a vehicle collision and if the driver or passenger hits their head or other part of their body at the mirror assembly), the front surfaces (with the scored edges) of the substrates are placed in compression while the rear surfaces (with the non-scored edges) of the substrates are placed in tension. Because tiny microfractures or microdefects or stress risers or micro cracks occur at the

scored edge of the glass substrate from the scoring or scribing process, the scored edges provide weakened points at the scored edge of the glass substrate that may be more susceptible to cracking or to crack initiation, and especially when placed in tension (glass is typically weak in tension and strong is compression, so the scribed side must be located at the compression side). Thus, by making sure that the scored or scribed edges of the respective front and rear substrates are at the front surfaces of the substrates (the surfaces that will be placed in compression during any impact or collision), the glass substrates have a reduced likelihood of cracking and failing during an impact or collision. Thus, the present invention provides that the scored or scribed edge of the front substrate in a laminate or sandwiched electrochromic construction is at the first surface of the laminate assembly, and the scored or scribed edge of the rear substrate is at the third surface of the laminate assembly or sandwiched electrochromic assembly.

[00125] The present invention also provides an enhanced seaming process for seaming the edge of the rear glass substrate (such as with belt sandpaper or even a machine ground "bullnose" edge treatment) by seaming only the end regions of the substrate and leaving the upper and lower edges (the longer dimensioned edges that will be at the upper and lower regions of the mirror reflective element when the mirror reflective element is normally mounted in a vehicle) as raw cut edges. This may be desirable because seaming reduces the bend strength of the glass substrate, as compared to raw cut glass edges (when the scribe side is on the front or third surface of the rear substrate). The raw cut edge is "pristine" and results in the greatest strength, while seaming the cut edge introduces uniform flaws and makes the glass weaker (at the expense of reducing variability in strength). Cut edges are nearly "pristine", and thus stronger than seamed edges. However, the cut edges are also highly vulnerable to damage in day to day processing or usage, and are more prone to handling damage (as compared to a seamed edge), and once such handling damage occurs, the damaged substrate becomes a weaker part than a seamed part. It is envisioned that the substrate may have its end regions seamed (the ends of the part away from the impact area), which may have a reduced affect on the bend strength, such that the center region of the glass substrate has raw cut (non-seamed) edges and thus is very strong and impact resistant.

[00126] FMVSS 111 provides requirements for the performance and location of inside and outside rearview mirrors, in order to reduce the number of deaths and injuries that occur

when the driver of a vehicle does not have a clear and reasonably unobstructed view to the rear, and ECE Regulation No. 46 provides uniform provisions concerning the approval of devices for indirect vision and of vehicles with regard to the installation of such devices. Such regulations (including other regulations) include specifications as to requirements for a mirror substrate that undergoes bend testing and other strength and/or cracking/breaking testing.

[00127] Referring now to FIG. 73, a bend test may be conducted on mirror glass substrates, such as for the front or rear substrates of a mirror reflective element. As can be seen in FIG. 73, the bend test may apply a force at a center region of a front surface of a glass substrate (such as a front or third surface of a rear glass substrate to simulate the type of forces that may be experienced at the reflective element during an impact or collision) that is supported at support locations approximately 113 mm apart, with the force being applied at a rate of 30 mm/minute until the glass breaks, and with the peak applied force recorded for each substrate. In the exemplary test results shown in FIG. 73, rear glass substrates were tested where the front surface or third surface was the scribed or scored surface and the edges were ground or fully hand seamed using a seaming belt (GF 1-5), and rear substrates were tested where the rear surface or fourth surface was the scribed or scored surface and edges were ground or fully hand seamed using a seaming belt (GB 6-10), and rear substrates were tested where the front or third surface was the scribed or scored surface and the edges were raw and with no edge treatment so the substrates were just cut glass (RF 1-5), and rear substrates were tested where the rear or fourth surface was the scribed or scored surface and the edges were raw and with no edge treatment so the substrates were just cut glass (RB 6-10). As can be seen in the test results, the bend strength is much higher when the substrate is scribed on its front or third surface (as compared to scribing at the rear or fourth surface), and the bend strength is higher with raw or unseamed glass when scribed on the front or third surface (as compared to ground substrates with scribing at the front or third surface). However, seaming the edges increases the strength of the glass substrate when the scribed side is the rear or fourth surface of the substrate (but still yields a bend strength that is less than either the seamed or raw samples with the scribed side being the front or third surface of the rear glass substrate).

[00128] Thus, the present invention provides a method or system of manufacturing the glass substrates for a mirror reflective element that ensures that the scribed surface of the glass shapes formed from a scribed glass sheet corresponds to the front or first surface of front glass substrates formed from such a scribed glass sheet or the front or third surface of rear glass substrates formed from such a scribed glass sheet. Such a system results in substantially greater bend strengths of the glass substrates to enhance the substrates' ability to withstand an impact, such as may occur during a vehicle collision or the like. The system may ensure the desired scribed surface via any suitable means, such as via particular handling of the substrates from the time they are formed from the glass sheet until they are coated at their coated surfaces (the rear or second surfaces of front substrates and/or the front or third surfaces of rear substrates), or such as via scanning the edges prior to coating the coated surfaces to determine which side or surface of the substrate has the scribed edge and adjusting or flipping the substrate so that the appropriate surface is coated. For applications where the larger glass sheets are ITO coated or mirror reflector coated before the individual glass substrate shapes are cut therefrom, the present invention provides assurances that the appropriate surface of the glass sheet is scribed (such as the non-ITO coated surface for front mirror glass substrates and such as the mirror reflector coated surface for rear mirror glass substrates). The reflective elements manufactured with such substrates thus provide enhanced strength and resistance to cracking or breaking during an impact, and thus provide enhanced and safer mirror assemblies suitable for use at the interior of vehicles.

[00129] Although shown and described as scribing the surface of a glass sheet that becomes the front surface of a front substrate or a rear substrate of an electrochromic reflective element, the present invention also provides similarly scribing or scoring a surface of a glass sheet or lite for cutting or forming prismatic substrates for prismatic reflective elements, such that the front surface of the formed individual prismatic substrate has the scribed edge and the mirror reflector coating is established at the non-scribed side or rear surface of the prismatic substrate.

[00130] The present invention also provides enhanced glass cutting techniques, such as by providing a glass cutting start/stop point at a desired or preferred location at the perimeter of the formed glass substrate. When cutting the glass, the start/stop point for the scribe and glass nipping is desired to be outside of the center zone or region of the finished glass

substrate (in other words, the start/stop point or location should be towards one of the end regions of the glass substrate. This is because, at the start/stop point there is a high probability of a larger glass flare that could be a stress concentration point, and thus it is desirable to move such a stress concentration point away from the center region of the glass substrate.

[00131] The present invention also provides a preferred glass computer numerical control (CNC) grinding start/stop point. When grinding the front glass substrate (such as to establish the desired radius of curvature at the forward edge of the substrate) the grinding start/stop point should not be in the center zone. This off-center start-stop point is desired because it is difficult or challenging to have a perfectly tangent start and stop overlap, such that there typically will be a slight point that could result in stress concentrations. Thus, it is desirable to move such a stress concentration point away from the center region of the glass substrate.

[00132] The present invention also provides a perimeter seal that may reduce the stress applied to the mirror reflective element by the perimeter seal. For example, a seal may induce stress at the glass substrates each time the seal and substrates go through a heat cure step. Thus, the mirror reflective element may not include a conductive epoxy that may have to go through a second bake step (such as a 150 degree C bake step or the like), so that the main seal epoxy would not have to endure a second bake step and thus would not experience more shrinkage and thus would not induce more stress at the glass substrates. Optionally, the mirror reflective element may include a soft perimeter seal (such as a silicone seal, a polyurethane seal or a soft UV curable urethane acrylate seal or the like).

[00133] Optionally, the mirror reflective element may include a perimeter seal that is wider than a typical perimeter seal, in order to improve the adhesion between the front and rear glass substrates by providing an optimized or enhanced seal band width. Such a construction may help to make the two substrates act or function more like a single unit. Also, if any glass chipping or breakage occurs, such a construction may hold the glass chips better than a thin perimeter seal construction.

[00134] Optionally, other means for reducing the flexing or enhancing the strength of the assembled mirror reflective element may be implemented to provide a mirror reflective element that is better suited for impacts and collisions and the like. For example, the

mirror reflective element may include an electrochromic medium of the solid polymer matrix (SPM) type (such as utilizing aspects of the reflective element assemblies described in U.S. Pat. Nos. 6,245,262; 5,724,187 and/or 5,668,663, which are hereby incorporated herein by reference in their entireties). We find that utilizing a SPM composition that cures with a high degree of cross linking when cured in situ to form a SPM electrochromic medium helps reduce glass flexing during impacts.

[00135] For prismatic and/or electrochomic INFINITY™ mirrors, such as are shown and/or described in U.S. Des. Pat. Nos. D633,423; D633,019; D638,761 and/or D647,017, and/or PCT Application No. PCT/US2011/056295, filed Oct. 14, 2011 and published Apr. 19, 2012 as International Publication No. WO 2012/051500, and/or PCT Application No. PCT/US2010/032017, filed Apr. 22, 2010 and published Oct. 28, 2010 as International Publication No. WO 2010/124064, and/or PCT Application No. PCT/US10/51741, filed Oct. 7, 2010 and published Apr. 14, 2011 as International Publication No. WO 2011/044312, and/or U.S. Pat. Nos. 7,253,723 and/or 8,154,418, which are hereby incorporated herein by reference in their entireties, we find that it is preferable that the front substrate be manufactured from double strength (typically around 3.2 mm thickness) soda lime transparent glass, and that the curved or rounded perimeter around the front most edge thereof is ground and polished (so as to be water clear) from the scored edge of a cut substrate/shape. It is also preferable that the opposing edge of the front substrate be beveled or chamfered. We do not find it necessary to bevel and/or chamfer the third surface edge of the rear substrate or the fourth surface edge of the rear substrate, but nevertheless the third surface edge should be the scored edge as cut from a larger flat sheet or lite of glass, as discussed above.

[00136] Optionally, and with reference to FIGS. 21-24, a prismatic reflective element 214 includes touch or proximity sensitive user inputs 220 and associated icons (such as icons 221a, 221b, 221c established at an appliqué 228) or the like so a user can readily identify the purpose or function of the user inputs and actuate the appropriate or desired or selected user input. In the illustrated embodiment, the user inputs 220 are disposed at a lower region of the mirror reflective element 214.

[00137] As best shown in FIG. 24, the user inputs 220 comprise a circuit pad 224 with electrically conductive traces 227 established at the circuit pad for sensing a touch or proximity at the sensor or input. The conductive traces 227 are established at each touch

input area or region 220a, 220b, 220c in a manner that allows light to pass through the touch pad and touch sensor areas to backlight icons 221a, 221b, 221c at an appliqué 228 disposed over or at or in front of the circuit pad 224, such as in a similar manner as discussed above. Optionally, and as shown in FIG. 24, the patterned traces comprise generally horizontal traces or grid lines 227a that span the gap or opening established in the solid or unmeshed or less meshed or more solid trace portion 227b at the substrate 224a at the respective touch areas 220a, 220b, 220c. The circuit pad 224 includes electrical circuitry and connectors 225 at the rear surface of the circuit pad or substrate for electrically connecting to circuitry of and in the mirror assembly that supports the prismatic reflective element assembly 214. As shown in FIG. 24A, the electrical connectors 225 are electrically conductively connected to the solid or unmeshed or less-meshed trace portions 227b (or to conductive traces that are in electrical conductive connection with a respective solid or unmeshed trace portion) so as to provide electrical connection to the meshed portions 227a (which are electrically conductively connected with the respective solid or unmeshed trace portion or portions at either or both sides of the meshed portion)

[00138] Optionally, and as shown in FIG. 24A, a touch pad or circuit pad 224' may have generally vertical traces or grid lines 227a' that span the gap or opening established in the solid trace portions 227b' of the circuit pad 224'. The electrical connectors 225' (such as six pin or six terminal connectors or other suitable electrical connectors) are electrically connected to respective traces of the circuit pad. In the illustrated embodiment, one connector 225' is electrically connected to or at the solid trace portion and a perimeter trace portion (that is established around and electrically isolated from the solid trace portion) of one of the touch pads or input areas 220c', while another connector 225' is electrically connected to or at the respective solid trace portions and perimeter trace portions (that are established around and electrically isolated from the respective solid trace portions) of two of the touch pads or input areas 220a', 220b'. The electrical connectors are electrically connected to circuitry of the mirror assembly, such as via an electrical wire or lead or the like, whereby the circuitry is operable to individually detect a touch at one or more of the touch pads or input areas.

[00139] Thus, the touch pad or sensor of the present invention comprises copper or conductive traces that can function to detect a touch at the touch pad while also allowing light to pass through a generally central portion of the touch area for backlighting an icon

or appliqué at the touch pad. In the illustrated embodiments of FIGS. 20, 24 and 24A, the dark or solid areas on either side of the icon comprises a copper layer (but may be any suitable metallic and/or electrically conductive layer), and the sensor includes copper (or other suitable material) lines or traces that are established horizontally or vertically in front of the icon (which is disposed at the touch pad). The copper lines or thin copper traces are spaced apart and allow light to pass through the touch pad and back light or illuminate the icon for enhanced day time and night time viewing of the touch areas. Although the copper lines or thin traces are shown as horizontally or vertically established, the thin traces may run horizontally or vertically or at any desired or selected or suitable angle (or in a pattern or the like as discussed above), with the total surface area of the touch pad area determining the sensitivity of the touch pad. The copper matrix or mesh traces are conductively connected with the copper solid or less-meshed or non-meshed traces at either or both sides of the mesh traces (or optionally above and/or below the mesh traces) so that the entire touch region is able to sense a touch at the region, either at the icon (where the mesh traces are established) or at either side or adjacent to the icon (where the solid or less-meshed trace or traces is/are established).

[00140] The pattern or thickness of the traces and thickness of the gaps between the traces is selected to provide sufficient light to pass therethrough for backlighting the icons of the appliqué while also providing sufficient conductivity and thus sensing sensitivity so as to be able to sense or detect a touch or proximity at the respective touch pad or input when a person's finger approaches and/or touches the appropriate location at the touch area of the reflective element. Other than the areas of the traces that cross the graphics or icons, the areas or portions of the solid or continuous traces are disposed a selected distance from the graphics (such as about 0.5 mm or thereabouts), to allow for positioning and size tolerancing of the graphics at the respective touch sensor. The substrate may comprise any suitable substrate, such as an FR408 board material (such as a board having a thickness of around 5 mil or thereabouts), with no UV blockers or dyes to reduce the light transmission through the substrate and to reduce shifting of color. Such an FR408 material allows for a thin, flexible circuit board or substrate that may be substantially transparent due to its thin construction.

[00141] Optionally, it is envisioned that the electrically conductive traces may be established directly at the rear surface of the glass mirror substrate so as to obviate the need for a

separate circuit element or board or the like. Optionally, although shown and described as opaque electrically conductive material, it is envisioned that the conductive material of the sensors may comprise a clear or substantially transparent conductive material or coating (such as an ITO coating or the like) established at the circuit element or substrate or at the glass surface of the mirror substrate. In such an application, the transparent conductive traces need not include the mesh traces and may comprise a solid or less-meshed or non-meshed conductive trace at the touch sensitive region or zone, whereby the transparent conductive trace is used to sense the presence of a person's finger or touch at the touch zone, while allowing for light to pass therethrough to illuminate or back light the respective icon at the appliqué or at the front substrate of the mirror reflective element (such as an icon established through an opaque coating at the rear surface of the mirror substrate and at the touch sensor region of the reflective element).

[00142] The mesh traces or trace portions facilitate increasing the sensor pad surface area, while locating the sensor directly behind the respective icon that the user will be touching, and allows for increasing the size of the icons without hurting the touch or proximity sensitivity of the sensor or sensors. The sensors and electrically conductive traces may be more sensitive at the continuous trace regions around the icons, but the patterned traces provide sufficient sensing sensitivity at the icons. Generally, it is desirable to provide gaps that are small or relatively small to limit or substantially preclude any shadowing effect at the appliqué when the sensor and icon are backlit.

[00143] The electrically conductive traces of the user inputs or touch sensor pads may comprise any suitable conductive material, such as copper traces or the like. For example, the copper traces may be established at a front surface of the sensor substrate at each of the sensing areas or pads, with electrical connectors or pads established at the sensor substrate (such as also at the front surface of the substrate or at the rear of the substrate) for electrically connecting (such as via soldering connectors or wires thereto) to the circuitry of the printed circuit board or circuit element of the mirror assembly when the mirror is assembled. Optionally, other suitable conductive materials may be used for the conductive traces, such as, for example, any suitable conductive metallic material or the like. Optionally, the conductive traces may comprise a transparent conductive material (such as indium tin oxide (ITO) or the like) or may comprise silver nanowires or conductive films with silver nanowires disposed or established therein or the like. Such conductive

films may be used in the FPC (flexible printed circuit) construction (whereas some transparent conductive coatings (such as ITO or the like) are not highly suitable for flexible substrate applications) to establish a transparent conductor, and such conductive films may be substantially transparent to allow light to pass therethrough, while providing sufficient sensitivity to the touch sensor or sensor pad. Optionally, the sensor substrate may comprise a substrate with holes or apertures at the icon areas, and with metallic conductive traces (such as copper or the like) disposed and extending across or spanning the holes or apertures to provide sensitivity at the holes in the substrate while the holes allow for light to pass through the substrate (which, in such an embodiment, may comprise a generally opaque or non-light transmitting substrate). The appliqué may provide a diffusing feature as well, particularly in applications where light passes through a hole in the sensor substrate or where the sensor substrate is substantially clear or transparent. Optionally, it is envisioned that the touch sensors may comprise a transparent conductive coating or layer (such as an ITO layer) that wraps around from the rear surface of the mirror substrate to and partially over the front surface of the mirror substrate, such that the capacitive touch sensors may be established at the front surface of the mirror reflective element (and anywhere at the front surface of the mirror reflective element, such as at a peripheral region of the reflective element or a generally central region of the reflective element).

[00144] Optionally, the back lighting device may comprise individual light emitting diodes disposed at or behind and generally aligned with the patterned traces and the appliqué icons so that light emanating from an individual light emitting diode passes through the translucent substrate and through the gaps in the respective patterned conductive traces and through the respective icon for viewing by a person viewing the mirror reflective element. It is envisioned that other lighting devices may be used, such as side lighting light pipes or the like that light or illuminate the appliqué icons from the side of the appliqué, whereby light need not pass through the sensor substrate. However, the direct lighting or back lighting of the present invention provides enhanced lighting or backlighting at the icons and, thus, provides enhanced visibility and discernibility of the icons during high ambient lighting conditions.

[00145] Thus, the mirror assembly 10 provides a touch or input area 21 at a lower region of the electro-optic reflective element (but it could be elsewhere around or at the reflective

element, such as a side region or upper region of the reflective element) and at a region that is devoid of conductive coatings at the surfaces of the front and rear substrates of the electro-optic reflective element 14 (and devoid of the rear substrate itself so that the touch sensor is disposed to the rear of the front substrate and at a cutaway region of the rear substrate). As shown in FIG. 1, the icons of the appliqué 28 are viewable at the touch area 21. In the illustrated embodiment, the icons are white and thus may have enhanced viewability at the opaque appliqué. Optionally, the inputs may be continuously backlit or may be episodically backlit (such as when the vehicle is initially turned on or when a door opens or when the interior lights of the vehicle are activated or the like) to enhance viewability of the inputs so the user can readily see them and discern them. Optionally, the individual user input or touch pad may be backlit when it is actuated to provide a confirmation of the touch being detected by the user input sensor and circuitry. Optionally, and with reference to FIG. 2, the icons 22a, 22b, 22c, at or near the user input area 21 may be backlit in response to a respective user input being actuated or touched (to provide confirmation to the user that the touch was detected and the feature was actuated) and/or the icons 22a, 22b, 22c, 22d may be backlit in response to other inputs or signals.

[00146] Thus, the icons may be backlit or illuminated or activated in response to the user touching or actuating a respective one of the user inputs. The icons may remain illuminated for a period of time after actuation (such as a selected time period following actuation of the respective touch sensor) or may be deactivated responsive to an input or triggering event. For example, the mirror assembly circuitry may be in communication with a vehicle bus or network bus of the vehicle, and the icon or icons may be activated responsive to a user's touch or input, and may be deactivated responsive to a vehicle system or function that is communicated to the mirror circuitry via the network bus of the vehicle. For example, the icon or icons may be activated and may remain activated until the vehicle speed reaches a threshold level (such as until the forward speed of travel of the vehicle reaches, for example, about 5 mph or about 8 mph or thereabouts). Such vehicle speed information may be provided via the vehicle bus to allow the icons or indicators to be activated and to remain activated during times when a user may be looking at the mirror for a prolonged period of time (such as when the vehicle is stopped or barely moving), and thus avoids the potential annoyance to the user of the icons being deactivated too soon.

[00147] In the illustrated embodiment, reflective element assembly 14 includes indicia formed or established at the user inputs or individual touch pads to indicate to the user what the function of the respective user input is so the user is invited to touch the appropriate area of the touch area or region of the reflective element to activate/control that function. For example, the indicia and user inputs may be established for a telematics system of a vehicle, such as an ONSTAR® system or the like. One of the indicia or icons 21a thus may indicate that a respective or corresponding user input or touch pad 20a is for initiating a telephone call or the like, while another of the indicia or icons 21b may indicate that a respective or corresponding user input or touch pad 20b is for connecting the vehicle communication system or telematics system to a remote service or the like, and another of the indicia or icons 21c may indicate that a respective or corresponding user input or touch pad 20c is for connecting the vehicle communication system or telematics system to an emergency response system or the like. Thus, the user may readily recognize the functions associated with the user inputs and may be invited to touch the appropriate location of the front surface of the reflective element to activate/control the selected or desired function.

[00148] Optionally, other forms of input icons (such as of appliqué 28) and display icons (such as of appliqué 40) may be provided or implemented depending on the particular application of the mirror assembly. For example, and with reference to FIG. 13, the user input icons 21a', 21b', 21c' may be backlit or illuminated in different colors (such as white and/or red and/or blue or the like), or, and with reference to FIG. 14, the user input icons 21a", 21b", 21c" may comprise other designs or configurations, depending on the particular application and desired appearance of the mirror assembly. Although shown as providing three user inputs for a telematics system (such as ONSTAR®), clearly the user inputs and icons of the mirror assembly may be provided for control or adjustment or actuation of other functions or features, such as for other types of telematics systems (such as for U-CONNECT™ telematics systems and/or the like), while remaining within the spirit and scope of the present invention.

[00149] Thus, the touch element or circuit element provides touch pads or touch sensors that are ergonomically and readily accessible by the driver simply touching or approaching the touch zone of the mirror reflective element and thus the sensor element behind the mirror reflective element. Optionally, the touch sensors may comprise any suitable touch

sensing or proximity sensing means, such as, for example, capacitive touch technology, infrared (IR) touch technology, ALSENTIS™ touch systems technology, capacitive sensing technology, field effect technology, HSS technology and/or the like, depending on the particular application of the mirror assembly and user inputs or touch/proximity sensors.

[00150] The appliqué or appliqués may be disposed at or established behind the reflective element to render covert the touch sensor and circuit element. Optionally, the appliqué or appliqués may comprise a darkened or opaque appliqué or may comprise a reflective appliqué (that may match or substantially match the spectral reflectance of the mirror reflector as viewed by the driver of the vehicle so that the appliqué is not readily discernible to a person viewing the mirror reflective element when the mirror assembly is normally mounted in the vehicle) that is substantially reflective and partially transmissive of visible light so that the circuit element is rendered covert behind the appliqué.

[00151] As shown in FIGS. 1 and 2, the mirror assembly is configured and constructed so as to function as a human machine interface (HMI) for an ONSTAR® telematics system available from General Motors of Detroit, Mich. In the illustrated embodiment, the mirror assembly is configured and constructed so as to be readily recognizable and usable by General Motors' customers that are familiar with or used to interfacing with ONSTAR® via conventional mirror-bezel mounted buttons or the like, such as described in U.S. Pat. No. 6,329,925; 7,308,341 and/or 7,289,037, which are hereby incorporated herein by reference in their entireties. The individual icons thus may be the shape and color associated with and expected for known ONSTAR® icons of conventional vehicle applications. Optionally, and such as for white icons as described above, the icons may be backlit via a colored illumination source to provide a desired color touch icon at the touch area. For example, and with reference to FIG. 13, icon 21b' may be backlit or illuminated blue and icon 21c' may be backlit or illuminated red (or other selected color), such as by a blue or red light emitting diode disposed to the rear of the reflective element, and/or such as by a blue or red colored (or other selected color) mask, tape, light transmitting appliqué and/or the like disposed at the reflective element. During normal use of the mirror assembly, the touch pad may be low level illuminated, such as via use of, for example, a white light-emitting LED (or other suitable color) backlighting the touch pad. When the driver then touches at or has his or her finger approximately closely to the touch pad, the intensity of the backlighting LED (backlighting the touch pad) may substantially increase to acknowledge

the driver's touch thereat or approach thereto, and concurrently (and after an appropriate debounce to avoid inadvertent triggering) the display icon illumination intensity may also increase or may be actuated to acknowledge/confirm the user's touch at the touch pad. When the phone conversation or event is to be concluded, the driver may retouch the touch pad, whereupon the LED may again increase in intensity to acknowledge the touch/approach at the touch pad, and concurrently (and after an appropriate debounce to avoid inadvertent triggering) the icon illumination intensity may also increase to acknowledge/confirm the user's touch at the touch pad.

[00152] Optionally, the icons may comprise white icons that are viewable as white when the backlighting element is unpowered, and when they are backlit, the backlighting elements operate to backlight with white, blue, and red LEDs to give the respective icons 21a', 21b', 21c' colors that confirm the actuation or operation. The display icons in the dimming area may be activated or backlit in response to a sensing by a respective user input. Optionally, the display icons (such as display icons 22a", 22b", 22c" of FIG. 14) may be backlit at vehicle startup (or when a vehicle door is opened or key fob is actuated or the like, or otherwise when one or more interior lights is/are activated), and may then fade out. Optionally, and as shown in FIG. 14, the mirror assembly may include a fault indicator 22d" (such as an "On!" fault indicator of an ONSTAR® system or the like) that is backlit or illuminated or actuated responsive to a fault detection or the like.

[00153] Thus, the mirror assembly may include icons established at the primary reflective surface or area of the reflective element, while the user inputs or touch sensors or buttons may be accessed at a lower region of the mirror assembly beyond and below and separate from the EC-active or principal reflecting region of the reflective element. Such a construction avoids or reduces fingerprints or smudges at the outermost glass surface of the reflective element at the principal reflecting region. The icons comprise display on demand type icons or displays and thus are viewable through the mirror reflector and are discernible to a driver viewing the reflective element when the icons are backlit or illuminated, and may be substantially not discernible when not backlit or illuminated. Optionally, a "fault" icon (that indicates to the driver of the vehicle when an error or fault is detected in the telematics system, such as ONSTAR® or U-CONNECT™ or the like, or when the telematics system or user input or touch system is not functioning properly) may

be disposed at the primary reflective area and may be viewable through the mirror reflector when backlit (thus providing a display on demand type of display for the fault icon).

[00154] Optionally, and such as described in PCT Application No. PCT/US2011/056295, filed Oct. 14, 2011 and published Apr. 19, 2012 as International Publication No. WO 2012/051500, and/or PCT Application No. PCT/US10/51741, filed Oct. 7, 2010 and published Apr. 14, 2011 as International Publication No. WO 2011/044312, which are hereby incorporated herein by reference in their entireties, in order to limit or avoid accidental actuations of one or more of the touch pads or capacitive sensors disposed at and behind the perimeter region of the mirror reflective element when the user is otherwise touching the front surface of the mirror reflective element, such as when wiping or washing the first or front surface of the reflective element or when adjusting the mirror to adjust the rearward field of view at the mirror, it is envisioned that the mirror assembly may include an additional touch or proximity sensitive sensor or switch or means, such as an additional capacitive switch or the like, that is disposed at or behind a portion of the reflective element or behind the rest of the reflective element, such as behind the entire or substantially the entire viewing area of the mirror reflective element (such as behind the entire or substantially the entire electro-optically dimmable area of an electro-optic mirror reflective element or cell). Thus, if the surface of the reflective element at the main viewing or dimming region is being contacted or elsewhere remote from the touch sensor regions, further contact at or near the user input or touch sensor input regions (such as at the lower perimeter region and such as where the icons or graphics are disposed) may be ignored by the touch sensor system. Thus, the system would recognize and respond to a user's touch at one of the touch sensors when the system did not at the same time receive an indication that another region or regions of the mirror reflective element were also being touched by the user (since such multiple touching areas would be indicative of the user cleaning or wiping the reflective element surface or otherwise adjusting the mirror assembly and reflective element).

[00155] The reflective element 14 and mirror casing 12 are adjustable relative to the mounting arm or pivot assembly 18 (FIG. 6) to adjust the driver's rearward field of view when the mirror assembly is normally mounted at or in the vehicle. The mirror assembly includes a socket or pivot mount that may receive a ball member of a mounting arm of the pivot assembly or mounting structure 18, such as a double pivot or double ball mounting

structure or a single pivot or single ball mounting structure or the like (such as a pivot mounting assembly of the types described in U.S. Pat. Nos. 6,318,870; 6,593,565; 6,690,268; 6,540,193; 4,936,533; 5,820,097; 5,100,095; 7,249,860; 6,877,709; 6,329,925; 7,289,037; 7,249,860 and/or 6,483,438, and/or U.S. patent application Ser. No. 11/226,628, filed Sep. 14, 2005 and published Mar. 23, 2006 as U.S. Pat. Pub. No. US-2006-0061008, and/or PCT Application No. PCT/US2010/028130, filed Mar. 22, 2010, which are hereby incorporated herein by reference in their entireties). The mounting assembly may have a ball or socket element mounted to or attached to or established at a mirror attachment plate or backing plate (which may optionally include or incorporate circuitry thereat or thereon) that is attached at the rear surface of the mirror reflective element (optionally with a mirror casing disposed over or receiving the attachment plate or with a cap portion of a mirror assembly attaching to the backing plate or the like, such as by utilizing aspects of the mirror assemblies described in U.S. Pat. No. 7,289,037, which is hereby incorporated herein by reference in its entirety), or the mounting assembly may have a ball or socket element mounted to or attached to or established at a portion of the mirror casing (or to an attachment element disposed at or in the mirror casing), where the ball or socket or pivot joint element pivotally attaches to a mounting arm or mounting structure that attaches to an interior portion of the vehicle, such as an inner surface of the vehicle windshield or the like.

[00156] In the illustrated embodiment, mounting assembly 18 comprises a double-ball or double-pivot mounting assembly whereby the reflective element and casing are adjustable relative to the vehicle windshield (or other interior portion of the vehicle) about a pair of pivot joints. Mounting assembly 18 includes a base portion or mounting base and a mounting arm, with the reflective element 14 and mirror casing 12 pivotally mounted at one end of mounting arm about a mirror ball pivot joint (such as a ball and socket joint or the like at the rear of the attachment plate) and the mounting arm pivotally mounted at the mounting base at the other end of the mounting arm about another or second mirror ball pivot joint (such as a ball and socket joint or the like) that allows for a driver of the vehicle to which mirror assembly 10 is mounted to adjust the reflective element to adjust the rearward field of view of the driver. Optionally, the mounting assembly may comprise other types of mounting configurations, such as a single-ball or single-pivot mounting

configuration or the like, while remaining within the spirit and scope of the present invention.

[00157] In the illustrated embodiment, the mounting base is configured to be attached to an interior surface of a vehicle windshield (such as to a mounting button or attachment element adhered to the interior surface of the vehicle windshield). The mounting base may be mounted to a mounting button or attachment element at the vehicle windshield via a breakaway mounting construction, such as by utilizing aspects of the mounting constructions described in U.S. Pat. Nos. 5,820,097 and/or 5,100,095, which are hereby incorporated herein by reference in their entireties. The mounting arm may comprise a molded (such as injection molded) polymeric mounting arm or may be otherwise formed, depending on the particular application of the mirror assembly (and may utilize aspects of the mounting assemblies described in U.S. Pat. Nos. 6,318,870; 6,593,565; 6,690,268; 6,540,193; 4,936,533; 5,820,097; 5,100,095; 7,249,860; 6,877,709; 6,329,925; 7,289,037; 7,249,860 and/or 6,483,438, and/or U.S. patent application Ser. No. 11/226,628, filed Sep. 14, 2005 and published Mar. 23, 2006 as U.S. Pat. Pub. No. US-2006-0061008, and/or PCT Application No. PCT/US2010/028130, filed Mar. 22, 2010, which are hereby incorporated herein by reference in their entireties).

[00158] The mirror assembly may comprise any suitable construction, such as, for example, a mirror assembly with the reflective element being nested in the mirror casing and with the mirror casing having a curved or beveled perimeter edge around the reflective element and with no overlap onto the front surface of the reflective element (such as by utilizing aspects of the mirror assemblies described in U.S. Pat. Nos. 7,255,451; 7,289,037; 7,360,932 and/or 8,049,640, and/or U.S. patent applications, Ser. No. 12/900,063, filed Oct. 7, 2010, now U.S. Pat. No. 8,277,059; and/or Ser. No. 12/752,305, filed Apr. 1, 2010, now U.S. Pat. No. 8,529,108, or such as a mirror assembly having a rear substrate of an electro-optic or electrochromic reflective element nested in the mirror casing, and with the front substrate having curved or beveled perimeter edges, or such as a mirror assembly having a prismatic reflective element that is disposed at an outer perimeter edge of the mirror casing and with the prismatic substrate having curved or beveled perimeter edges, such as described in U.S. Des. Pat. Nos. D633,423; D633,019; D638,761 and/or D647,017, and/or PCT Application No. PCT/US2010/032017, filed Apr. 22, 2010 and published Oct. 28, 2010 as International Publication No. WO 2010/124064, and/or PCT

Application No. PCT/US10/51741, filed Oct. 7, 2010 and published Apr. 14, 2011 as International Publication No. WO 2011/044312, and/or PCT Application No. PCT/US2011/056295, filed Oct. 14, 2011 and published on Apr. 19, 2012 as International Publication No. WO 2012/051500, which are hereby incorporated herein by reference in their entireties (and with electrochromic and prismatic mirrors of such construction are commercially available from the assignee of this application under the trade name INFINITY™ mirror).

[00159] In the illustrated embodiment, the interior rearview mirror assembly is designed and constructed as an electrochromic mirror assembly having a front glass substrate, and, such as shown in FIG. 4, with the front glass substrate of the electrochromic laminate element being constructed with its first surface/outermost perimeter edges slanted or beveled or rounded or the like, such as shown/described in U.S. Des. Pat. Nos. D633,423; D633,019; D638,761 and/or D647,017, and/or PCT Application No. PCT/US2011/056295, filed Oct. 14, 2011 and published Apr. 19, 2012 as International Publication No. WO 2012/051500, and/or PCT Application No. PCT/US2010/032017, filed Apr. 22, 2010 and published Oct. 28, 2010 as International Publication No. WO 2010/124064, and/or PCT Application No. PCT/US10/51741, filed Oct. 7, 2010 and published Apr. 14, 2011 as International Publication No. WO 2011/044312, which are hereby incorporated herein by reference in their entireties, in order to obviate/avoid a sharp edge at the front or outermost perimeter surface of the mirror reflective element and mirror assembly that could potentially hurt/injure an occupant of a vehicle equipped with the interior rearview mirror assembly during an accident.

[00160] The mirror casing 12 may comprise any suitable mirror casing, and may comprise a plastic or polymeric molded casing or housing. Optionally, for applications where the perimeter edge region of the front substrate of the mirror reflective element 14 is curved and exposed (such as described in PCT Application No. PCT/US2011/056295, filed Oct. 14, 2011 and published Apr. 19, 2012 as International Publication No. WO 2012/051500, and/or PCT Application No. PCT/US2010/032017, filed Apr. 22, 2010 and published Oct. 28, 2010 as International Publication No. WO 2010/124064, and/or PCT Application No. PCT/US10/51741, filed Oct. 7, 2010 and published Apr. 14, 2011 as International Publication No. WO 2011/044312, which are hereby incorporated herein by reference in their entireties), the mirror casing 12 may comprise a metallic finish or high gloss finish or

textured finish or the like at least at the forward portion that abuts the rear of the front substrate (or the rear of a prismatic substrate for prismatic mirror applications). The curved or contoured or sculpted finished or polished perimeter regions of the reflective element in such applications appear reflective due to the perimeter band disposed at the rear surface of the front substrate of an electrochromic (or due to the reflector coating at the rear surface of a prismatic reflective element). Thus, it is desirable to form the exterior surface of the mirror casing (at least at or near the forward edge region of the mirror casing that abuts the rear surface of the reflective element substrate) with a finished surface to provide an enhanced aesthetic appearance immediately adjacent and to the rear of the curved transition surface of the reflective element. For example, the mirror casing may be painted or in-mold decorated to create or establish a desired finish or appearance around the forward perimeter region of the casing so as to provide a continuity of appearance at the interface or junction of the mirror casing and reflective element. For example, with an in-mold film approach, the mirror casing may have a reflective appearance or a brushed metallic appearance (such as brushed stainless steel or brushed nickel appearance). Optionally, for example, the mirror casing may comprise an in-mold paint, or the mirror casing may be painted, such as via a high gloss paint and such as in a similar manner as an exterior rearview mirror assemblies, to provide the desired color or appearance. Optionally, the mirror casing may be colored and the mirror mounting assembly may also be colored, or they may be powder coated grey or black or the like, so as to provide a generally uniform appearance. Optionally, the mirror casing may be formed to have an all around metallic appearance, or may be formed to have a particular finish or texture (such as stippling or patterns or the like formed or established at the outer surface of the mirror casing) impacted or established at the casing, and the textured casing may also be decorated or painted or the like to provide the desired appearance. Thus, the mirror casing may be formed or processed to provide an affirmative carryover of the high gloss / reflective appearance of the exposed polished curved transition surface of the glass substrate of the reflective element to the exterior surface of the mirror casing at least around and along the mirror casing at the junction of the reflective element and mirror casing and at least immediately rearward of the junction of the reflective element and mirror casing. Optionally, the perimeter regions of the mirror casing may be reduced in size/depth so that the casing may be generally not viewable at the rear perimeter of the

glass substrate when the mirror assembly is normally mounted in a vehicle and normally viewed by a driver of the vehicle.

[00161] Although shown as an electrochromic mirror application, it is envisioned that such touch elements may be suitable for prismatic mirror constructions as well, while remaining within the spirit and scope of the present invention. For example, the user inputs and iconistic touch pads or display areas discussed above may be suitable for use in a prismatic interior rearview mirror assembly, while remaining within the spirit and scope of the present invention. For example, and with reference to FIGS. 25 and 26A-C, a prismatic interior rearview mirror assembly 210 may include a mirror casing 212, a reflective element (such as reflective element 214, discussed above) and toggle mechanism 217 and user inputs 220, such as user inputs disposed behind the reflective element. The user inputs 220 and circuit element 224 are disposed behind associated icons 221a, 221b, 221c, and the icons may be formed at a darkened appliqué 228 (which may optionally be adhered to the circuit element via an adhesive 238), such that fingerprints and/or smudges at the touch areas may be less visible/discernible. The icons may be backlit via one or more light emitting diodes 248 or the like at a circuit element or board 246. The reflective element 214 is attached or adhered at an attachment plate 244, such as via a foam tape or adhesive tape 242 or the like. The user inputs and touch sensors and mirror assemblies may be otherwise similar to the mirror assemblies discussed above, such that a detailed discussion of the mirror assemblies need not be repeated herein. Optionally, display icons of a second appliqué (not shown in FIGS. 25 and 26A-C) may be disposed above the user inputs 220 and touch area 221 and may be illuminated or backlit so as to be displayed on demand for viewing through the reflective element and through the mirror reflector of the prismatic reflective element, such as when a respective one of the user inputs is actuated by the driver of the vehicle.

[00162] In the illustrated embodiment, and as shown in FIG. 26C, mirror assembly 210 includes a rubber or silicone or elastomeric or resilient gasket or pad 241, which is disposed at the rear of the touch sensor 224 and between the touch sensor 224 and the attachment plate 244 when the mirror assembly is assembled together. The gasket 241 is formed with apertures that generally align with the illumination sources 248 and the user inputs 220a, 220b, 220c to allow light to pass therethrough, and the gasket 241 also includes apertures that receive the electrical connectors 225 of the touch sensor, such as

in a similar manner as discussed above. Thus, when the connectors 225 (such as a multi-pin socket type of connector) are received in the apertures of the gasket, electrical connection may be made (via insertion of pins or terminals at the circuit board 246 into the respective sockets of the connectors 225) as the touch sensor and reflective element are attached at the attachment plate. The gasket 241 comprises a compressible or resilient material that, when the reflective element and touch sensor are attached at the attachment plate, presses the appliqué 228 and sensor 224 against the rear glass surface of the prismatic reflective element so that the appliqué is substantially flat against the glass and there is reduced air at the appliqué and sensors.

[00163] In the illustrated embodiment, the indicia or icons 221a, 221b, 221c and associated user inputs are provided for a telematics system of a vehicle, such as an ONSTAR® system or the like. One of the indicia 221a thus may indicate that a respective or corresponding user input or touch pad is for initiating a telephone call or the like, while another of the indicia 221b may indicate that a respective or corresponding user input or touch pad is for connecting the vehicle communication system or telematics system to a remote service or the like, and another of the indicia 221c (such as a red cross or an "SOS" icon or the like) may indicate that a respective or corresponding user input or touch pad is for connecting the vehicle communication system or telematics system to an emergency response system or the like. Thus, the user may be readily recognize the functions associated with the user inputs and may be invited to touch the appropriate location of the front surface of the reflective element to activate/control the selected or desired function. In the illustrated embodiment, the indicia or icons may be established at an appliqué that is disposed behind a window or area with a background color that demarcates or distinguishes the window or area from the principal reflecting area of the reflective element (such as, for example, a grey background color or the like).

[00164] The prismatic mirror assembly may be mounted or attached at an interior portion of a vehicle (such as at an interior surface of a vehicle windshield) via any suitable mounting means, and the reflective element may be toggled or flipped or adjusted between its daytime reflectivity position and its nighttime reflectivity position via any suitable toggle means, such as by utilizing aspects of the mirror assemblies described in U.S. Pat. Nos. 6,318,870 and/or 7,249,860, and/or U.S. Publication No. US-2010-0085653, published Apr. 8, 2010, which are hereby incorporated herein by reference in their entireties.

Optionally, the interior rearview mirror assembly may include circuitry therein (such as at a printed circuit board or the like disposed within the mirror casing, and electrical connection to the circuitry may be made via an electrical lead or connector of a wiring harness of the vehicle. Optionally, the electrical connector may be received through the mirror casing and through an aperture established through the toggle element, such as by utilizing aspects of the mirror assemblies described in U.S. Pat. No. 5,798,688 and/or U.S. Publication No. US-2010-0085653, published Apr. 8, 2010, which are hereby incorporated herein by reference in their entireties.

[00165] The icons and associated touch or proximity sensors of the mirror assemblies of the present invention may be used as the actual switch and may utilize multiple technologies. Optionally, for example, the touch proximity sensor may utilize capacitive touch technology, IR touch technology, ALSENTIS™ touch systems technology, capacitive sensing technology, field effect technology, HSS technology and/or the like, depending on the particular application of the mirror assembly and user inputs or touch/proximity sensors. For example, the touch sensor may detect when an electrically conductive object or material enters an electric field at or near the sensor. The sensor, responsive to a voltage applied thereto, may generate an electric field that may emanate through the glass substrate of the mirror reflective element, and when a conductive object or material enters the field, the sensor detects the change and generates an output signal indicative of the detected touch or proximity of the object or finger. Optionally, and desirably, the sensor may provide a digital output indicative of the sensing of the object or touch. Optionally, and desirably, the touch sensors may be operable over wide temperature ranges, such as between, for example, -40 and +120 degrees C, making it suitable for automotive applications.

[00166] Within the scope of the present invention, various touch or proximity technologies, including surface capacitance touch, projection (projected) capacitance touch, resistive touch, infrared (IR) touch (where an IR beam or the like is interrupted and/or sensed), surface acoustic wave (SAW) touch, and close field effect touch, as are commonly known in the touch sensor art. Such touch sensors may utilize aspects of the user input systems described in U.S. Pat. No. 8,154,418 and/or PCT Application No. PCT/US2011/056295, filed Oct. 14, 2011 and published Apr. 19, 2012 as International Publication No. WO 2012/051500, and/or PCT Application No. PCT/US10/51741, filed Oct. 7, 2010 and

published Apr. 14, 2011 as International Publication No. WO 2011/044312, U.S. Pat. No. 7,360,932 and/or U.S. patent applications, Ser. No. 12/091,525, filed Apr. 25, 2008 and published Jan. 15, 2009 as U.S. Pat. Pub. No. US-2009-0015736; Ser. No. 11/239,980, filed Sep. 30, 2005 and published Jun. 15, 2006 as U.S. Pat. Pub. No. US-2006-0125919; and/or Ser. No. 12/576,550, filed Oct. 9, 2009 and published Apr. 15, 2010 as U.S. Pat. Pub. No. US-2010-0091394, which are hereby incorporated herein by reference in their entireties.

[00167] Optionally, the user inputs or touch sensors of an electro-optic or prismatic mirror assembly may comprise reconfigurable user inputs, such that in one situation or setting, the user inputs provide one feature or function (or set of features or functions, such as, for example, for control and operation of a telematics system) and in another situation or setting, the user inputs provide a second different feature or function (or set of features or functions, such as, for example, for control and operation of a universal garage door opening system, such as a vehicle based garage door opening system of the types described in U.S. Pat. Nos. 6,396,408; 6,362,771; 7,023,322 and/or 5,798,688, which are hereby incorporated herein by reference in their entireties). Thus, when the system is set for one type of operation, a person touching a particular area of the touch sensitive region of the mirror reflective element assembly may actuate a particular or selected function, and when the system is set for another type of operation, a person touching the same particular area of the touch sensitive region of the mirror reflective element assembly may actuate a different function. For example, and with reference to FIG. 1, when the telematics function is selected for the user inputs 21a, 21b, 21c, actuation of the user inputs controls the telematics system in accordance with the indicator displayed at the respective user input or touch region. When it is desired to control, for example, a garage door opener of the vehicle, the user may actuate or toggle a selection input or touch sensor (not shown), whereby the operation of the user inputs 21a, 21b, 21c is changed or reconfigured to control the garage door opener of the vehicle, so that when, for example, a user presses input 21a, the garage door opener system generates the appropriate signal for opening the garage door that is associated with that input.

[00168] The user inputs thus may be selected or toggled for other features or functions to provide multiple functions at the mirror assembly with only a small number (such as three or four) of user inputs or touch sensors. The functions of the user inputs may be selected

by the user, such as via actuation of another user input or toggle or switch (such as a fourth user input or touch sensor (not shown) in FIG. 1), whereby the user may toggle between the two (or more) sets of functions associated with the user inputs or touch sensors. Thus, for example, a single reconfigurable user input or sensor may be disposed at each touch region, whereby the user inputs may be reconfigured to provide a selected or appropriate output via actuation of a selection input or toggle switch or the like (such as responsive to an additional or fourth button or input or switch/toggle). Optionally, each of the touch sensitive regions may comprise or may be associated with two (or more) separate and distinct inputs or sensors disposed at each touch location, whereby the operation of a selected one of the separate inputs or sensors may be selected or controlled via actuation of a selection input or toggle switch or the like (such as responsive to actuation of an additional or fourth button or input or switch/toggle).

[00169] Optionally, the selection or toggle function may be achieved via appropriate actuation of one or more of the reconfigurable user inputs. For example, a user may press and hold one of the existing inputs for a period of time (or may press/actuate the user input or sensor a predetermined number of times (such as two or more actuations within one second (or more or less) or the like) to change/reconfigure the functions of the user inputs, or the user may press a predetermined combination of inputs or sensors at one time to change/reconfigure the functions of the user inputs.

[00170] Optionally, the backlit icons 22a, 22b, 22c (FIG. 2) may be changed to show or indicate the selected function of the respective user input or touch sensor, so that the user is cognitively aware of the function of the user inputs when the user is actuating one or more of the user inputs. Optionally, the backlighting of the user inputs may be changed to indicate the different functions of the user inputs. For example, when backlit in white or other color, the inputs may operate to control the telematics system, but when backlit in red or other color, the inputs may operate to control the garage door opener system (or other system or accessory of the vehicle). In such an application, the icons at the user inputs may be generic so that the color or appearance change (in response to the selected function or functions) is readily perceived and understood by the user. Optionally, two icons may be provided for each user input, with one icon representing the telematics function of the user input and illuminating when the respective user input is actuated when the user inputs are in the telematics mode, and another icon (which may be disposed

above or below the first icon or to either side of the first icon, but still generally above the respective user input) representing the garage door opening function (or other function) of the user input and illuminating when the respective user input is actuated when the user inputs are in the garage door opener mode (or other mode).

[00171] Thus, the present invention may provide multiple controls or functions of the user inputs or sensors at a reduced cost and at a reduced size (by avoiding having to add additional touch sensors and associated circuitry for six or nine (or more or less) control features). It is envisioned that the telematics functions of the user inputs would be the default function, and the icons may reflect the appropriate telematics function for the respective inputs or sensors. Optionally, if the telematics system is not used (such as when a user or vehicle owner does not subscribe to the system or does not renew their subscription), the system may be reconfigurable to allow the user select and set the garage door opener function (or other function) as the default function of the user inputs or touch sensors. The mirror assembly and user input system thus is able to switch between two (or more) features while utilizing the same three (or more or less) user inputs or touch sensors or buttons.

[00172] Other mirror and user input designs or configurations may be contemplated for a mirror assembly that incorporates touch sensors or proximity sensors in accordance with the present invention. For example, the mirror assembly may include a plastic molding that comprises a portion that (a) abuts a circumferential edge of the mirror glass substrate (such as the front glass substrate of an electrochromic mirror reflective element or a glass prism of a prismatic mirror reflective element) and (b) has an outer curved surface that extends from generally adjacent to a first surface of the glass substrate and that may lack a sharp edge, such as described in U.S. Pat. Nos. 7,255,541; 7,289,037; 7,360,932 and/or 8,049,640, and/or U.S. patent application Ser. No. 12/752,305, filed Apr. 1, 2010, now U.S. Pat. No. 8,529,108, which are hereby incorporated herein by reference in their entireties. Optionally, for example, the mirror assembly may include a reflective element with a beveled or rounded or curved front perimeter of the glass substrate that may be exposed to, contactable by and viewable by the driver of the vehicle when the interior rearview mirror assembly is normally mounted in the vehicle, such as described in U.S. Des. Pat. Nos. D633,423; D633,019; D638,761 and/or D647,017, and/or PCT Application No. PCT/US2011/056295, filed Oct. 14, 2011 and published Apr. 19, 2012 as International

Publication No. WO 2012/051500, and/or PCT Application No. PCT/US2010/032017, filed Apr. 22, 2010 and published Oct. 28, 2010 as International Publication No. WO 2010/124064, and/or PCT Application No. PCT/US10/51741, filed Oct. 7, 2010 and published Apr. 14, 2011 as International Publication No. WO 2011/044312, which are hereby incorporated herein by reference in their entireties. Optionally, the mirror assembly may include a conventional bezel, such as described in U.S. Pat. No. 7,224,324, which is hereby incorporated herein by reference in its entirety.

[00173] Optionally, for example, and with reference to FIG. 27, a mirror assembly 310 may include a mirror casing 312 and a reflective element 314 (such as an electrochromic reflective element, such as shown in FIG. 27, or such as a prismatic reflective element), with a bezel portion 315 disposed at the front edge portion of the mirror casing 312, and with the bezel portion 315 including a transparent cover panel or substrate 315a disposed at the front surface of the reflective element (and such as by utilizing aspects of the mirror assemblies described in International Publication No. WO 2011/044312, published Apr. 14, 2011, and/or PCT Application No. PCT/US2011/056295, filed Oct. 14, 2011 and published on Apr. 19, 2012 as International Publication No. WO 2012/051500, which are hereby incorporated herein by reference in their entireties). The transparent cover 315a may comprise a plastic substrate that is disposed over the glass substrate of the reflective element and that is integrated with the plastic bezel casing portion 315. For example, the bezel portion 315 may comprise an opaque perimeter portion 315b (such as a black or chrome or colored plastic portion or the like) disposed along and around the perimeter of the reflective element 314, with a transparent cover portion 315a integrally formed or molded with the perimeter portion 315b, such that the bezel portion 315 encompasses the front of the reflective element and substantially houses or encases the reflective element at the rear mirror housing or casing 312.

[00174] Optionally, such as for electrochromic mirror applications, the transparent cover portion 315a may include a perimeter border band or opaque portion about and along its perimeter region, such that the cover portion 315a provides a hiding layer that functions to hide or conceal or render covert the perimeter seal of the reflective element (such that the reflective element may be manufactured without such a perimeter band established at and along the perimeter region of the second or rear surface of the front or first substrate). For example, the opaque bezel portion 315b may overlap the perimeter region of the reflective

element to provide the opaque border band around or along the perimeter region of the reflective element. The bezel portion 315 may attach to the mirror casing 312 via any suitable attaching means, such as by utilizing aspects of the mirror assemblies described in PCT Application No. PCT/US2011/056295, filed Oct. 14, 2011 and published on Apr. 19, 2012 as International Publication No. WO 2012/051500, and/or U.S. provisional applications, Ser. No. 61/554,017, filed Nov. 1, 2011; and/or Ser. No. 61/543,492, filed Oct. 5, 2011, which are hereby incorporated herein by reference in their entireties. The reflective element 314 may be attached at a back plate attached at the mirror casing 312 or may be attached at the bezel portion 315, depending on the particular application of the mirror assembly.

[00175] Optionally, other bezel and/or glass substrate constructions may be selected or implemented to provide a curved or beveled perimeter edge at and around the periphery of the reflective element, while remaining within the spirit and scope of the present invention. With reference to FIGS. 30-39, various bezel and glass substrate shapes are shown that provide such a curved or beveled periphery at the reflective element and/or bezel of the mirror assemblies of the present invention.

[00176] For example, and with reference to FIGS. 30-34, a mirror assembly may include an electrochromic reflective element 350 having a front substrate 352 and a rear substrate 354 and an electrochromic medium 356 disposed therebetween and bounded by a perimeter seal 358. Optionally, an opaque perimeter hiding layer or band 360 may be disposed at the rear surface of the front substrate to render covert the mirror casing 362 and perimeter seal 358 to a person viewing the reflective element from inside the vehicle when the mirror assembly is normally mounted in the vehicle. As shown in FIG. 30, the front substrate 352 has a rounded or curved perimeter edge region 352a that provides or establishes the curved transition between the front surface of the front substrate and the side surface of the mirror casing. Optionally, and with reference to FIG. 31, a bezel portion 364 may provide or include a rounded or curved perimeter edge region 364a that provides or establishes the curved transition between the front surface of the front substrate of an electrochromic reflective element and the side surface of the mirror casing. Optionally, and with reference to FIG. 32, the bezel portion 364' may be partially curved and the perimeter edge region 352a' of the front substrate 352' of an electrochromic reflective element may be partially curved so that the bezel portion and the edge region of the front

substrate cooperate or combine to provide or establish the curved transition between the front surface of the front substrate and the side surface of the mirror casing (so that the radius or curved transition region is split or shared between the bezel and the perimeter region of the front substrate). Optionally, and with reference to FIG. 33, the bezel portion 364" may partially overlap a beveled edge region 352a" of the front substrate 352" of an electrochromic reflective element, with the bezel portion 364" providing or establishing the curved transition between the front surface of the front substrate and the side surface of the mirror casing, and with the rear of the overlapping bezel portion optionally being configured or shaped to correspond to and receive the beveled edge region of the front substrate. In such an embodiment, the perimeter seal 358" may be disposed so as to be generally behind the overlapping bezel portion to render covert the perimeter seal so that a perimeter hiding layer or opaque perimeter band may not be included. Optionally, and with reference to FIG. 34, a thin bezel or cover portion 366 may partially overlap a perimeter region of a front substrate 352'" of an electrochromic reflective element, such as at a notch or recess 352b'" established at the front surface of the front substrate and along the perimeter region of the front surface of the front substrate (and with the recess 352b'" receiving the overlapping cover portion therein such that an outer surface 366a of the cover portion is generally flush with or generally coplanar with the front surface of the front substrate). In such an embodiment, the perimeter seal 358'" may be disposed so as to be generally behind the overlapping cover portion to render covert the perimeter seal so that a perimeter hiding layer or opaque perimeter band may not be included.

[00177] Optionally, and with reference to FIGS. 35-39, a mirror assembly may include a prismatic reflective element having a prismatic or wedge-shaped glass substrate with a reflector coating or layer at its rear surface. As shown in FIG. 35, the prismatic substrate 370 has a rounded or curved perimeter edge region 370a that provides or establishes a curved transition between the front surface of the prismatic substrate and the side surface of the mirror casing 372. Optionally, and with reference to FIG. 36, a bezel portion 374 may provide or include a rounded or curved perimeter edge region 374a that provides or establishes the curved transition between the front surface of a prismatic substrate and the side surface of the mirror casing. Optionally, and with reference to FIG. 37, the bezel portion 374' may be partially curved and the perimeter edge region 370a' of a prismatic substrate 370' may be partially curved so that the bezel portion and the edge region of the

prismatic substrate cooperate or combine to provide or establish the curved transition between the front surface of the prismatic substrate and the side surface of the mirror casing (so that the radius or curved transition region is split or shared between the bezel and the perimeter region of the prismatic substrate). Optionally, and with reference to FIG. 38, the bezel portion 374" may partially overlap a beveled edge region 370a" of a prismatic substrate 370", with the bezel portion 374" providing or establishing the curved transition between the front surface of the prismatic substrate and the side surface of the mirror casing, and with the rear of the overlapping bezel portion optionally being configured or shaped to correspond to and receive the beveled edge region of the prismatic substrate. Optionally, and with reference to FIG. 39, a thin bezel or cover portion 376 may partially overlap a perimeter region of the front surface of a prismatic substrate 370'", such as at a notch or recess 370b'" established at the front surface of the prismatic substrate and along the perimeter region of the front surface of the prismatic substrate (and with the recess 370b'" receiving the overlapping cover portion therein such that an outer surface 376a of the cover portion is generally flush with or generally coplanar with the front surface of the prismatic substrate).

[00178] Optionally, and with reference to FIG. 40, a thin flat bezel or cover element 377 may partially overlap a perimeter region of the front surface of the mirror substrate 317 (such as a front substrate of an electro-optic or electrochromic reflective element or such as a prismatic substrate of a prismatic reflective element). The bezel element 377 comprises a thin (such as about 0.4 mm thick or thereabouts) element that is curved to provide a curved or rounded outer perimeter region around the mirror substrate 317 (and may have a filler element or attaching element 378 disposed at the inner region of the curved element for attaching the bezel element to the mirror casing). The bezel element 377 may comprise a molded polymeric or plastic element or a stamped metallic material, or may be overmolded with selected features. The bezel element overlaps a perimeter region of the generally planar front surface of the mirror substrate (and may be adhered to the front surface of the mirror substrate) and (because of the thin or low profile of the bezel element) provides a nearly flush appearance to a person viewing the mirror assembly when the mirror assembly is normally mounted in a vehicle. Optionally, the flat or thin bezel element may be finished via any suitable manner to provide the desired appearance

and/or texture and/or reflectivity and/or the like at the bezel element and around the periphery of the mirror substrate.

[00179] Clearly, other shapes and configurations of the front substrate of an electrochromic reflective element or a prismatic substrate of a prismatic reflective element and/or a bezel or mirror casing or cover portion may be implemented to provide or establish the curved transition between the front surface of the front substrate or prismatic substrate and a side surface of the mirror casing, while remaining within the spirit and scope of the present invention (and such as by utilizing aspects of the mirror assemblies described in U.S. Des. Pat. Nos. D633,423; D633,019; D638,761 and/or D647,017, and/or PCT Application No. PCT/US2011/056295, filed Oct. 14, 2011 and published on Apr. 19, 2012 as International Publication No. WO 2012/051500, and/or PCT Application No. PCT/US2010/032017, filed Apr. 22, 2010 and published Oct. 28, 2010 as International Publication No. WO 2010/124064, and/or PCT Application No. PCT/US10/51741, filed Oct. 7, 2010 and published Apr. 14, 2011 as International Publication No. WO 2011/044312, which are all hereby incorporated herein by reference in their entireties). The reflective element may be disposed at and/or attached at the bezel or mirror casing or cover element via any suitable means, such as adhesive or snap together construction or molding of the bezel or casing or element at least partially at or over the perimeter regions of the reflective element.

[00180] Optionally, the reflective element (such as a reflective element having a curved or rounded or beveled front perimeter edge region, such as discussed above) may be truncated or cut and a portion of a bezel (such as a bezel or mirror casing portion having a similarly curved or rounded or beveled front perimeter region) may be disposed at the cut portion or portions of the reflective element, in order to provide a partially exposed bezel at the front of the reflective element. For example, and with reference to FIGS. 41A-42, a mirror assembly 380 includes a mirror reflective element 382 (such as an electrochromic mirror reflective element or prismatic mirror reflective element or the like) and a front mirror casing portion or bezel portion 384 that is partially exposed to a person viewing the front of the mirror (such as a driver of a vehicle viewing the mirror assembly when the mirror assembly is normally mounted in the vehicle) at side regions of the mirror reflective element and mirror assembly. In the illustrated embodiment, the mirror reflective element 382 has curved or rounded upper and lower front perimeter edge regions 382a, 382b and cut or non-rounded side regions 382c, while the front mirror casing portion or bezel portion

384 partially receives the reflective element therein and has side portions 384a that abut the side regions 382c of the mirror reflective element 382, with the side portions 384a having curved or rounded front perimeter edge regions 384b that are curved or rounded in a similar manner or shape or form as the upper and lower front perimeter edge regions 382a, 382b of mirror reflective element 382. Thus, the front surface 384c of the side bezel portion 384a is generally coplanar with the front surface 382d of the mirror reflective element at the side regions, and the curved perimeter edge regions 382a, 382b and 384b are substantially similar and have substantially similar profiles at the junction between the bezel portion and reflective element, so that the side bezel portions 384a generally correspond to the profile and surfaces of the reflective element at the cut side regions of the mirror reflective element. The front mirror casing portion or bezel portion may be attached at a rear mirror casing portion 386 (FIG. 41B) or the mirror casing and side bezel portions may be unitarily formed as a single unitary mirror casing.

[00181] Optionally, and as shown in FIGS. 41A-42, the bezel portion 384 may have a rear portion 384d that abuts against the rear surface of the reflective element (such as against a perimeter rear surface region of a front substrate of an electrochromic reflective element or such as against at least a perimeter rear surface region of a prismatic substrate of a prismatic reflective element), so as to partially receive the reflective element between the side bezel portions 384a of the bezel portion 384. The side bezel portions 384a (and/or the other portions of the bezel) may have a different appearance or colored or metallic appearance to contrast the mirror reflective element or to generally match the mirror reflective element, in order to provide the desired appearance for the mirror assembly. Optionally, the side bezel portions 384a (and optionally the rear bezel portion 384d) may have a metallic appearance or may be selectively colored (such as to customize the mirror reflective element for an individual's desire or taste or to generally match or contrast a vehicle trim/lighting color scheme or the like) to provide an enhanced aesthetic appearance for the mirror assembly. Optionally, one or more user inputs (such as touch sensors or buttons or switches or the like) may be disposed at the side bezel portions so that the user touches the side bezel portions to actuate or control one or more accessories and thus does not have to touch the mirror reflective element to actuate or control the accessory or accessories. Clearly, the mirror assembly may include other user inputs,

such as touch sensors at or behind the front substrate of the reflective element, such as discussed above.

[00182] Optionally, for example, a touch sensitive element for a mirror assembly of the present invention can be a capacitive type or a resistive type or an inductive type, such as are known in the touch panel arts, including such as disclosed in U.S. Pat. Nos. 3,798,370; 4,198,539; 4,661,655; 4,731,508; 4,822,957; 5,045,644; 6,001,486; 6,087,012; 6,627,918; 6,787,240 and/or 7,224,324, and U.S. patent applications, Ser. No. 09/946,228, filed Sep. 5, 2001 and published Mar. 14, 2002 as U.S. Pat. Publication No. US2002/0031622; and/or Ser. No. 10/744,522, filed Dec. 23, 2003 and published Jul. 15, 2004 as U.S. Pat. Publication No. US2004/0137240, and/or U.S. provisional application Ser. No. 60/244,577, filed Oct. 31, 2000, which are hereby incorporated herein by reference in their entireties. Also, the touch inputs of the present invention do not necessarily require physical contact between the driver's finger and touch sensitive element. Close approach of the driver's finger (or a stylus or other touch/proximity means) to the touch sensitive surface may suffice to achieve a touch input. This can thus be by non-contacting input or by contacting input by a variety of means such as thermal or pyro detection, capacitive or inductive detection, resistive sensing, electromagnetic disturbance sensing or the like. Optionally, a reading of the fingerprint of the person touching the mirror reflector can be taken to verify identity of the person and so authorize particular actions in response (such as turning on the vehicle ignition, such as to start the engine, conducting a remote banking transaction, identifying a person for the purpose of setting vehicle accessories such as seat position, mirror position, climate control, audio system controls, ride system, and the like to the particular setting preferred by that individual person such as is common in vehicle memory systems). The touch sensitive elements or user actuatable selector elements may be responsive to a change in at least one of heat, electrical capacitance, electrical inductance or electrical resistance or the like due to at least close approachment of a human finger, and the mirror assembly may include a plurality of display elements at a plurality of display locations, with a display element of the plurality of display elements being associated with a respective one of the touch sensitive elements. The display element may be selectively activated or backlit by activation of the respective touch sensitive element, and optionally display information desired by a user may be generated in response to the touch sensitive elements being actuated by the user, with such display information being displayed at or

near or above the display elements. The display location of the display element and the location of the respective touch sensitive element may be local one another or co-located such that a cognitive relationship between the display element and the respective touch sensitive element is established.

[00183] The user actuatable inputs of the present invention may be operable to control any of the accessories of or associated with the mirror assembly and/or accessory module or the like. Optionally, the mirror assembly and/or accessory module and/or console or the like may include other user inputs or actuating devices, without affecting the scope of the present invention. For example, the mirror assembly may include touch sensitive elements or touch sensors or proximity sensors, such as the types of touch sensitive elements described in U.S. Pat. Nos. 5,594,222; 6,001,486; 6,310,611; 6,320,282; 6,627,918; 7,224,324 and/or 7,253,723, which are hereby incorporated herein by reference in their entireties, or such as proximity sensors of the types described in U.S. Pat. Nos. 7,224,324; 7,249,860 and/or 7,446,924, and/or PCT Application No. PCT/US03/40611, filed Dec. 19, 2003 and published on Jul. 15, 2004 as PCT Publication No. WO 2004/058540 A2, which are hereby incorporated herein by reference in their entireties, or such as membrane type switches, such as described in U.S. Pat. No. 7,360,932, which is hereby incorporated herein by reference in its entirety, or such as detectors and the like, such as the types disclosed in U.S. Pat. Nos. 7,255,541; 6,504,531; 6,501,465; 6,492,980; 6,452,479; 6,437,258 and 6,369,804, which are hereby incorporated herein by reference in their entireties, and/or the like, while remaining within the spirit and scope of the present invention.

[00184] Thus, the mirror reflective element assembly may include icons or indicia and respective user inputs to indicate to the user the function or functions associated with the respective user inputs or touch pads or areas. The icons may be present and viewable and discernible all the time and/or may be backlit icons, and may be branded or colored by the telematics supplier. Optionally, the icons may be part of a video mirror with a video display screen disposed behind the reflective element (and with the icons displayed by the video display screen and viewable through the transflective mirror reflector of the video mirror reflective element assembly), or the icons may be dedicated icons created by transmissive holes or areas or windows, such as with backlighting at the icon and icon area. Optionally, for example, the icons may comprise one or more colored masks

disposed at the rear surface of the reflective element, with one or more white LEDs backlighting the colored mask to backlight the icons. Optionally, the icons may, when backlit, be viewable through the third surface transflective mirror reflector of the mirror reflective element, or the icons may be formed or established behind a hole or window created or formed at and through the third surface mirror reflector in front of where the icon is disposed, with a colored pattern or icon or indicia disposed at or formed or established at the fourth or rear surface of the reflective element and corresponding and/or coinciding with the hole formed at least partially through the third surface reflector, so the user may view through the hole or window and see the icon (which may be backlit or otherwise illuminated if desired). Optionally, a strip of icons or indicia may be disposed at the rear of the reflective element or a liquid crystal display (LCD) may be disposed at the rear of the reflective element to display the icons at the respective areas and at or near the respective user inputs or touch pads established at the perimeter band. The icons thus may be reconfigurable icons as part of a video display screen of a video mirror or may be fixed icons, such as backlit fixed icons established at the rear of the reflective element. The icons are formed or established or displayed at or near the respective user inputs or touch pads and thus are local to and cognitively associated with the respective user inputs or touch pads.

[00185] Optionally, the mirror assembly may include one or more other displays, such as the types disclosed in U.S. Pat. Nos. 5,530,240 and/or 6,329,925, which are hereby incorporated herein by reference in their entireties, and/or display-on-demand transflective type displays, such as the types disclosed in U.S. Pat. Nos. 7,855,755; 7,274,501; 7,255,451; 7,195,381; 7,184,190; 7,046,448; 5,668,663; 5,724,187 and/or 6,690,268, and/or in U.S. patent applications, Ser. No. 11/226,628, filed Sep. 14, 2005 and published Mar. 23, 2006 as U.S. Pat. Pub. No. US-2006-0061008; and/or Ser. No. 10/538,724, filed Jun. 13, 2005 and published Mar. 9, 2006 as U.S. Pat. Pub. No. US-2006-0050018, which are all hereby incorporated herein by reference in their entireties.

[00186] Optionally, the mirror assembly may include a perimeter lighting feature or ring that provides illumination (such as a low intensity illumination or glow) around the periphery of the reflective element (such as by utilizing aspects of the mirror assemblies described in U.S. patent application Ser. No. 13/644,593, filed Oct. 4, 2012, and published Apr. 11, 2013 as U.S. Publication No. US-2013-0088884, which is hereby incorporated herein by

reference in its entirety). For example, and with reference to FIGS. 43-45B, an interior rearview mirror assembly 410 for a vehicle includes a mirror casing or housing or shroud or cap or holder 412, a reflective element 414 positioned at a front portion of the mirror casing 412 and a lighting system or device 416 operable to provide illumination at and behind and generally around the periphery of the reflective element 414. Mirror assembly 410 is adjustably mounted to an interior portion of a vehicle (such as to an interior surface of a vehicle windshield or a headliner of a vehicle or the like) via any suitable mounting structure or mounting configuration or assembly, such as a single ball or pivot mounting configuration or a double ball or pivot mounting configuration or the like.

[00187] In the illustrated embodiment, the lighting device or system 416 comprises one or more illumination sources (such as two or more light emitting diodes (LEDs)) and a light directing element or light guiding element 418, 420 (such as a plastic or polymeric light pipe or light directing element). Optionally, and desirably, the light device 416 includes an illumination source at each side or side perimeter portion of the reflective element, such that individual activation of one of the illumination sources will illuminate the perimeter ring or portion of that particular side or periphery portion of the reflective element, while illumination or activation of both illumination sources will illuminate or provide illumination around the entire or substantially the entire periphery of the reflective element. The lighting device provides a rearward facing light element (facing rearward with respect to the vehicle when the mirror assembly is normally mounted in the vehicle) around the perimeter of the mirror reflective element that emits light around (and optionally through) the perimeter of the mirror glass of the interior rearview mirror assembly.

[00188] In the illustrated embodiment, the lighting device comprises a bezel portion that is disposed around the periphery of the front substrate of the reflective element and that overlaps or encompasses the front or first surface of the reflective element (which may be a prismatic or electrochromic reflective element or the like). The bezel portion or lighting device may be attached at the reflective element and/or the mirror casing via any suitable means, such as by adhering to the front surface of the reflective element (such as by utilizing aspects of the mirror assemblies described in U.S. Pat. No. 7,360,932, which is hereby incorporated herein by reference in its entirety), and/or such as by snapping or otherwise attaching to an open face of the mirror casing, such as utilizing aspects of the mirror assemblies described in U.S. patent application Ser. No. 13/644,593, filed Oct. 4,

2012, and published Apr. 11, 2013 as U.S. Publication No. US-2013-0088884, which is hereby incorporated herein by reference in its entirety. Thus, illumination provided by the lighting device illuminates the bezel portion or structure and is visible from both the sides and front of the mirror assembly so that both halves of the light ring are visible to the driver and passengers of the vehicle. Optionally, the light ring may be operable to emit different colors and/or may be intermittently operable or flashed, so as to use color codes and/or blinking to indicate to the driver certain warnings or statuses or the like. Optionally, the two halves or portions can be lit or illuminated independently to display side-specific warnings.

[00189] For example, the lighting device may comprise two separate light pipes and/or diffusers or the like (such as light pipes disposed along and within a thin perimeter bezel portion so that, when the illumination sources (which may be disposed at one of the ends of each of the light pipes) are activated, the illumination is provided along the respective bezel portion to provide a glow or illumination of the bezel portion). For example, The light ring or lighting strip or the like may each comprise a light pipe or light directing element having a translucent outer wall or surface, such that illumination directed along the lighting strip is viewable through the translucent wall of the lighting strip, whereby the lighting strip glows or is diffusely illuminated along the respective perimeter portion of the reflective element of the mirror assembly. The outer wall of the lighting strip may comprise a black plastic material (or may comprise any suitable or desired or selected color or material) so that, when the illumination sources are not activated, the lighting device appears to be similar to a normal or conventional bezel portion of a mirror assembly.

[00190] The two separate light pipes enable lighting each half of the mirror reflective element perimeter portion independently. Use of colored or color-changing lighting elements or blinking/flashing light may be used to indicate different statuses, such as vehicle or safety system statuses, such as indicators relating to blind zone monitoring (where one side of the mirror may be illuminated to indicate detection of an object at that side of the vehicle and at or approaching the blind zone at that side of the vehicle), reverse assist (where one or both sides of the mirror may be illuminated to indicate object detection during a reversing maneuver of the vehicle), lane departure (where one side of the mirror may be illuminated to indicate that it is not safe to change lanes to a side lane adjacent that side of the vehicle, such as responsive to the driver actuating a turn signal at that side of the vehicle), safety belt warning (where the driver or passenger side of the

mirror may be illuminated to indicate that the driver or passenger is not wearing their seatbelt), proximity alert (where one side of the mirror may be illuminated to indicate detection of an object at that side of the vehicle), parking assist (where one or both sides of the mirror may be illuminated to indicate detection of an object at the respective side of the vehicle during a parking maneuver of the vehicle), security alarm status (where one or both sides of the mirror may be illuminated to indicate that a security system is activated and/or to indicate detection of an intruder or the like). Optionally, the illumination source (such as a colored or variable colored light emitting diode or the like) may be adjusted to provide customization of colors, such as for a default state and for customizable warnings. Optionally, it is envisioned that the illumination source or sources may be operable responsive to a music or audio input or the like, whereby the illumination sources may provide a music-controlled mood lighting mode or the like.

[00191] The functional capabilities of the lighting device should meet the desired or required functional requirements of the OEM and any regulation requirements. The lighting device provides a means of illuminating the perimeter of the mirror reflective element of the interior rearview mirror assembly and allows for customized light colors. For example, the illumination feature may operate in conjunction with or corresponding to a selected custom color for the interior lighting of the vehicle (such as MYCOLOR® offered by Ford Motor Company), whereby the illumination color emitted by the illumination source or sources or lighting element of the interior rearview mirror assembly may be selected or customized by the user to a desired color or color combination. The colored illumination scheme may be selected to match the lighting scheme of the vehicle in which the mirror assembly is mounted or the owner of the vehicle may separately select a color scheme to customize or personalize the interior rearview mirror assembly (such as by utilizing aspects of the mirror assemblies described in U.S. Pat. Nos. 7,626,749; 7,255,451; 7,289,037, which are hereby incorporated herein by reference in their entireties).

[00192] Optionally, the lighting device may include an active dual blind zone monitoring device that provides a visual alert (by illuminating an appropriate side of the mirror) that is generally in the driver's forward field of view (and optionally the mirror assembly or alert system may provide an audible alert and/or tactile and/or haptic alert as well). Such a visual indication in the driver's forward field of view limits the need to look away from road. Optionally, the lighting device may function in conjunction with a reverse assist system.

For example, the lighting device may illuminate either or both sides of the mirror responsive to detection of an object rearward of the vehicle during a reversing maneuver. Such an alert may be in conjunction with a video display (and optional graphic overlays or alert highlighting) at the interior rearview mirror assembly that is operable to display video images captured by a rearward facing camera of the vehicle.

[00193] The lighting device of the present invention thus may include two lighting strips or light pipes or illumination elements disposed along the respective half or perimeter portion of the mirror reflective element. Each lighting strip 418, 420 is associated with a respective illumination source. The illumination sources may be disposed behind the reflective element (such as at a circuit element or circuit board of the mirror assembly) and may emit light that passes through the reflective element to an end region or receiving portion of the respective lighting strip. Optionally, the illumination sources may be disposed at the front of the reflective element (such as at a housing portion or cap portion 422 or 424 of the lighting device) and may emit light that at an end region or receiving portion of the respective lighting strip. In such a configuration, the lighting device may comprise a self-contained lighting device or unit that may be attached at the mirror assembly, such as during manufacture of the mirror assembly or optionally as an aftermarket device (where the lighting device may replace the mirror bezel or may be disposed over the mirror bezel or may provide a bezel to a frameless or bezelless mirror assembly). Power and/or control to the lighting device may be provided via any suitable means, such as via electrical connections of the types described in U.S. Pat. No. 7,360,932, which is hereby incorporated herein by reference in its entirety. Optionally, the lighting device may be connected to a power source and/or a control at the mirror assembly and optionally may be connected to a vehicle network bus or communication bus (such as a CAN bus or a LIN bus or the like) so that the lighting device may receive signals from or associated with other vehicle systems or the like, such as vehicle system status signals and/or the like).

[00194] The lighting device system 416 thus provides illumination at a perimeter region of the mirror assembly to provide circumferential or peripheral illumination at the reflective element and/or mirror casing for viewing by the driver of the vehicle. The illumination device or system is preferably operable to provide a low light level or intensity or "glow" at the periphery of the mirror assembly and in a desired or selected color to enhance the appearance of the mirror assembly. Optionally, the lower cap portion 422 of the lighting

device 416 may include additional illumination sources or indicators 422a, 422b (or may have apertures or windows or light transmitting portions that allow for illumination emanating from the respective light source to be viewable at the lower cap portion 422 when the light source or sources is/are activated) to provide further indicators at the mirror assembly.

[00195] Thus, light emitted by the illumination sources is directed by the respective light strip or light directing element 418, 420 along the respective perimeter edge region of the reflective element to provide a circumferential light ring about and around the reflective element 414 of the mirror assembly 410. Optionally, the light directing element or ring may be selectively operable or solely operable to only illuminate along a selected perimeter region (such as along a lower perimeter region, whereby the illumination provided by the light directing element may function as an interior accent / console light that would be less noticeable to the driver (so the driver would not directly view the light source, just the illumination below the mirror assembly, such as at the instrument panel or a center stack area or the like). Optionally, the light system and light strip or light directing element may include an icon or graphic or logo thereat (such as an icon or logo or graphic that is laser etched, soda-blasted or masked or otherwise established at a portion of the light strip or the end or cap portions of the lighting device), so that, when the illumination source or sources are activated, the icon or graphic or logo is viewable by and discernible to a person viewing the interior rearview mirror assembly.

[00196] Optionally, the mirror assembly may include a display device or module that is operable to display information through the reflective element, with the display device projecting or emitting light that is directed or reflected towards the rear of the reflective element so as to be viewable through the reflective element, such as by utilizing aspects of the mirror assemblies described in U.S. Pat. No. 7,046,448, which is hereby incorporated herein by reference in its entirety. For example, and with reference to FIG. 46, an interior rearview mirror assembly 440 may include a mirror casing 442 and a reflective element 444 (such as an electrochromic reflective element or prismatic reflective element or the like) and a display device 445. In the illustrated embodiment, display device 445 comprises a backlit display screen 445a (such as a LCM display screen) that, when backlit by a plurality of illumination sources (such as a plurality of light emitting diodes or the like) emits or projects illumination in a direction generally along or parallel to the rear surface of

the reflective element, whereby the emitted illumination is reflected towards the reflective element via an angled mirror element or reflecting element 445b. The mirror assembly may include a projection film or the like 445c, such as, for example, a VIKUITI® rear projection film or the like, disposed at the rear surface of the reflective element 444, such that reflected information or image that is reflected by the reflecting element 445b passes through the film 445c and through the reflective element 444 for viewing by the driver of the vehicle when the mirror assembly is normally mounted in the vehicle and when the driver is normally operating the vehicle and/or viewing the mirror assembly in the vehicle.

[00197] Optionally, and with reference to FIG. 47, an interior rearview mirror assembly 440' may include a mirror casing 442' and a reflective element 444' (such as an electrochromic reflective element or prismatic reflective element or the like) and a display device 445'. In the illustrated embodiment, display device 445' comprises a backlit display screen or projecting device or element 445a' (such as a LCM display screen) that, when backlit by a plurality of illumination sources (such as a plurality of light emitting diodes or the like) emits or projects illumination in a direction generally along or parallel to the rear surface of the reflective element, whereby the emitted illumination is reflected towards the reflective element via an angled mirror element or reflecting element 445b', and whereby the reflected images are focused via a lens or optic element 445d' to project the images towards the rear surface of the reflective element (where the reflective element 445b' and the optic element 445d' may be incorporated in a housing or casing at the output end of the projecting device 445a'). The mirror assembly may include a projection film or the like 445c', such as, for example, a VIKUITI® rear projection film or the like, disposed at the rear surface of the reflective element 444', such that reflected information or image that is reflected by the reflecting element 445b' and directed/focused via optic element 445d' passes through the film 445c' and through the reflective element 444' for viewing by the driver of the vehicle when the mirror assembly is normally mounted in the vehicle and when the driver is normally operating the vehicle and/or viewing the mirror assembly in the vehicle. Optionally, the projecting element and reflecting element and optic element and the like may be incorporated into a projector module 447', such as shown in FIG. 48, while remaining within the spirit and scope of the present invention.

[00198] Optionally, and with reference to FIG. 49, an interior rearview mirror assembly 440" may include a mirror casing 442" and a reflective element 444" (such as an electrochromic

reflective element or prismatic reflective element or the like) and a display device or projection module 445". In the illustrated embodiment, display device 445" comprises a backlit display screen or projecting device or element 445a" (such as a LCM display screen) that, when backlit by a plurality of illumination sources (such as a plurality of light emitting diodes or the like) emits or projects illumination in a direction generally towards the rear of the reflective element, whereby the projected images are focused via a lens or optic element 445d" to project/focus the images towards the rear surface of the reflective element (where the projecting element 445a" and the optic element 445d" may be incorporated in a housing or casing). The mirror assembly or projection module may include a projection film or the like 445c", such as, for example, a VIKUITI® rear projection film or the like, disposed at the rear surface of the reflective element 444", such that projected information or image that is directed/focused via optic element 445d" passes through the film 445c" and through the reflective element 444" for viewing by the driver of the vehicle when the mirror assembly is normally mounted in the vehicle and when the driver is normally operating the vehicle and/or viewing the mirror assembly in the vehicle.

[00199] The images projected towards and through the reflective element may comprise any suitable or desired size or shape or location, depending on the particular application of the mirror assembly and desired appearance of the display. For example, and with reference to FIGS. 50A-D, the images may be displayed through the reflective element 444 as a rectangular display or image 447a (FIG. 50A) at a side region or central region of the reflective element, or as a circular or oval display or image 447b, 447c (FIGS. 50B and 50C) at a central or side region of the reflective element, or as a trapezoid-shaped or non-rectangular-shaped display or image 447d (FIG. 50D) at a side or central region of the reflective element. The projection devices of the present invention allow for different sizes and shapes and locations of the displayed images at the reflective element, depending on the particular application of the display devices and mirror assemblies, and may allow for a smaller sized display device while providing a desired size for the displayed images.

[00200] Optionally, the mirror assembly or mirror mounting assembly or system may include an energy absorbing device or element to improve the safety of the interior rearview mirror assembly, such as on impact during a collision of the vehicle. The energy absorbing device functions to absorb energy on impact to reduce or substantially preclude or eliminate glass breakage of the interior mirror assembly during a vehicle collision or

sudden stop or impact. The energy absorbing device or element may comprise any suitable element that functions to absorb energy when there is an impact at the front of the rearview mirror assembly or at the reflective element of the rearview mirror assembly.

[00201] For example, and with reference to FIG. 51, an interior rearview mirror assembly 510 includes a reflective element 514 positioned at a front portion of a mirror housing or casing 512, and is adjustably mounted at an interior portion of a vehicle (such as to an interior surface of a vehicle windshield or a headliner of a vehicle or the like) via a mounting structure or mounting configuration or assembly 518. An energy absorbing device or element 520 is provided between the mounting configuration (or as part of the mounting configuration) and the mirror reflective element and the energy absorbing device functions to absorb energy when there is a sudden movement or acceleration of the reflective element relative to the interior portion of the vehicle at which the mirror assembly is attached (such as responsive to an impact with the reflective element of the mirror assembly by an object or occupant within the vehicle during a vehicle collision). The mirror assembly 510 may include a housing or backplate 522 and/or an anti-scatter tape or foam 524 that is disposed between the reflective element and the backplate, and may also include the rear mirror casing or mirror housing 512, depending on the particular application of the mirror assembly.

[00202] The energy absorbing device 520 may comprise any suitable device or element that functions to absorb energy during a sudden acceleration of the reflective element relative to the interior portion of the vehicle at which the mirror assembly is mounted. The energy absorbing device 520 may comprise a component of the mounting structure or may be incorporated in the mounting structure and/or mirror backplate and/or mirror housing. For example, and with reference to FIG. 52A, an energy absorbing device 528 may comprise a thin wall attachment plate 528a that has the ball stud or mirror mounting ball element 528b disposed thereat (for pivotally mounting the mirror head to a mirror mounting arm of the mounting structure), and that may have an energy absorbing material disposed in a cavity of the energy absorbing device to further enhance the absorbing of energy during an impact. Optionally, for example, and with reference to FIG. 52B, an energy absorbing device 530 may comprise an attachment plate 530a that has a ball stud or mirror mounting ball element 530b (and the plate may be overmolded over a portion of the ball stud), and that may include a thin shear plate 530c at the joint of the ball stud and attachment plate,

so that the shear plate may move or shear responsive to a threshold impact at the mirror reflective element or mirror head of the mirror assembly, so that the mounting structure shears before the mirror reflective element breaks. Optionally, for example, and with reference to FIG. 52C, an energy absorbing device 532 may comprise a ball stud 532b that is movably received in a housing 532a (such as a housing at a base or mirror mount that attaches the mirror assembly at the interior portion of the vehicle or such as a housing at an attachment plate or backplate that attaches at the rear of the mirror reflective element or the like), with an energy absorbing material 532c that limits movement of the ball stud relative to the housing and that absorbs energy as the ball stud is moved relative to the housing, such as responsive to a threshold impact at the mirror reflective element or mirror head of the mirror assembly. Optionally, for example, and with reference to FIG. 52D, an energy absorbing device 534 may comprise a mounting arm or tube 534a of the mounting structure (that may pivotally attach to a ball stud at one or both ends thereof). The mounting arm or tube 534a may comprise a collapsible feature (such as a collapsible material and/or creases or grooves or weakened areas 534b that facilitate crumpling or collapsing of the arm responsive to a threshold impact at the mirror reflective element or mirror head of the mirror assembly. Other means for absorbing energy during or responsive to a threshold impact at the mirror reflective element or mirror head of the mirror assembly may be implemented while remaining within the spirit and scope of the present invention.

[00203] Optionally, a breakaway ball stud (such as with two ball brackets) may be provided that is insert molded to the attachment plate or toggle, and the breakaway ball stud may include a feature that may shear during impact and collapse into the part, thereby absorbing some of the impact energy. Optionally, features to limit or prevent the ball from detaching from the mirror altogether may be also or otherwise included, such as a barb on the innermost end of the ball stud or the like.

[00204] Optionally, the mirror assembly may include a collapsible attachment plate or toggle, which provides a feature around the insert molded ball stud that may be made to collapse permanently during impact to absorb some impact energy. In such a construction, it may be beneficial to incorporate an impact absorbing material or foam, such as, for example, a Bayer Bayfill EA2204L material or the like. The foam may be used to fill the void created by a collapse zone, and the mirror construction may increase the

system stiffness by potentially casting the foam around the plastic collapse features, preferably while not degrading vibration stability or flex during adjustment, while still allow for the desired collapsing.

[00205] Optionally, the mirror assembly may include a breakaway screw mount, such as a special gib (or dovetail) design that is just as robust relative to force from the set screw, but has features designed to start a crack during impact. Thus, during impact, the gib cracks and the mirror fully detaches from the windshield. With such a construction, the mirror may detach from the windshield before the mirror glass cracks.

[00206] Optionally, a ball-in-socket type of mounting configuration may be used to provide a single or double pivot joint mounting assembly for pivotally or adjustably mounting the mirror assembly at an interior portion of a vehicle, such as at an in-cabin surface of a vehicle windshield. Typically, such a ball-in-socket type of mounting configuration includes a flat wire C-shaped ring which provides a compression spring for creating the adjustment torque. Optionally, it is envisioned that a standard coil spring may be used to provide the desired torque, but such a coil spring has a non-flat end surface where multiple coils are stacked, such as where the terminal ends of the coiled metal are stacked. Such stacking may require tooling changes as this makes the coiled spring taller overall than the flat wire spring. Thus, the present invention provides a "key ring" style spring (FIG. 52E) that solves this issue so that no tooling modifications are required, and makes the assembly more consistent because the equipment can now push on a flat surface at the ends of the spring.

[00207] Although shown and described as having a mounting structure (such as a single or double ball/pivot mounting structure) that attaches at the mirror head and protrudes from or through the rear of the mirror casing, it is envisioned that a mounting structure may attach elsewhere at the mirror head, such as at an upper region of the mirror head. For example, and with reference to FIG. 53, an interior rearview mirror assembly 550 comprises a mirror head 552 having a reflective element 554 positioned at a front portion of a mirror housing or casing 556, with the mirror head adjustably mounted at an interior portion of a vehicle (such as to an interior surface of a vehicle windshield or a headliner of a vehicle or the like) via a mounting structure or mounting configuration or assembly 558 that pivotally attaches the mirror head to the interior portion of a vehicle via attachment at an upper region 556a of the mirror casing. In the illustrated embodiment, the attachment element or ball stud or

pivot element 560 of the mirror head 552 is attached to or formed with the mirror casing 556 and protrudes generally upwardly therefrom, where it is pivotally received in a amounting arm or receiving element or pivot socket 558a to pivotally attach the mirror head to the mounting structure. By providing the pivot attachment at the upper region of the mirror casing (and exterior of the mirror casing), the mirror assembly may have additional room or space within the mirror casing for housing additional content, such as additional circuitry and/or accessories and/or the like. Optionally, the pivot attachment may protrude from and be exterior of other regions or portions of the mirror casing, while providing enhanced interior space within the mirror casing, while remaining within the spirit and scope of the present invention.

[00208] Thus, the mirror reflective element assembly may comprise an electro-optic (such as electrochromic) reflective element or a prismatic reflective element. After the reflective element is coated and assembled, the reflective element is typically inspected to make sure that the curvature of the glass is within appropriate tolerance levels and that the uniformity of the reflective coatings is within appropriate tolerance levels and, for electrochromic reflective elements that have two spaced apart and joined substrates, that the uniformity of the spatial relationship of the substrates is within appropriate tolerance levels. Optionally, an imaging sensor or camera (such as a pixelated imaging array or the like) can be used in inspecting the reflective element assemblies and determining whether or not they are within the desired or appropriate tolerances.

[00209] For example, and with reference to FIGS. 54 and 55, an inspection system 570 may include an imaging sensor or camera 572, which may be used with an array or matrix of illumination sources or lighted points or spots 574 on a grid board 576, whereby a reflective element 578 may be positioned in front of the grid board 576 (with the camera 572 disposed at a generally central region of the grid board). For example, the reflective element may be fixedly supported at a fixture or the like to position each reflective element at a substantially precise or known distance and location relative to the fixed camera and lighted or backlit grid board. When the points or spots or dots on the grid board are illuminated or backlit, the illumination points are reflected by the fixtured reflective element and the reflected image is captured by the camera 572. An exemplary captured image 580 is shown in FIG. 55, showing an image of the reflective element and the reflected grid of light spots or dots.

[00210] An image processor is operable to process images captured by the camera to determine whether or not the reflected image of the light pattern or grid is within the desired or appropriate tolerance levels (such as by comparing a position of each reflected light dot in the captured image with an expected position for the respective light dots as reflected by an acceptable or substantially flawless mirror). For example, the reflected image is processed and analyzed for distortion and spatial relationship to determine the flatness and matching of the two substrates of an electrochromic reflective element assembly. The inspection method or system of the present invention thus provides enhanced detection of even minor imperfections or irregularities and can detect slight changes or differences between the reflective elements by processing and analyzing the reflected light grid. When one or more of the light dots in the captured reflected image is/are not where it should be in the captured reflected image, the system can detect such an irregularity and determine if it is within or outside of a desired quality tolerance level.

[00211] Thus, the mirror reflective element assembly may comprise an electro-optic reflective element assembly, such as an electrochromic reflective element assembly, with a frameless construction. The reflective element assembly may provide a low profile reflective element assembly, with a 6 mm perimeter band (such as a chrome band or the like) disposed around its periphery, and with the band being wider or waisted at the user input or touch zone or area (and with an aperture or window established therethrough at the touch input zone or area). The reflective element may utilize aspects of the mirror assemblies disclosed in U.S. Pat. Nos. 7,224,324 and/or 7,110,156, and/or U.S. Des. Pat. Nos. D493,131 and/or D493,394, which are all hereby incorporated herein by reference in their entireties. The telematics icons or indicia or graphics (or other icons or indicia depending on the particular application of the mirror assembly) may be displayed or viewable to a person viewing the reflective element assembly when the reflective element assembly is normally mounted in the vehicle. Optionally, for example, the icons may be displayed or backlit so as to have a brightness or intensity of at least about 1500 cd/m^2 during daytime or higher ambient lighting conditions and/or at least about 80 cd/m^2 during nighttime or lower ambient lighting conditions (such as responsive to a photosensor or the like at the mirror assembly). The user input indicators or individual touch pads may be established at an appliqué disposed to the rear of the reflective element assembly, and may be backlit by one or more white LEDs or the like, with a target intensity or brightness

of at least about 5 cd/m^2 fixed brightness (such as for night viewing, whereby the low intensity backlighting of the individual touch pads may be washed out or partially washed out during daytime lighting conditions).

[00212] The mirror assembly of the present invention may be mounted at or to the interior portion of the vehicle (such as to an in-cabin surface of the vehicle windshield) via any suitable mounting means, such as a single ball mounting configuration or double ball mounting configuration. The electrical connection of the mirror circuitry to circuitry or wiring of the vehicle may be via any suitable electrical connection. For example, a standard CCC 10 pin harness connection may be made at the circuitry of the mirror assembly when the mirror assembly is normally mounted in the vehicle. Optionally, a single printed circuit board may be disposed at the rear of the reflective element and may include the capacitive switches or sensors and the backlighting LEDs for the icons and/or other circuitry associated with the user inputs and features / functions. Optionally, the mirror assembly may include a fault indicator or alert indicator (such as a red LED or the like and such as disposed at or between the icons) to indicate to the user when an error or fault is detected in the telematics system or user input or touch system. Optionally, the telematics system and mirror reflective element assembly may provide an indication that the system is functioning properly, such as via a green LED or the like at or near the icons. Optionally, when a user touches an individual touch pad to activate one of the user inputs or touch sensors, the green LED may flash to confirm actuation of that user input. Optionally, the system may provide a delay in activating or controlling the selected feature of the touched individual touch pad to ensure that a proper touch was made by the user. Optionally, the telematics input lines may be fed to a microcontroller or control circuit while the LEDs are powered via a separate high current power supply. The green LED and the red LED or fault indicator may be viewable at or through the same aperture or window (such as a window established between two adjacent touch sensors, such as shown in FIG. 21).

[00213] Optionally, the mirror assembly may include a display device, such as a video display screen, disposed behind the mirror reflective element and viewable, when activated, through the mirror reflector and reflective element by the driver of the vehicle when the driver is normally operating the vehicle. The display screen may be operable to display video images, such as images captured by one or more cameras of the vehicle,

such as video images captured by a rear backup camera of vehicle, whereby the rearward images are displayed for viewing by the driver of the vehicle during a reversing maneuver. The display screen may display other images from one or more other cameras, and/or may display information or the like, for viewing by the driver or occupant of the vehicle.

[00214] Optionally, the display device or display screen or system may be in communication with an on-board diagnostics system of the vehicle (such as via a wire connection to the diagnostics system or port or via a wireless communication associated with the diagnostics system), whereby the display screen may display vehicle system information or status or accessory information or status or the like. For example, the display screen or system may be operable to display real time engine data, such as coolant temperature, oil pressure, engine RPMs, mass air flow rate, intake manifold pressure, throttle position, combustion mixture, engine component operation and status, battery voltage, battery and charging system information, climate control information and/or the like. The displayed information may be reconfigurable or selectable, and may be configured or selected by the driver to display the desired vehicle status or features, in order to provide the driver with information of interest to the driver and to not provide the driver with information that is not of interest or is of less interest to the driver. Optionally, the display screen or system may be operable to display various driving parameters or features to assist the driver in knowing how economically the driver is driving and to assist the driver in improving the fuel economy of the vehicle by adjusting his or her driving habits. For example, the display screen or system may provide a driving score based on acceleration, braking and speed variations to help the driver drive the vehicle in the most economic way for that particular vehicle and/or driving conditions. The display screen or system may also or otherwise provide average fuel economy data, fuel consumption data, trip/odometer data and/or the like, such as may be provided by conventional vehicle-based trip computers. Optionally, the display screen or system may be operable to display fault conditions or status reports on various vehicle systems or accessories, and may be operable to decode diagnostic engine trouble or fault codes so that the user can, for example, see why the "check engine" light or warning was activated, and may allow the user to reset the warning light or alert if desired or appropriate. Optionally, the display screen or system may provide other information or images pertaining to various vehicle accessories or systems, and may be adjusted or reconfigured by the driver or user to display selected features.

[00215] The video display screen device or module of the mirror assembly or display system of the present invention may comprise any suitable type of video screen and is operable to display images in response to an input or signal from a control or imaging system. For example, the video display screen may comprise a multi-pixel liquid crystal module (LCM) or liquid crystal video display (LCD), preferably a thin film transistor (TFT) multi-pixel liquid crystal video display (such as discussed below), or the video screen may comprise a multi-pixel organic electroluminescent video display or a multi-pixel light emitting diode (LED) video display, such as an organic light emitting diode (OLED) or inorganic light emitting video diode display or the like, or an electroluminescent (EL) video display or the like. For example, the video display screen may comprise a video screen of the types disclosed in U.S. Pat. Nos. 7,855,755; 7,734,392; 7,370,983; 7,338,177; 7,274,501; 7,255,451; 7,195,381; 7,184,190; 6,902,284; 6,690,268; 6,428,172; 6,420,975; 5,668,663; 5,724,187; 5,416,313; 5,285,060; 5,193,029 and/or 4,793,690, and/or U.S. patent applications, Ser. No. 13/023,750, filed Feb. 9, 2011, now U.S. Pat. No. 8,890,955; Ser. No. 10/538,724, filed Jun. 13, 2005 and published Mar. 9, 2006 as U.S. Pat. Pub. No. US-2006-0050018; Ser. No. 11/226,628, filed Sep. 14, 2005 and published Mar. 23, 2006 as U.S. Pat. Pub. No. US-2006-0061008; Ser. No. 12/091,525, filed Apr. 25, 2008 and published Jan. 15, 2009 as U.S. Pat. Pub. No. US-2009-0015736; Ser. No. 12/091,525, filed Apr. 25, 2008 and published Jan. 15, 2009 as U.S. Pat. Pub. No. US-2009-0015736; Ser. No. 12/578,732, filed Oct. 14, 2009 and published Apr. 22, 2010 as U.S. Pat. Pub. No. US-2010-0097469; Ser. No. 09/585,379, filed Jun. 1, 2000, now abandoned; and/or Ser. No. 10/207,291, filed Jul. 29, 2002, now abandoned, and/or PCT Application No. PCT/US10/47256, filed Aug. 31, 2010, which are all hereby incorporated herein by reference in their entireties.

[00216] Optionally, the mirror assembly and/or prismatic or electrochromic reflective element may include one or more displays, such as for the accessories or circuitry described herein. The displays may be of types disclosed in U.S. Pat. Nos. 5,530,240 and/or 6,329,925, which are hereby incorporated herein by reference in their entireties, and/or may be display-on-demand or transflective type displays, such as the types disclosed in U.S. Pat. Nos. 7,338,177; 7,274,501; 7,195,381; 6,690,298; 5,668,663 and/or 5,724,187, and/or in U.S. patent applications, Ser. No. 11/226,628, filed Sep. 14, 2005 and published Mar. 23, 2006 as U.S. Pat. Pub. No. US-2006-0061008; and/or Ser. No.

12/091,525, filed Jul. 15, 2008 and published Jan. 15, 2009 as U.S. Pat. Pub. No. US-2009-0015736, which are all hereby incorporated herein by reference in their entireties. Optionally, the prismatic reflective element may comprise a display on demand or transflective prismatic element (such as described in U.S. Pat. Nos. 7,274,501 and/or 7,338,177, which are hereby incorporated herein by reference in their entireties) so that the displays are viewable through the reflective element, while the display area still functions to substantially reflect light, in order to provide a generally uniform prismatic reflective element even in the areas that have display elements positioned behind the reflective element.

[00217] The video display screen may be controlled or operable in response to an input or signal, such as a signal received from one or more cameras or image sensors of the vehicle, such as a video camera or sensor, such as a CMOS imaging array sensor, a CCD sensor or the like, such as the types disclosed in U.S. Pat. Nos. 5,550,677; 5,760,962; 6,396,397; 6,097,023; 5,877,897 and 5,796,094, and/or U.S. patent application Ser. No. 10/534,632, filed May 11, 2005 and published Aug. 3, 2006 as U.S. Pat. Pub. No. US-2006-0171704, which are hereby incorporated herein by reference in their entireties, or from one or more imaging systems of the vehicle, such as a reverse or backup aid system, such as a rearwardly directed vehicle vision system utilizing principles disclosed in U.S. Pat. Nos. 5,550,677; 5,760,962; 5,670,935; 6,201,642; 6,396,397; 6,498,620; 6,717,610 and/or 6,757,109, which are hereby incorporated herein by reference in their entireties, a trailer hitching aid or tow check system, such as the type disclosed in U.S. Pat. No. 7,005,974, which is hereby incorporated herein by reference in its entirety, a cabin viewing or monitoring device or system, such as a baby viewing or rear seat viewing camera or device or system or the like, such as disclosed in U.S. Pat. Nos. 5,877,897 and/or 6,690,268, which are hereby incorporated herein by reference in their entireties, a video communication device or system, such as disclosed in U.S. Pat. No. 6,690,268, which is hereby incorporated herein by reference in its entirety, and/or the like. The imaging sensor or camera may be activated and the display screen may be activated in response to the vehicle shifting into reverse, such that the display screen is viewable by the driver and is displaying an image of the rearward scene while the driver is reversing the vehicle.

[00218] Optionally, a rear camera, such as a rear backup video camera/imager or the like (such as a camera and system of the types described in U.S. Pat. Nos. 5,550,677;

5,670,935; 6,498,620; 6,222,447 and/or 5,949,331, which are hereby incorporated herein by reference in their entireties), may be disposed at the vehicle and may have a rearward field of view rearward of the vehicle for capturing images rearward of the vehicle such as for driver assistance during a reversing maneuver of the vehicle or the like. Because such a rear camera has a rearward field of view, the rearward facing camera may be operable to capture images of rearwardly approaching or following vehicles that are behind the vehicle equipped with the rearward facing camera when the vehicle so equipped is driving forwardly along the road or highway. It is envisioned that an image processor or controller (such as an EyeQ™ image processing chip available from Mobileye Vision Technologies Ltd. of Jerusalem, Israel, and such as an image processor of the types described in PCT Application No. PCT/US10/25545, filed Feb. 25, 2010 and published Sep. 2, 2010 as International Pub. No. WO/2010/099416, which is hereby incorporated herein by reference in its entirety) may process image data captured by the rearward facing camera to assess glare lighting conditions (such as to detect headlights of following vehicles that may cause glare at the interior and/or exterior rearview mirror assemblies of the equipped vehicle), and the controller may adjust or control the dimming of the electro-optic mirror assembly or assemblies of the equipped vehicle responsive to such image processing. Using principles of the systems described in U.S. Pat. No. 5,550,677, which is hereby incorporated herein by reference in its entirety, the system may operate to independently control any one or more of the interior rearview mirror assembly and the exterior rearview mirror assemblies of the equipped vehicle, such as based on the intensity and location of glare light detected by the camera and image processor. Such a rear reversing or backup camera and controller can also operate to detect the ambient light level present at the vehicle and may adjust the dimming of the mirror system accordingly, and/or may adjust other displays, lighting and/or accessories of the vehicle in accordance with and responsive to the ambient light detection by the rear backup camera (or by other cameras on the vehicle that view exterior to the vehicle). Such glare detection and ambient light detection and image processing of image data captured by a rear backup assist camera of the vehicle may obviate the need for a separate glare sensor elsewhere at the vehicle, such as at or in the interior rearview mirror assembly of the vehicle or the like. Such image processing and such a mirror control system may utilize aspects of the imaging systems described in U.S. Pat. Nos. 5,550,677; 5,670,935; 5,760,962; 6,201,642; 6,396,397; 6,498,620; 6,097,023;

5,877,897 and 5,796,094, which are hereby incorporated herein by reference in their entireties.

[00219] Optionally, the mirror assembly may include other electrically operated or powered accessories, such as a compass sensor and compass display. Such a compass sensor and circuitry for the compass system that detects and displays the vehicle directional heading to a driver of the vehicle may comprise any suitable compass sensor and/or circuitry, such as a compass system and compass circuitry that utilizes aspects of the compass systems described in U.S. Pat. Nos. 7,370,983; 7,329,013; 7,289,037; 7,249,860; 7,004,593; 6,928,366; 6,642,851; 6,140,933; 4,546,551; 5,699,044; 4,953,305; 5,576,687; 5,632,092; 5,677,851; 5,708,410; 5,737,226; 5,802,727; 5,878,370; 6,087,953; 6,173,508; 6,222,460 and/or 6,513,252, and/or European patent application, published Oct. 11, 2000 under Publication No. EP 0 1043566, and/or U.S. patent application Ser. No. 11/226,628, filed Sep. 14, 2005 and published Mar. 23, 2006 as U.S. Pat. Pub. No. US-2006-0061008, which are all hereby incorporated herein by reference in their entireties. The compass circuitry may include compass sensors, such as a magneto-responsive sensor, such as a magneto-resistive sensor, a magneto-capacitive sensor, a Hall sensor, a magneto-inductive sensor, a flux-gate sensor or the like. The compass sensor may be incorporated in or associated with a compass system and/or display system for displaying a directional heading of the vehicle to the driver, such as a compass system of the types described in U.S. Pat. Nos. 7,289,037; 5,924,212; 4,862,594; 4,937,945; 5,131,154; 5,255,442; 5,632,092 and/or 7,004,593, which are all hereby incorporated herein by reference in their entireties. Optionally, an integrated automotive "compass-on-a-chip" may be disposed in a cavity of the mounting base of the mirror (or within the mirror housing or in an attachment to the mirror mount or elsewhere within the mirror assembly such as to the rear of the video screen or to the rear of the mirror reflective element) and may comprise at least two sensor elements (such as magneto-responsive sensor elements, or a Hall effect sensor or multiple Hall effect sensors), associated A/D and D/A converters, associated microprocessor(s) and memory, associated signal processing and filtering, associated display driver and associated LIN/CAN BUS interface and the like, all (or a sub-set thereof) created or disposed or commonly established onto a semiconductor chip surface/substrate or silicon substrate, such as utilizing CMOS technology and/or fabrication techniques as known in the semiconductor manufacturing arts, and constituting

an application specific integrated chip ("ASIC"), such as utilizing principles described in U.S. Pat. Nos. 7,815,326; 7,004,593; 7,329,013 and/or 7,370,983, and/or U.S. patent application Ser. No. 11/226,628, filed Sep. 14, 2005 and published Mar. 23, 2006 as U.S. Pat. Pub. No. US-2006-0061008, which are hereby incorporated herein by reference in their entireties, and/or such as by utilizing aspects of an EC driver-on-a-chip such as described in U.S. Pat. No. 7,480,149, which is hereby incorporated herein by reference in its entirety.

[00220] As discussed above, the mirror assembly may comprise an electro-optic or electrochromic mirror assembly that includes an electro-optic or electrochromic reflective element. The perimeter edges of the reflective element may be encased or encompassed by the perimeter element or portion of the bezel portion to conceal and contain and envelop the perimeter edges of the substrates and the perimeter seal disposed therebetween. The electrochromic mirror element of the electrochromic mirror assembly may utilize the principles disclosed in commonly assigned U.S. Pat. Nos. 7,274,501; 7,255,451; 7,195,381; 7,184,190; 6,690,268; 5,140,455; 5,151,816; 6,178,034; 6,154,306; 6,002,544; 5,567,360; 5,525,264; 5,610,756; 5,406,414; 5,253,109; 5,076,673; 5,073,012; 5,117,346; 5,724,187; 5,668,663; 5,910,854; 5,142,407 and/or 4,712,879, and/or PCT Application No. PCT/US2010/029173, filed Mar. 30, 2010, which are hereby incorporated herein by reference in their entireties, and/or as disclosed in the following publications: N. R. Lynam, "Electrochromic Automotive Day/Night Mirrors", SAE Technical Paper Series 870636 (1987); N. R. Lynam, "Smart Windows for Automobiles", SAE Technical Paper Series 900419 (1990); N. R. Lynam and A. Agrawal, "Automotive Applications of Chromogenic Materials", Large Area Chromogenics: Materials and Devices for Transmittance Control, C.M. Lampert and C.G. Granquist, EDS., Optical Engineering Press, Wash. (1990), which are hereby incorporated by reference herein in their entireties; and/or as described in U.S. Pat. No. 7,195,381, which is hereby incorporated herein by reference in its entirety. The thicknesses and materials of the coatings on the substrates, such as on the third surface of the reflective element assembly, may be selected to provide a desired color or tint to the mirror reflective element, such as a blue colored reflector, such as is known in the art and such as described in U.S. Pat. Nos. 5,910,854; 6,420,036 and/or 7,274,501, which are all hereby incorporated herein by reference in their entireties. Optionally, the electrochromic circuitry and/or a glare sensor (such as a rearward facing

glare sensor that receives light from rearward of the mirror assembly and vehicle through a port or opening along the casing and/or reflective element of the mirror assembly) and circuitry and/or an ambient light sensor and circuitry may be provided on one or more circuit boards of the mirror assembly.

[00221] Optionally, it is envisioned that aspects of the present invention may be suitable for an interior rearview mirror assembly that comprises a prismatic mirror assembly or a non-electro-optic mirror assembly (such as a generally planar or optionally slightly curved mirror substrate) or an electro-optic or electrochromic mirror assembly. For example, the interior rearview mirror assembly may comprise a prismatic mirror assembly, such as the types described in U.S. Pat. Nos. 7,289,037; 7,249,860; 6,318,870; 6,598,980; 5,327,288; 4,948,242; 4,826,289; 4,436,371 and 4,435,042, which are hereby incorporated herein by reference in their entireties. Optionally, the prismatic reflective element may comprise a conventional prismatic reflective element or prism or may comprise a prismatic reflective element of the types described in U.S. Pat. Nos. 7,420,756; 7,289,037; 7,274,501; 7,249,860; 7,338,177 and/or 7,255,451, which are all hereby incorporated herein by reference in their entireties, without affecting the scope of the present invention. A variety of mirror accessories and constructions are known in the art, such as those disclosed in U.S. Pat. Nos. 5,555,136; 5,582,383; 5,680,263; 5,984,482; 6,227,675; 6,229,319 and 6,315,421 (which are hereby incorporated herein by reference in their entireties), that can benefit from the present invention.

[00222] Optionally, any and/or all of the electrically powered accessories of the vehicle may be powered via the power source of the vehicle and may be connected to a control and/or the power source when the mirror assembly is installed in the vehicle (such as via electrical connection to a vehicle wiring harness or the like). Optionally, the mirror assembly may include a battery or independent power source for powering one or more of its electrical accessories. Optionally, the mirror assembly may include one or more ultrathin battery. Such an ultrathin battery may be very thin and can be readily packaged within the mirror head (such as a rechargeable, about 0.3 mm thick, Organic Radical Battery (ORB), which is a flexible ultrathin battery that can be recharged quickly, and which is being developed by NEC Corp. of Tokyo, Japan). Such an ultrathin battery may be useful to, for example, refresh a video screen display as a supplement to the vehicle power, and/or may power the EC/LCD dimming of the mirror reflective element and/or the

like. The battery may be readily packaged within the mirror head and can be recharged via the vehicle power source.

[00223] Optionally, the reflective element may includes an opaque or substantially opaque or hiding perimeter layer or coating or band disposed around a perimeter edge region of the front substrate (such as at a perimeter region of the rear or second surface of the front substrate) to conceal or hide or the perimeter seal from viewing by the driver of the vehicle when the mirror assembly is normally mounted in the vehicle. Such a hiding layer or perimeter band may be reflective or not reflective and may utilize aspects of the perimeter bands and mirror assemblies described in U.S. Pat. Nos. 5,066,112; 7,626,749; 7,274,501; 7,184,190 and/or 7,255,451, and/or PCT Application No. PCT/US2010/032017, filed Apr. 22, 2010 and published Oct. 28, 2010 as International Publication No. WO 2010/124064, and/or PCT Application No. PCT/US10/51741, filed Oct. 7, 2010 and published Apr. 14, 2011 as International Publication No. WO 2011/044312, and/or U.S. pat. application Ser. No. 11/226,628, filed Sep. 14, 2005 and published Mar. 23, 2006 as U.S. Pat. Pub. No. US-2006-0061008, which are all hereby incorporated herein by reference in their entireties. Optionally, the perimeter band may comprise a chrome/chromium coating or metallic coating and/or may comprise a chrome/chromium or metallic coating that has a reduced reflectance, such as by using an oxidized chrome coating or chromium oxide coating or "black chrome" coating or the like (such as by utilizing aspects of the mirror assemblies described in U.S. Pat. No. 7,184,190 and/or 7,255,451, which are hereby incorporated herein by reference in their entireties). Optionally, other opaque or substantially opaque coatings or bands may be implemented while remaining within the spirit and scope of the present invention.

[00224] The interior rearview mirror assembly may include a casing, such as described above, or the mirror assembly may comprise or utilize aspects of other types of casings or the like, such as described in U.S. Pat. Nos. 7,338,177; 7,289,037; 7,249,860; 6,439,755; 4,826,289 and 6,501,387, which are all hereby incorporated herein by reference in their entireties, without affecting the scope of the present invention. For example, the mirror assembly may utilize aspects of the flush or frameless or bezelless reflective elements described in U.S. Pat. Nos. 7,626,749; 7,360,932; 7,289,037; 7,255,451; 7,274,501 and/or 7,184,190, and/or in U.S. patent applications, Ser. No. 11/226,628, filed Sep. 14, 2005 and published Mar. 23, 2006 as U.S. Pat. Pub. No. US-2006-0061008; and/or Ser. No.

10/538,724, filed Jun. 13, 2005 and published Mar. 9, 2006 as U.S. Pat. Pub. No. US-2006-0050018, which are all hereby incorporated herein by reference in their entireties.

[00225] Optionally, the mirror assembly may comprise a modular mirror construction, and may include back housing portions or the like, such as cap portions of the types described in U.S. Pat. No. 7,289,037, which is hereby incorporated herein by reference in its entirety. A display screen may be provided as a modular display screen and may be mountable or installable in the appropriate or suitable mirror casing to provide a modular mirror assembly and display screen. For example, a rear casing or cap portion may include the display screen module including the associated components, such as the rails and motor and the like for a video slideout module (such as by utilizing aspects of the video mirrors described in U.S. Pat. Nos. 7,370,983 and 6,690,268, and/or U.S. patent applications, Ser. No. 10/538,724, filed Jun. 13, 2005 and published Mar. 9, 2006 as U.S. Pat. Pub. No. US-2006-0050018; and/or Ser. No. 12/091,525, filed Apr. 25, 2008 and published Jan. 15, 2009 as U.S. Pat. Pub. No. US-2009-0015736, which are hereby incorporated herein by reference in their entireties), and may be attachable to a reflective element and/or mirror casing to assemble the modular mirror assembly. The display screen module thus may be provided as an optional component or accessory for a vehicle, and may be readily assembled to a common reflective element and/or mirror casing of the mirror assembly.

[00226] Optionally, the mirror casing and/or reflective element may include customized or personalized viewable characteristics, such as color or symbols or indicia selected by the vehicle manufacturer or owner of the vehicle, such as the customization characteristics described in U.S. Pat. Nos. 7,626,749; 7,255,451; 7,289,037, which are hereby incorporated herein by reference in their entireties.

[00227] Optionally, the mirror assembly and/or any associated user inputs may be associated with various accessories or systems, such as, for example, a tire pressure monitoring system or a passenger air bag status or a garage door opening system or a telematics system or any other accessory or system of the mirror assembly or of the vehicle or of an accessory module or console of the vehicle, such as an accessory module or console of the types described in U.S. Pat. Nos. 7,289,037; 6,877,888; 6,824,281; 6,690,268; 6,672,744; 6,386,742 and/or 6,124,886, and/or U.S. patent application Ser. No. 10/538,724, filed Jun. 13, 2005 and published Mar. 9, 2006 as U.S. Pat. Pub. No. US-2006-0050018, which are hereby incorporated herein by reference in their entireties.

[00228] Optionally, the user inputs or buttons may comprise user inputs for a garage door opening system, such as a vehicle based garage door opening system of the types described in U.S. Pat. Nos. 6,396,408; 6,362,771; 7,023,322 and/or 5,798,688, which are hereby incorporated herein by reference in their entireties. The user inputs may also or otherwise function to activate and deactivate a display or function or accessory, and/or may activate/deactivate and/or commence a calibration of a compass system of the mirror assembly and/or vehicle. The compass system may include compass sensors and circuitry within the mirror assembly or within a compass pod or module at or near or associated with the mirror assembly. Optionally, the user inputs may also or otherwise comprise user inputs for a telematics system of the vehicle, such as, for example, an ONSTAR® system as found in General Motors vehicles and/or such as described in U.S. Pat. Nos. 4,862,594; 4,937,945; 5,131,154; 5,255,442; 5,632,092; 5,798,688; 5,971,552; 5,924,212; 6,243,003; 6,278,377; 6,420,975; 6,477,464; 6,946,978; 7,308,341; 7,167,796; 7,004,593; 7,657,052 and/or 6,678,614, and/or U.S. pat. application Ser. No. 10/538,724, filed Jun. 13, 2005 and published Mar. 9, 2006 as U.S. Pat. Pub. No. US-2006-0050018, which are all hereby incorporated herein by reference in their entireties.

[00229] Optionally, the mirror assembly may include one or more other accessories at or within the mirror casing, such as one or more electrical or electronic devices or accessories, such as antennas, including global positioning system (GPS) or cellular phone antennas, such as disclosed in U.S. Pat. No. 5,971,552, a communication module, such as disclosed in U.S. Pat. No. 5,798,688, a blind spot detection system, such as disclosed in U.S. Pat. Nos. 5,929,786 and/or 5,786,772, transmitters and/or receivers, such as a garage door opener or the like, a digital network, such as described in U.S. Pat. No. 5,798,575, a high/low headlamp controller, such as disclosed in U.S. Pat. Nos. 5,796,094 and/or 5,715,093, a memory mirror system, such as disclosed in U.S. Pat. No. 5,796,176, a hands-free phone attachment, a video device for internal cabin surveillance and/or video telephone function, such as disclosed in U.S. Pat. Nos. 5,760,962 and/or 5,877,897, a remote keyless entry receiver, lights, such as map reading lights or one or more other lights or illumination sources, such as disclosed in U.S. Pat. Nos. 6,690,268; 5,938,321; 5,813,745; 5,820,245; 5,673,994; 5,649,756; 5,178,448; 5,671,996; 4,646,210; 4,733,336; 4,807,096; 6,042,253; 5,669,698; 7,195,381; 6,971,775 and/or 7,249,860, microphones, such as disclosed in U.S. Pat. Nos. 7,657,052; 6,243,003; 6,278,377 and/or

6,420,975, speakers, antennas, including global positioning system (GPS) or cellular phone antennas, such as disclosed in U.S. Pat. No. 5,971,552, a communication module, such as disclosed in U.S. Pat. No. 5,798,688, a voice recorder, a blind spot detection system, such as disclosed in U.S. Pat. Nos. 7,720,580; 7,038,577; 6,882,287; 5,929,786 and/or 5,786,772, transmitters and/or receivers, such as for a garage door opener or a vehicle door unlocking system or the like (such as a remote keyless entry system), a digital network, such as described in U.S. Pat. No. 5,798,575, a high/low headlamp controller, such as a camera-based headlamp control, such as disclosed in U.S. Pat. Nos. 5,796,094 and/or 5,715,093, a memory mirror system, such as disclosed in U.S. Pat. No. 5,796,176, a hands-free phone attachment, an imaging system or components or circuitry or display thereof, such as an imaging and/or display system of the types described in U.S. Pat. Nos. 7,400,435; 7,526,103; 6,690,268 and/or 6,847,487, and/or U.S. patent application Ser. No. 11/239,980, filed Sep. 30, 2005 and published Jun. 15, 2006 as U.S. Pat. Pub. No. US-2006-0125919, a video device for internal cabin surveillance (such as for sleep detection or driver drowsiness detection or the like) and/or video telephone function, such as disclosed in U.S. Pat. Nos. 5,760,962 and/or 5,877,897, a remote keyless entry receiver, a seat occupancy detector, a remote starter control, a yaw sensor, a clock, a carbon monoxide detector, status displays, such as displays that display a status of a door of the vehicle, a transmission selection (4wd/2wd or traction control (TCS) or the like), an antilock braking system, a road condition (that may warn the driver of icy road conditions) and/or the like, a trip computer, a tire pressure monitoring system (TPMS) receiver (such as described in U.S. Pat. Nos. 6,124,647; 6,294,989; 6,445,287; 6,472,979; 6,731,205 and/or 7,423,522, and/or an ONSTAR® system, a compass, such as disclosed in U.S. Pat. Nos. 5,924,212; 4,862,594; 4,937,945; 5,131,154; 5,255,442 and/or 5,632,092, and/or any other accessory or circuitry or the like (with all of the above-referenced patents and PCT and U.S. patent applications being commonly assigned to Donnelly Corporation and being hereby incorporated herein by reference in their entireties).

[00230] Optionally, the mirror assembly (such as at the mounting base, which may be fixed relative to the vehicle windshield) may include an imaging sensor (such as a forward facing imaging sensor or camera that has a forward field of view through the vehicle windshield) that may be part of or may provide an image output for a vehicle vision system, such as a headlamp control system or lane departure warning system or object detection system or

other vehicle vision system or the like, and may utilize aspects of various imaging sensors or imaging array sensors or cameras or the like, such as a CMOS imaging array sensor, a CCD sensor or other sensors or the like, such as the types described in U.S. Pat. Nos. 5,550,677; 5,670,935; 5,760,962; 5,715,093; 5,877,897; 6,922,292; 6,757,109; 6,717,610; 6,590,719; 6,201,642; 6,498,620; 5,796,094; 6,097,023; 6,320,176; 6,559,435; 6,831,261; 6,806,452; 6,396,397; 6,822,563; 6,946,978; 7,038,577; 7,004,606 and/or 7,720,580, and/or U.S. patent applications, Ser. No. 10/534,632, filed May 11, 2005 and published Aug. 3, 2006 as U.S. Patent Publication No. US-2006-0171704; Ser. No. 12/091,359, filed Jun. 10, 2008 and published Oct. 1, 2009 as U.S. Pat. Pub. No. US-2009-0244361; and/or Ser. No. 12/377,054, filed Feb. 10, 2009 and published Aug. 26, 2010 as U.S. Pat. Pub. No. US-2010-0214791, and/or PCT Application No. PCT/US08/78700, filed Oct. 3, 2008 and published Apr. 9, 2009 as International Publication No. WO 2009/046268, and/or PCT Application No. PCT/US08/76022, filed Sep. 11, 2008 and published Mar. 19, 2009 as International Publication No. WO 2009/036176, which are all hereby incorporated herein by reference in their entireties. The sensor may include a lens element or optic between the imaging plane of the imaging sensor and the forward scene to substantially focus the scene at an image plane of the imaging sensor. The imaging sensor may comprise an image sensing module or the like, and may utilize aspects described in U.S. patent applications, Serial No. 10/534,632, filed May 11, 2005 and published Aug. 3, 2006 as U.S. Pat. Pub. No. US-2006-0171704; and/or Ser. No. 12/091,359, filed Oct. 27, 2006 and published Oct. 1, 2009 as U.S. Pat. Pub. No. US-2009-0244361, which are hereby incorporated herein by reference in their entireties.

[00231] Optionally, the accessory or accessories, such as those described above and/or below, may be positioned at or within the mirror casing and/or mirror cap portion or the like, and may be included on or integrated in a printed circuit board positioned within the mirror casing and/or cap portion, such as along a rear surface of the reflective element or elsewhere within a cavity defined by the casing, without affecting the scope of the present invention. The user actuatable inputs and/or touch sensors and/or proximity sensors and displays described above may be actuatable to control and/or adjust the accessories of the mirror assembly / system and/or overhead console and/or accessory module and/or vehicle. The connection or link between the controls and the display screen device and/or the navigation system and/or other systems and accessories of the mirror system may be

provided via vehicle electronic or communication systems and the like, and may be connected via various protocols or nodes, such as BLUETOOTH®, SCP, UBP, J1850, CAN J2284, Fire Wire 1394, MOST, LIN, FlexRay™, Byte Flight and/or the like, or other vehicle-based or in-vehicle communication links or systems (such as WIFI and/or IRDA) and/or the like, or via VHF or UHF or other wireless transmission formats, depending on the particular application of the mirror / accessory system and the vehicle. Optionally, the connections or links may be provided via various wireless connectivity or links, without affecting the scope of the present invention.

[00232] Optionally, the mirror assembly may include or incorporate or receive a module that provides for upgradeable HMI between consumer electronics and the automotive systems and/or mirror systems, such as by utilizing aspects of the mirror assemblies and systems described in International Publication No. WO 2011/028686, published on Mar. 10, 2011, which is hereby incorporated herein by reference in its entirety. Such an upgradeable system may provide the prerequisite items for an HMI video, tactile feedback or haptic feedback, keyboard and sound, both sent and received via video and audio inputs and outputs. A replaceable module may provide interface to various consumer electronics (such as consumer hand held devices and the like), and the module can be replaced to provide connectivity or communication with different consumer electronics. The module may connect to circuitry or the like at the interior rearview mirror assembly, or may be disposed/connected elsewhere in the vehicle. The present invention thus provides upgradeability of the mirror assembly or vehicle systems for different or new consumer electronics, which typically change and are improved or enhanced at a faster pace than the vehicle systems. The replaceable module may also provide an interface to an intelligent home system (such as a garage door opening system or vehicle starting system, which may allow for a person to start their car from inside their home and via a home-based system). The replaceable module thus may be readily changed or replaced to keep the vehicle compatible with consumer electronics as the consumer electronics are upgraded.

[00233] Optionally, aspects of the mirror assemblies discussed above may be incorporated in or associated with an exterior rearview mirror assembly that is configured for mounting at a side region of a vehicle. Optionally, an exterior rearview mirror assembly of the present invention may comprise dual actuators and dual pivot axes for adjusting a mirror

head and reflective element relative to a side of a vehicle at which the mirror assembly is mounted. For example, and with reference to FIGS. 56-58B, an exterior rearview mirror assembly 610 comprises a reflective element 612 (such as a generally planar or bent reflective element and such as an electrochromic reflective element or a flat glass or curved glass reflective element, such as a flat or curved reflective element having a single flat or planar or curved or convex curved glass substrate or having two flat or curved substrates or the like) that is attached at a rear attaching portion 614a of a mirror head housing 614. In the illustrated embodiment, the reflective element is adhered at a rear attaching surface of the mirror head housing, with the front perimeter edge regions of the reflective element being curved or rounded or beveled to provide a smooth or continuous transition between the generally planar front surface of the reflective element and the side walls or surfaces of the mirror housing, such as in a similar manner as discussed above with respect to the interior rearview mirror assemblies.

[00234] As shown in FIGS. 56, 56A and 56B, mirror head housing 614 is attached at an inner bracket or mounting element 616 that is attached at a first actuator 618, whereby rotational driving of the first actuator 618 imparts a rotation of bracket 616 and mirror head housing 614 about a first pivot axis 618a. First actuator 618 is attached to or mounted at an outer bracket 620 that is mounted to or attached to a second actuator 622, which is attached at or disposed at or in an outer cover 624, whereby rotational driving of second actuator 622 imparts of rotation of bracket 620 and first actuator 618 and bracket 616 and mirror head housing 614 about a second pivot axis 622a. The outer cover 624 is disposed at or attached to or mounted at the side portion of the vehicle (and pivotally or rotatably mounted thereat, such as via the actuator 622) when the exterior mirror assembly is normally mounted at the side of the vehicle.

[00235] When so mounted, the mirror head is adjustable about the first and second axes (via selective actuation of one or both actuators) to adjust the rearward field of view for the driver of the vehicle. For example, and with reference to FIG. 57, when the second actuator 622 is selectively operated to rotate or pivot outer bracket 620 relative to the side of the vehicle, the mirror head housing 614 is pivoted about the second pivot axis 622a to vertically adjust the rearward field of view for the driver of the vehicle (such as, for example, within about a +/- 15 degree range of pivotal adjustment). Also, and with reference to FIGS. 58A and 58B, when the first actuator 618 is selectively operated to

rotate or pivot inner bracket 616 relative to outer bracket 620, the mirror head housing 614 is pivoted about the first pivot axis 618a to laterally adjust the rearward field of view (such as, for example, within about a +/- 60 degree range of pivotal adjustment). The pivot axes may be angled relative to one another to provide the desired cooperative pivoting of the mirror head and reflective element relative to the side of the vehicle at which the mirror assembly is mounted. For example, the pivot axes may be angled relative to one another at an angle of at least about 15 degrees or at least about 30 degrees or more, such as an angle of up to about 90 degrees, depending on the particular application of the mirror assembly. The operation of the actuators and the operational speed of the actuators may be selected to provide the desired adjustment of the mirror head and reflective element depending on the particular relative angle of the pivot axes and/or the angle of the second pivot axis 622a relative to the side of the vehicle and/or the angle of the first pivot axis 618a relative to the second pivot axis and/or relative to the side of the vehicle.

[00236] Because of the angled relationship of the axes of rotation of the actuators and the angled interface or mounting interface of the mirror head housing 614 and outer cover 624, the first and second actuators may be operated together or cooperatively operated to laterally adjust the rearward field of view while maintaining a generally constant tip angle (and without also vertically adjusting the rearward field of view of the reflective element). Thus, when the mirror has been adjusted so that the reflective element has the desired vertical adjustment (via operation of the second actuator 622), a user may laterally adjust the mirror to laterally adjust the rearward field of view of the reflective element, whereby both actuators 618 and 622 may operate to pivot the mirror head about both pivot axes 618a, 622a so that the mirror head is pivoted toward or away from the side of the vehicle while limiting vertical adjustment of the rearward field of view of the reflective element. For example, and as can be seen with reference to FIG. 58B, if the mirror head 614 is pivoted about pivot axis 622a in the direction A, then the outer cover 624 may concurrently be pivoted about pivot axis 618a in the direction B, such that the mirror head may have limited or reduced vertical adjustment as it is laterally adjusted relative to the side of the vehicle (so that the mirror head is moved generally in the direction C in FIG. 58B).

[00237] Optionally, and desirably, the actuators 618, 622 may operate at different speeds to provide the desired or selected lateral adjustment with limited vertical adjustment (and/or to provide a desired or selected vertical adjustment with limited lateral adjustment and/or to

provide a desired or selected vertical and lateral adjustment). The actuators may be controlled by a control or control system that receives an input from a user actuatable device (such as a directional keypad or joystick control common for controlling known exterior mirror actuators) and that may automatically control one or both of the actuators at the desired directions and/or speeds to provide the desired or selected adjustment of the mirror head and reflective element. The control may be operable to determine the appropriate adjustment speeds and degree of adjustment for the actuators to provide the desired adjustment in a manner that appears (to a person viewing the mirror assembly during a lateral adjustment of the mirror head) to be a smooth lateral adjustment of the mirror reflective element. The selected or appropriate speeds and adjustment ranges or angles may vary depending on the particular application of the mirror assembly, such as the particular angle of the side of the vehicle at which the mirror assembly is mounted, and/or the interface angle of the mirror head and outer cover (relative to the angle of the side of the vehicle) and/or the relative angle between the pivot axes of the two actuators (it is envisioned that, at least for some embodiments, the tip or vertical adjustment actuator may run at a slower speed than the lateral adjustment actuator to provide a smooth adjustment of the mirror reflective element and rearward field of view).

[00238] The control of the mirror assembly may be provided via any suitable control system. For example, and with reference to FIG. 58C, a control system 680 is operable to control the actuator motors to adjust the mirror head housing and the reflective element, such as in response to one or more user inputs. Control system 680 includes a controller 682 (such as a microcontroller or microprocessor or the like), which is operable to control the motor drivers 684 and actuator motors 686 responsive to one or more user inputs or buttons or switches 688. Controller 682 receives a position signal from each of the actuator motors so that the controller knows the position or angle or degree of rotation of each motor of the mirror assembly. As shown in FIG. 58C, the control system 680 includes a supply conditioning element or device 690, a regulator 691, a motor supply cutthroat 692, a supply measure 693 in communication with the controller 682 and a current sensor 694 in communication with the controller, the motor supply cutthroat and each of the motor drivers.

[00239] The configuration or architecture of the control system for the exterior rearview mirror assembly is such that the specific mechanical implementation (i.e. the relative

planes of motion of each actuator) is separated from the vehicle control systems (and thus the control system of the exterior mirror assembly may plug into an electrical connector or main connector 696 of the vehicle (such as via a multi-pin connector or plug-and-socket type connector or the like), such as when the exterior rearview mirror assembly is mounted at an exterior portion of a vehicle during assembly of the vehicle. The necessary knowledge of the mechanical implementation is fully contained within the control system of the mirror assembly itself. This ensures that the vehicle control systems need not change for every application. This allows a greater degree of design and styling flexibility without affecting the vehicle control systems.

[00240] The controller board incorporates a controller or microcontroller that is responsible for overall mirror system control and status monitoring. The motion command input is received by the microcontroller either via the user input buttons or toggle or switch 688 (such as for controlling up, down, left, right, fold and deploy motions and/or the like) or from another vehicle module via the communications block 698, typically either a LIN or CAN bus or the like. The controller interprets the input or command and activates each motor driver accordingly. The control signal to each motor driver is pulse width modulated (PWM) to regulate the speed of each motor and thereby each axis of motion in the mirror assembly.

[00241] The speed of each motor is determined algorithmically based on the mechanical configuration of the mirror assembly. In this manner, the mirror assembly can move in a typical fashion regardless of the axis orientation. As the actual speed of each motor is dependent on the supplied driving voltage as well as the ambient temperature of the system, the controller measures those parameters and further algorithmically adjusts the pulse width of the control signal. As an additional input, position feedback can be utilized to directly measure the position and speed of each actuator and relative to each axis of rotation. These attributes can be used by the controller to further adjust the pulse width supplied to each motor driver. Optionally, the mirror assembly and/or control circuitry may operate the actuator or actuators at 12 volts or the like during normal operation, and may include a booster circuit that is operable to operate the actuator at a higher power or voltage (such as at 24 Volts or the like) for increased speed during a powerfold operation (where the mirror head is pivoted about both axes to fold or move so as to be generally along the side of the vehicle).

[00242] This feedback enables real-time adjustment of the motion of the mirror head about each axis of rotation to provide highly accurate and repeatable motion over time and wear during the life cycle of the rearview mirror assembly. The control system is configured to also provide a memory system for the mirror assembly, such as for vehicle applications that include such memory systems. The vehicle module responsible for the memory system typically provides a reference voltage and ground and reads back a scaled version of the reference voltage. The controller in the exterior rearview mirror assembly provides these scaled voltages via the position output signals. These signals are algorithmically calculated from the position feedback read from each actuator and are scaled to the provided reference voltage.

[00243] The exterior rearview mirror assembly of the present invention thus provides for adjustment of the rearward field of view at the rearview mirror via adjustment or operation of two actuators having different or non-co-axial axes of rotation. For example, and as shown in FIG. 59, the exterior mirror assembly 610 has the mirror head housing 614 pivotally attached at the outer cover 624 via the first actuator 618, whereby rotational driving of the first actuator 618 imparts a rotation of mirror head housing 614 about the first pivot axis 618a relative to the outer cover 624. The outer cover 624 is pivotally attached at the side of the vehicle via the second actuator, whereby rotational driving of second actuator 622 imparts of rotation of outer cover 624 and mirror head housing 614 the a second pivot axis 622a. The outer cover 624 is disposed at or attached to or mounted at the side portion of the vehicle (and pivotally or rotatably mounted thereat, such as via the actuator 622) when the exterior mirror assembly is normally mounted at the side of the vehicle.

[00244] As shown in FIGS. 60A-62, actuator 618, 622 (the first actuator 618 is preferably similar in construction and components as the second actuator 622, so they are described as a common actuator below) comprises a housing or bracket 630 that houses or receives the drive motor 632 therein. In the illustrated embodiment, an output shaft 632a (with a worm gear 632b attached thereat) of the drive motor 632 is rotatably drivable (via actuation of the drive motor 632 in the selected or appropriate direction) to rotatably drive a combination gear element 634, which, in turn, rotatably drives an output gear 636 at the housing 630 and at a gear bushing 638. In the illustrated embodiment, the gear element 634 has a gear element 634a that engages worm gear 632b and a worm gear element

634b that engages a first gear element 636a of output gear 636 (such as through an opening or aperture 631 at a center housing portion 630a of housing 630, with the gear bushing 638 and first gear element 636a of output gear 636 received in or nested in the center housing portion 630a and the worm gear 634b disposed outboard of the center housing portion 630a and at the aperture 631). A rivet tube 640 extends through housing 630 and receives or extends through a bearing washer 642a and a bearing 642 at one end (where a housing cover 630b is attached to contain or house the motor and other components with the housing 630). A memory system 644 is disposed between the bearing washer 642a and the gear bushing 638. Rivet tube 640 extends through or receives a spring 646 and spring washer 648 at the other end of the tube 640, with a clutch plate 650 and an adapter plate 652 disposed between the spring 646 and the housing 630.

[00245] When the exterior rearview mirror assembly 610 is assembled and mounted at a vehicle, the housing 630 of second actuator 622 may be attached or affixed at the side portion of the vehicle. The outer cover 624 has an attachment plate or receiver 654 (FIG. 59) that receives the spring 646 and spring washer 648 therein and that interfaces with and attaches to the adapter plate 652 (such as via a snap together connection or via one or more fasteners or the like, or the adaptor plate and the mirror bracket or attachment plate may be combined and the rivet tube may hold the parts together instead of fasteners or the like). When assembled and mounted in this manner, rotational driving of drive motor 632 of second actuator 622 imparts rotation of the output gear 636, which, in turn, rotatably drives the clutch plate 650, which rotatably drives the adapter plate 652 and thus the receiver 654 and outer cover 624 relative to the actuator housing 630 and the side of the vehicle. Likewise, when the exterior rearview mirror assembly 610 is assembled, the housing 630 of the first actuator 618 may be attached or affixed at the mirror housing 614 and the attachment plate or receiver 654 may be attached or affixed at the outer cover 624, such that rotational driving of drive motor 632 of first actuator 618 imparts rotation of the output gear 636, which, in turn, rotatably drives the clutch plate 650, which rotatably drives the adapter plate 652 and thus the receiver 654 and outer cover 624 relative to the actuator housing 630 and the mirror housing 614. The adapter plate 652 is press fit at the rivet tube 640 such that rotation of the adapter plate imparts a corresponding rotation of the rivet tube, which rotates via bearing 642 relative to the housing cover portion 630b and housing 630.

[00246] As best shown in FIGS. 62 and 63, the actuator comprises a clutch system at the adapter plate 652, the clutch plate 650 and the housing 630. As shown in FIG. 63, the adapter plate 652 has a manual clutch surface 652a that engages a corresponding clutch surface 650a of the clutch plate, and the clutch plate 650 includes another clutch surface 650b that engages a stabilization clutch surface 630a of the housing 630. Thus, during electrical operation of the motor 632, the output gear 636 drives the clutch plate 652, which slides against the clutch surface 630c of the actuator housing 630.

[00247] Such a clutch assembly or system provides a reduced or zero-backlash output that has enhanced vibrational stability. During manual operation of the mirror assembly (such as if a user manually grasps and rotates the mirror), the manual clutch surface 652a of the adapter plate 652 slides against the clutch surface 650a of the clutch plate 650, while the clutch plate 650 is held steady by the gear train when the motor is not actuated. The mirror assembly can thus be manually adjusted about either axis, whereby the clutch slips to allow for such manual adjustment and for a breakaway function or feature. Optionally, the mirror assembly may be manually controlled and operated by providing manual controls for the pivoting about the pivot axes of the mirror assembly to adjust the rearward field of view of the mirror reflective element.

[00248] In the illustrated embodiment, the exterior rearview mirror assembly uses two angled clutch surfaces to improve the lateral and rotational stability of each of the first and second actuators. As can be seen in FIG. 63, the stabilization clutch surfaces 630c, 650b are disposed or established radially inward from the manual clutch surfaces 650a, 652a, and are configured at a sharper or steeper or increased angle relative to the manual clutch surfaces. The increased angle and reduced diameter of the stabilization clutch surfaces reduces the minimum output torque required by the drive mechanism to electrically adjust the mirror while still allowing for a heavy manual adjustment effort and spring load (to reduce the possibility of unintentional manual adjustments of the mirror assembly, such as via mild bumping of the mirror head or the like).

[00249] Although shown and described as having the angled clutch surfaces 650a, 652a shown in FIG. 63, other shaped or contoured clutch surfaces may be implemented while remaining within the spirit and scope of the present invention. For example, the clutch surfaces may have dual surfaces or non-planar engaging surfaces or the like. For example, and with reference to FIG. 63A, the clutch surface 650a' may comprise a dual

angled surface that engages a correspondingly formed clutch surface 652a'. Other shapes and configurations of the clutch surfaces may be implemented while remaining within the spirit and scope of the present invention.

[00250] The actuator may include a memory system, such as a contact memory system or a non-contact memory system or the like. In the illustrated embodiment, the actuator includes memory system 644, which comprises a memory circuit element or circuit board 644a, a memory wiper or element 644b and a memory wiper holder 644c, which are disposed at the housing 630 and between the housing 630 and the and an end cover element 630b of the housing 630 (such as best seen in FIG. 62). The memory wiper holder 644c, memory wiper 644b and adapter plate 652 are press fit or secured to the rivet tube 640, so they all rotate together as a single construction, while the memory circuit board 644a is fixed at the housing 630 and thus does not rotate with the memory wiper holder and wiper when the actuator is actuated. As the adapter plate 652 is rotated relative to the housing 630 (via rotational driving of the drive motor 632), the rivet tube 640 rotates and the memory wiper 644b attached at the memory wiper holder 644c is thus swept along circuitry traces or carbon ink traces 644d on the memory circuit board 644a (such as two concentric traces disposed around the memory circuit board). Responsive to such sweeping of the memory wiper 644b, circuitry determines the degree of rotation of the adapter plate or element relative to the housing based on the location of the memory wiper (which may contact both traces and thus may close a circuit or provide a jumper between the traces so that circuitry that is electrically connected to the traces can determine the location of the memory wiper along the traces) along the circuit traces (which have terminals at each end thereof for connection to circuitry that is operable to determine where along the traces the wiper is located at any given time).

[00251] Thus, the memory system 644 is operable to determine the degree of rotation of the mirror head relative to the outer housing and the degree of rotation of the outer housing relative to the side of the vehicle, and the system may provide a memory selection function so a driver of the vehicle may save a particular mirror setting, such as in a similar manner with conventional memory mirror systems. Thus, when a driver of the vehicle later selects the saved setting, one or both actuators 618, 622 operate to set the mirror head at the appropriate position or orientation relative to the outer housing and to set the outer housing

at the appropriate position or orientation relative to the side of the vehicle, in order to provide the desired or selected rearward field of view to the driver of the vehicle.

[00252] Optionally, and with reference to FIGS. 64A and 64B, a memory system 644' comprises a memory circuit element or circuit board 644a', a pair of memory wipers or contacts or elements 644b', 644c' and a memory contact holder 644d', which are disposed at the housing and between the housing and the and the end cover element of the housing (not shown in FIGS. 64A and 64B, but similar to the components shown in FIG. 62). The memory contact holder 644d', memory contacts 644b', 644c' and the adapter plate are press fit or secured to the rivet tube, so they all rotate together as a single construction, while the memory circuit board 644a' is fixed at the housing and thus does not rotate with the memory wiper holder and wiper when the actuator is actuated, such as in a similar manner as discussed above.

[00253] Memory system 644' comprises an absolute position feedback system that provides an unrestricted 360 degree planar movement of an element or actuator (such as either or both actuators 618, 622). The rotational position of the actuator is provided via three concentric rings 645a', 645b', 645c' fabricated on the printed circuit board 644a' and optionally constructed using a resistive ink. The innermost ring 645a' and outermost ring 645c' are constructed by printing the resistive ink over a copper trace. The copper trace provides a low impedance path in parallel with the resistive element, electrically shorting the resistance of the ink. The center ring 645b' is constructed by printing the resistive ink directly on the PCB substrate and on two small copper pads located about 180 degrees relative to each other. The length of the pads (along the arc of the circumference) is very narrow. The width of the pads is approximately equal to the width of the ring. These pads provide an electrical connection to center ring 645b'. One of these pads is connected to ground while the other is connected to a positive reference voltage. This construction creates two resistors in parallel, each occupying about half of the circumference of center ring 645b'. As shown in FIG. 64B, bridging the gap between inner ring 645a' and center ring 645b' is a contact 644b' and bridging the gap between center ring 645b' and outer ring 645c' is a contact 644c'. The contacts 644b', 644c' comprise metallic elements that are each constructed to create a highly conductive and flexible contact surface that rides on the resistive ink surface of the rings. Each metal contact on center ring 645b' applies the

voltage sensed at the contact point on center ring 645b' onto the opposing ring (such as inner ring 645a' for contact 644b' and outer ring 645c' for contact 644c').

[00254] The metal elements are placed at an angle relative to each other that is significantly less than 180 degrees and significantly more than zero degrees, such as at an angle of around 45 degrees or more or less. The arrangement of contact 644b' and contact 644c' ensures that there is a unique voltage pair at every position in the 360 degrees of rotation of the actuator. In this manner, the absolute position of the actuator can be determined algorithmically by reading the sensed voltages at each of the inner ring 645a' and the outer ring 645c'. Motion direction can be determined algorithmically by repeatedly reading the sensed voltages over time and determining which voltage leads the other as movement occurs. Motion velocity can be determined algorithmically by repeatedly reading the sensed voltages over time and determining the rate of change of the voltage amplitude.

[00255] Thus, the memory system is operable to determine the position of the actuator at all times during operation of the mirror assembly. Each of the actuators includes a respective memory system so that the control of the mirror assembly can determine the degree of rotation of each of the actuators at any time, and can thus determine the position or orientation or plane of the mirror reflective element at any time. If 360 degree motion is not needed, a single memory wiper and simpler carbon trace may be utilized to provide the appropriate memory function. Optionally, to limit rotation of the mirror head and/or the outer cover, one or more mechanical stops or elements may be provided (such as via molding a stop feature onto the mirror head and mirror base or cover, so that the molded features collide or engage to limit rotation of the mirror head within a desired or appropriate range of motion.

[00256] Optionally, other mirror constructions are envisioned within the scope of the present invention. For example, the angle of misalignment of the pivot axes of the first and second actuators may vary or may be selected depending on the particular application of the mirror assembly. Such different pivot axes may be varied to accommodate different interface angles between the outer cover and the side of the vehicle and/or different interface angles between the mirror housing and the outer cover, depending on the particular application of the mirror assembly. For example, and with reference to FIG. 65A, an exterior rearview mirror assembly 610' may have a greater angle between the axes of rotation of the actuators, while, and such as shown in FIG. 65B, an exterior rearview mirror

assembly 610" may have an angle between the axes of rotation of the actuator that approaches 90 degrees or thereabouts. Clearly, other constructions and configurations are contemplated for mirror assemblies within the scope of the present invention.

[00257] Optionally, although the exterior mirror assemblies described above are shown with the axes of rotation of the actuators at a non-orthogonal angle (such as an obtuse angle) relative to one another, it is envisioned that an exterior mirror assembly may have two or more actuators providing different axes of rotation. For example, a third actuator and pivot axis may be added to achieve a more complex motion of the mirror head relative to the side of the vehicle (such as by utilizing a modular actuator or the like), and with the three (or more) actuators cooperatively operating at the same or different speeds to provide the desired movement or adjustment of the mirror head.

[00258] Optionally, it is further envisioned that an exterior mirror assembly may have two actuators with generally orthogonal axes of rotation while remaining within the spirit and scope of the present invention. For example, and with reference to FIGS. 66A-D, an exterior mirror assembly 710 comprises a reflective element (such as a generally planar or bent reflective element and such as an electrochromic reflective element or a flat glass or curved glass reflective element, such as a flat or curved reflective element having a single flat or planar or curved or convex curved glass substrate or having two flat or curved substrates or the like) that is attached at a rear attaching portion of a mirror head housing 714. Mirror head housing 714 is pivotally attached at a mounting arm or element 716 via a first or outer actuator 718 (FIGS. 66B and 66D), whereby rotational driving of the first actuator 718 imparts a rotation of mirror head housing 716 about a first pivot axis 718a relative to mounting arm 716. First actuator 718 is attached to or mounted at an outer end of mounting arm or element 716, which in turn is pivotally mounted at a sail mount of a vehicle via a second or inner actuator 722, which is configured to be attached at or disposed at or in the sail mount at a side of a vehicle, whereby, when so attached at the vehicle, rotational driving of second actuator 722 imparts a rotation of mounting arm 716 and first actuator 718 and mirror head housing 714 about a second pivot axis 722a. The second actuator 722 is disposed at or attached to or mounted at the side portion or sail mount of the vehicle when the exterior mirror assembly is normally mounted at the side of the vehicle.

[00259] In the illustrated embodiment, the pivot axis 722a is generally horizontal and extends laterally at the side of the vehicle and the pivot axis 718a is generally vertical when the exterior mirror assembly is normally mounted at the side of the vehicle. Thus, rotation of mounting arm 716 about pivot axis 722a imparts a rotation of mirror head housing 714 and the reflective element in an upward and downward direction to provide vertical tilting of the mirror reflective element, and rotation of mirror head housing 714 about pivot axis 718a imparts a rotation of the reflective element about the vertical axis to provide lateral adjustment of the field of view and to provide folding in and out of the mirror head.

[00260] Thus, when the mirror assembly 710 is mounted at the sail mount or side of the vehicle, the mirror head is adjustable about the first and second axes (via selective actuation of one or both actuators) to adjust the rearward field of view for the driver of the vehicle. For example, when the second actuator 722 is selectively operated to rotate or pivot mounting arm 716 relative to the side of the vehicle, the mirror head housing 714 is pivoted about the second pivot axis 722a to vertically adjust the rearward field of view for the driver of the vehicle. Also, when the first actuator 718 is selectively operated to rotate or pivot mirror head housing 714 relative to mounting arm 716, the mirror head housing 714 is pivoted about the first pivot axis 718a to laterally adjust the rearward field of view (such as, for example, within about a +/- 60 degree or more range of pivotal adjustment).

[00261] Because of the generally orthogonal angled relationship of the axes of rotation of the actuators, the first and second actuators may be operated separately or together or cooperatively operated to vertically and/or laterally adjust the rearward field of view. Thus, when the mirror has been adjusted so that the reflective element has the desired vertical adjustment (via only operation of the second actuator 722), a user may laterally adjust the mirror to laterally adjust the rearward field of view of the reflective element (via only operation of the first actuator 718). In such an embodiment, the actuators 718, 722 may be independently operated to adjust the mirror field of view vertically and/or laterally, whereby the mirror assembly need not include a controller that coordinates the speed and/or actuation of the actuators to provide the desired or selected field of view. For example, the user input or toggle at the interior of the vehicle may control or adjust the first or outer actuator when moved or adjusted laterally or side-to-side (such as by the driver of the vehicle) and may control or adjust the second or inner actuator when moved up/down

or fore/aft, and may control both actuators together (and at the same speed or optionally at different speeds if desired) when moved diagonally.

[00262] In the illustrated embodiment of FIGS. 66A-D, the mirror assembly is configured to mount at the side of the vehicle, such as at a sail mount region or at the door of the vehicle, with the axis of rotation 722a of the second actuator 722 extending generally horizontally and laterally at the side of the vehicle when the mirror assembly is normally mounted at the side of a vehicle. Optionally, and with reference to FIGS. 67A-D, a mirror assembly 710' may be mounted at a side of the vehicle so that the axis of rotation 722a' of the second actuator 722' is generally vertical (and the axis of rotation 718a' of the first actuator 718' (FIGS. 67B and 67D) is generally horizontal and extends generally laterally) when the mirror assembly is normally mounted at the side of a vehicle, such as at a door mount of the vehicle or the like. In the illustrated embodiment, the mirror head housing 714' is pivotally attached at a mounting arm or element 716' via the first or outer actuator 718', whereby rotational driving of the first actuator 718' imparts a rotation of mirror head housing 716' about the generally horizontal first pivot axis 718a' relative to mounting arm 716'. First actuator 718' is attached to or mounted at an upper end of mounting arm or element 716', which in turn is pivotally mounted at a door mount of a vehicle via the second or inner actuator 722', which is configured to be attached at or disposed at or in the door mount at a side of a vehicle, whereby, when so attached at the vehicle, rotational driving of second actuator 722' imparts a rotation of mounting arm 716' and first actuator 718' and mirror head housing 714' about the generally vertical second pivot axis 722a'. Thus, the mirror assembly 710' may function similar to mirror assembly 710, discussed above, but with the outer or upper or first actuator providing the vertical adjustment of the mirror head and reflective element and the inner or lower or second actuator providing the lateral adjustment of the mirror head and reflective element.

[00263] Optionally, the multi-axis actuating mechanism, such as the dual actuator mechanisms described above, of the present invention may be incorporated into a mounting/attachment device/element/unit that attaches or mounts at a side of a vehicle at a location where conventional exterior sideview mirrors are typically disposed, and is actuatable to adjust, via a support arm or structure, an attachment element or bracket (that is disposed at a distal end of the support arm or structure from the side of the vehicle) about multiple degrees of freedom with respect to the side of the vehicle in order that the

rearward field of view of a mirror reflective element supported by, and adjusting in tandem with, the bracket can be adjusted by the actuating mechanism via the support arm structure to allow the driver to adjust his or her rearward and/or sideward field of view. The attachment device thus may be mounted at the side of the vehicle, and a selected or appropriate mirror reflective element (that may comprise an electro-optic mirror reflective element or a non-electro-optic or fixed reflectance mirror reflective element) and mirror casing may be readily attached to the attachment element or bracket (and optionally the mirror casing may be attached at the mirror reflective element itself), so that both the reflective element and the mirror casing move in tandem, whereby the mounting device may adjust the attachment element and the mirror head attached thereto about multiple axes relative to the side of the vehicle to adjust the rearward field of view of the driver of the vehicle and/or to pivot or fold the mirror head along the side of the vehicle or the like. Thus, a common or standard or universal mounting/attaching device may be mounted at or attached at the side of the vehicle and may adjust an attachment element or bracket (which may have a reflective element and mirror casing or structure attached thereto) inward/outward, forward/rearward, up/down and rotationally about multiple axes of rotation (such as about pitch, yaw and roll axes or about a generally vertical axis and/or other axes non-coaxial with the first or generally vertical axis or the like) with respect to the side of the vehicle at which it is mounted and the ground plane at the vehicle.

[00264] For example, and with reference to FIG. 68, an adjustment device or mounting device or actuator device 730 may be attached at a side 732 of a vehicle (such as at a driver or passenger side vehicle door or window or the like) and may include one or more actuators that are operable to provide multiple degrees/axes of freedom of adjustment of an attachment plate or bracket 734 relative to the vehicle side 732. The mounting or attaching device 730 may include an attachment element or structure 736 for attaching at the vehicle, and the attachment structure 736 may house or support one or more actuators 738 for adjusting a support arm or structure 740 relative to the vehicle side 732. The actuators may be cooperatively operable similar to the dual actuators of the mirror assemblies described above or may otherwise provide multiple axes of adjustment of the attachment plate and mirror head (such as, for example, a ball actuator that may rotate or pivot the mounting arm or structure 740 in a three dimensional manner at the side of the vehicle). For example, the arm may be pivoted up/down and forward/rearward and any

directions in between, and the arm may be rotated about its longitudinal axis to further adjust the arm and the attachment element and the reflective element relative to the side of the vehicle (thus providing independent and/or cooperative pitch, yaw and roll adjustment of the reflective element relative to the side of the vehicle).

[00265] As shown in FIG. 68, the attachment element or bracket 736 is disposed at the outer or distal end of the support arm or structure 740, and a mirror reflective element 742 (which typically includes a backing plate or backplate and a heater pad disposed at a rearward surface of the reflective element) may be attached to the attachment element or bracket 736. Thus, adjustment of the support arm or structure causes a corresponding tandem adjustment of the attachment element 736 and of the mirror reflective element 742 to adjust the rearward field of view of the driver of the vehicle and/or to provide a powerfold function for the mirror reflective element. Optionally, and desirably, a mirror casing or shell 744 (FIG. 68A) may be readily attached at the mirror attachment element or bracket or to the mirror reflective element itself in order to provide the desired or appropriate appearance or styling of the exterior rearview mirror at the side of the vehicle and to provide mechanical protection of the reflective element and the like from environmental exposure. The mirror casing or shell may be attached via any suitable means, such as via snapping one or more casing portions at the rear of the mirror reflective element and/or bracket. When so attached, the mirror casing or shell moves in tandem with the tandem movement of the mirror reflective element 742 and attachment element 736 via adjustment of the support arm by the actuator or actuators of the attachment device.

[00266] Thus, a vehicle manufacturer may elect for at least a subset of its vehicle nameplates/models, a standardized attachment element and/or bracket and/or backplate and/or support arm (such as a standardized or common or universal mounting or actuator device), and then may attach a selected or appropriate reflective element and housing to the attachment element or bracket or backplate. The selected reflective element may be selected or customized for that particular vehicle nameplate or body style or optional mirror content (or for a vehicle model within a vehicle nameplate), and may provide the selected or desired or appropriate size and shape and type of reflective element for that particular vehicle. Similarly, the mirror casing or housing or shell may be selected and may be attached at the mirror reflective element or at the attachment element or the like of the mounting device, in order to provide the selected or desired or appropriate size and shape

and color and styling of the exterior rearview mirror assembly for that particular vehicle. Optionally, the mirror casing may be customizable for the particular vehicle line or style or for the particular vehicle in accordance with the customer's preferences. Thus, in accordance with this aspect of the present invention, a standardized set of actuator device/ support arm / attachment plate may be utilized across all vehicle models of a vehicle nameplate (such as, for example, all of the vehicle models of the Lincoln nameplate) of a vehicle manufacturer (such as, for example, Ford Motor Company), whereby different customized or selected mirror reflective elements and mirror casings may be selected for particular models (such as, for example, one design for the MKZ model and another design for the MKT model) for that nameplate of that vehicle manufacturer.

[00267] The mounting device and mirror reflective element and mirror casing may utilize any suitable attachment or mounting means, and may utilize aspects of the mirror assemblies and door assemblies of the types described in U.S. Pat. Nos. 7,289,037; 6,669,267 and/or 6,616,314, which are hereby incorporated herein by reference in their entireties. For example, the mirror casing may be provided as a clamshell construction or may constructed so that it first attaches to the mirror reflective element and the support arm is received through an aperture in the mirror casing to attach at the rear of the reflective element. When the mounting device and the mirror reflective element and mirror casing are so mounted at the side of a vehicle, the actuator or actuators of the mounting device is/are operable to move the mounting arm and attachment element or bracket (and the reflective element and mirror casing attached thereat) about multiple axes to provide the desired three dimensional adjustment of the mirror reflective element at the side of the vehicle (such as up/down and forward/rearward pivotable movement and clockwise and counterclockwise rotational movement about multiple axes, such as movement or adjustment about the pitch, yaw and roll axes). Thus, relative to the fulcrum point of the actuator device (at or near the side of the vehicle), the mirror reflective element can be moved so as to be in multiple orientations/planes at the side of the vehicle so that the driver can select his/her desired/required sideward and rearward field of view.

[00268] A typical known exterior mirror construction 760 is shown in FIG. 68B, where the mirror reflective element 762 is disposed in or housed in a mirror casing 764 (and is inboard of the open end of the mirror casing and not attached thereto) and is adjustable relative to the mirror casing via a mirror actuator 766, which is also disposed in the mirror

casing and occupies space behind the reflective element and within the cavity of the mirror casing. Also, all of the wiring for powering the mirror actuator and (if applicable) the electro-optic mirror reflective element and/or heater pad needs to be routed into the mirror head for powering the actuator and the like, thereby requiring complicated wire management to route the wires into the mirror casing and around and to the mirror actuator. In contrast to such known constructions, the present invention provides a mirror assembly that has the reflective element 742 disposed at and attached to or otherwise fixed relative to the mirror casing 744, such that, during adjustment, the reflective element and mirror casing move in tandem about the fulcrum of the mounting device at or near the side of the vehicle. As can be seen with reference to FIG. 68A, such a construction allows for space within the mirror casing that previously was occupied by the mirror actuators of known or conventional mirror assemblies. Such a construction may also ease the wire management of any wires needed to power the reflective element and/or heater pad and/or any accessory disposed at the mirror head, since the space within the mirror casing may be substantially open or unoccupied by the likes of a mirror actuator.

[00269] By eliminating the conventional actuators commonly used in conventional exterior rearview mirror assemblies to date, opportunities arise to provide additional electronic content in the exterior rearview mirror (such as at the areas where the conventional actuators used to reside). Thus, for example, the exterior rearview mirror may include various electronic accessories therein or thereat, and may include the likes of bus connectors, such as an Ethernet terminal or the like. Optionally, for example, and such as shown in FIG. 68D, a camera or camera module 746 (such as a rearward facing camera and/or a downward facing camera and/or a sideward facing camera and/or a forward facing camera) may be installed or included in or at the exterior rearview mirror assembly, such as at or in the mirror casing or shell 744" (which may comprise any suitable and optionally asymmetrical construction or design), and may be provided as a modular unit camera that may be readily included and electrically connected or plugged in at the mounting device when the mirror reflective element and/or mirror casing are attached at the mounting device (such as by utilizing aspects of the vision systems described in U.S. Pat. Nos. 8,017,898; 8,262,268; 5,760,962 and/or 5,550,677, which are hereby incorporated herein by reference in their entireties). The attaching device 730 and support arm 740 for the reflective element 742 in FIG. 68D may be similar to those described

above or may be constructed for the particular application or applications of the attaching device. Thus, a camera module (preferably comprising a lens system, a CMOS photosensor array and associated logic and control circuitry, and such as by utilizing aspects of the cameras described in U.S. Pat. No. 5,550,677; 5,760,962; 6,396,397; 6,097,023; 5,877,897 and 5,796,094, which are hereby incorporated herein by reference in their entireties) may be procured from an automotive camera module manufacturer and provided to the exterior sideview mirror manufacturer and configured to be received at the exterior rearview mirror assembly in an orientation that correctly sets the desired field of view of the received camera module. Ancillary electronics and/or required power sources / signal sources, including bus (such as CAN or LIN bus) interfaces/connectors, may be at least partially provided by the exterior mirror manufacturer itself, and may be incorporated into the configuration / construction of the exterior mirror assembly, thereby reducing the cost and complexity of the procured camera module.

[00270] Also, because, with the present invention, there is no longer a need for a mirror head with an actuator disposed therein, the shape of the mirror casing or housing (as presented to the wind flow as the vehicle drives in a forward direction of travel) need not follow traditional aerodynamic lines, and may effectively follow a shape that optimizes aerodynamic flow and minimizes the likes of eddy currents and turbulence in the air flow as experienced as the vehicle is driven forwardly on a road. For example, and with reference to FIG. 68C, a mirror casing 744' may be provided at the reflective element 742 (which is attached at the distal end of the mounting arm or structure 740 of the mounting device 730), with the mirror casing selectively shaped or styled for the particular application, whereby the mirror casing may or may not have the typical mirror casing shape and typical interior cavity rearward of the reflective element, such as typically provided in known exterior mirror constructions. As illustrated in FIGS. 68A, 68C and 68D, the disposition of the mirror reflective element to the exterior mirror casing/shell may preferably be such as described in U.S. Pat. No. 8,049,640 and/or in PCT Application No. PCT/US2011/056295, filed Oct. 14, 2011 and published Apr. 19, 2012 as International Publication No. WO 2012/051500, and/or PCT Application No. PCT/US2010/032017, filed Apr. 22, 2010 and published Oct. 28, 2010 as International Publication No. WO 2010/124064, and/or PCT Application No. PCT/US10/51741, filed Oct. 7, 2010 and

published Apr. 14, 2011 as International Publication No. WO 2011/044312, which are hereby incorporated herein by reference in their entireties.

[00271] Thus, the exterior rearview mirror assembly of the present invention provides a frameless exterior or sail mount mirror assembly that has the actuators at the mounting arm or structure of the mirror assembly and not within the mirror housing and not attached at the rear of the reflective element. The actuators adjust the mirror head and the reflective element in tandem (and do not adjust the reflective element relative to the mirror casing). The dual actuator (or multiple degrees of freedom actuator or actuators) of the exterior rearview mirror assembly or system of the present invention thus provides a mirror head that can be any shape and that does not require space in the mirror head for conventional actuators that operate to adjust or orient the reflective element relative to the mirror housing or casing. The mirror reflective element can be adhered or otherwise fixedly attached at a surface or mounting portion of the mirror head, and the mirror head can be any shape (such as generally flat or having a narrow or thin profile or the like) depending on the particular application of the mirror assembly and the vehicle manufacturer's design preferences. The mirror assembly of the present invention thus allows for inclusion of other accessories (such as turn signal indicators, blind spot indicators, lights, displays and/or the like) in the mirror head, without concerns of interference with conventional actuators disposed in the mirror head and at and behind the mirror reflective element. The exterior rearview mirror assembly and/or actuators may utilize aspects of the exterior rearview mirror assemblies described in U.S. Pat. Nos. 7,722,199; 7,314,285; 7,267,449; 7,159,992; 7,104,663; 7,093,946; 7,080,914; 7,073,914; 6,916,100; 6,755,544; 6,698,905; 6,685,864; 6,467,920; 6,362,548; 6,312,135; 6,243,218; 6,229,226; 6,213,612; 5,986,364; 5,900,999 and/or 5,703,731, and/or U.S. patent applications, U.S. patent applications, Ser. No. 13/249,433, filed Sep. 30, 2011, now U.S. Pat. No. 8,764,256, Ser. No. 13/023,747, filed Feb. 9, 2011, now U.S. Pat. No. 8,915,601, Ser. No. 11/504,353, filed Aug. 15, 2006 and published Jan. 4, 2007 as U.S. Publication No. 2007/002477, and/or Ser. No. 13/663,542, filed Oct. 30, 2012, now U.S. Pat. No. 9,067,541, and/or U.S. provisional application Ser. No. 61/645,959, filed May 11, 2012, which are all hereby incorporated herein by reference in their entireties.

[00272] The exterior rearview mirror assembly of the present invention thus provides for a mirror head with a reflective element fixedly disposed thereat, such that additional content

and/or enhanced styling may be readily achieved at the mirror head without concerns of space behind the reflective element (such space is typically taken up by a mirror reflective element actuator, which is not included in the exterior rearview mirror assembly of the types described above). Optionally, for example, the technology of the present invention allows for new technology or content to be readily added to and mounted into the mirror head. For example, the mirror head may include a camera disposed behind the reflective element, and/or the mirror head may include a display screen (such as a liquid crystal display screen or the like) disposed behind the reflective element and/or the mirror head may include any other electronic or mechanical content, such as, for example, a blind spot indicator and/or a turn signal indicator and/or an illumination module and/or wide angle reflector elements and/or the like (such as by utilizing aspects of the exterior mirror assemblies described in U.S. Pat. Nos. 8,058,977; 7,944,371; 7,492,281; 6,198,409; 5,929,786; 5,786,772; 7,581,859; 6,227,689; 6,582,109; 5,371,659; 5,497,306; 5,669,699; 5,823,654; 6,176,602; 6,276,821; 7,748,856; 7,255,451; 7,195,381; 6,717,712; 7,126,456; 6,315,419; 7,097,312 and/or 6,522,451, and/or U.S. patent application Ser. No. 12/187,725 , filed Aug. 7, 2008, now U.S. Pat. No. 8,786,704, and/or PCT Application No. PCT/US2006/018567, filed May 16, 2006 and published Nov. 23, 2006 as International Publication No. WO 2006/124682, which are hereby incorporated herein by reference in their entireties).

[00273] Optionally, the reflective element may comprise a frameless reflective element, such as the types marketed as a prismatic or electrochomic INFINITY™ mirror, such as are shown and/or described in U.S. Des. Pat. Nos. D633,423; D633,019; D638,761 and/or D647,017, and/or PCT Application No. PCT/US2011/056295, filed Oct. 14, 2011 and published Apr. 19, 2012 as International Publication No. WO 2012/051500, and/or PCT Application No. PCT/US2010/032017, filed Apr. 22, 2010 and published Oct. 28, 2010 as International Publication No. WO 2010/124064, and/or PCT Application No. PCT/US10/51741, filed Oct. 7, 2010 and published Apr. 14, 2011 as International Publication No. WO 2011/044312, and/or U.S. Pat. Nos. 7,253,723 and/or 8,154,418, which are hereby incorporated herein by reference in their entireties. Optionally, the mirror reflective element may have a thin or very thin bezel at the perimeter region of the front surface of the reflective element, and optionally, the mirror reflective element may have a clear bezel at the perimeter region of the front surface of the reflective element, or the like,

depending on the particular application of the mirror assembly and the desired appearance and/or styling of the mirror assembly.

[00274] Optionally, and with reference to FIGS. 69A and 69B, an exterior rearview mirror reflective element assembly 660 may include one or more indicators 662 disposed at a perimeter region of the mirror reflective element 660, such as for providing a blind spot indicator or lane change warning or the like to the driver of the vehicle equipped with the mirror assembly and/or for providing a turn signal indicator for drivers of other vehicles to the side and/or rear of the equipped vehicle (such as by utilizing aspects of the indicators described in U.S. Pat. Nos. 7,255,451 and/or 7,195,381, which are hereby incorporated herein by reference in their entireties). Reflective element assembly 660 comprises an electrochromic reflective element having a front substrate 664 and a rear substrate 666 with an electrochromic medium 668 sandwiched therebetween and in an interpane cavity 670 bounded by a perimeter seal 672. The rear surface 664b of the front substrate 664 has a transparent conductive coating or layer 674 disposed thereat and the front surface 666a of the rear substrate 666 has a metallic mirror reflective layer or layers 675 disposed thereat. An opaque or reflective or substantially non-light-transmitting perimeter band or hiding layer 676 is disposed around the periphery of the rear surface 664b of the front substrate 664 to hide or conceal the perimeter seal 672 when a person views the reflective element assembly from the front surface 664a of the front substrate 664.

[00275] In the illustrated embodiment, the indicator 662 comprises an organic light emitting diode (OLED) disposed in an OLED cavity 670a established at a perimeter region of the reflective element assembly and outboard of the EC cavity 670, with the OLED cavity 670a bounded by an outer seal portion 672a of the perimeter seal 672 and an inner seal portion 672b of the perimeter seal 672. The seal 672 thus may be dispensed around the periphery of the reflective element assembly and may be dispensed around the OLED cavity to define and seal the OLED cavity 670a and to isolate the OLED cavity from the EC cavity 670. Optionally, and as shown in FIGS. 69A and 69B, the perimeter band 676 may be made wider at the OLED indicator 662 to hide or conceal the perimeter band portions that circumscribe the OLED cavity 670. A window 676a is established (such as via laser ablation or etching or the like) through the perimeter band 676 at the OLED indicator 662 and OLED cavity 670a so that illumination emanating from the OLED indicator 662, when

powered or activated or energized, is viewable through the window 676a at the perimeter band 676.

[00276] The OLED indicator 662 is operable to illuminate responsive to electrical power applied thereto. The OLED material is an SPM-like material that may be filled into the separate cavity and that is illuminated when powered, with the glass conductive coatings configured to allow for separate electrification of the electrochromic medium and the OLED indicator. For example, and as shown in FIG. 69B, a delineation line or isolation line 675a may be established through mirror reflective layer or layers 675 to electrically isolate a principal reflecting region or portion 675b of the mirror reflective layer or layers 675 and an outboard OLED portion or region 675c of the mirror reflective layer or layers 675. Thus, the OLED indicator 662 may be electrically powered (such as via an electrical connection made at the third surface reflective layers at or near the OLED cavity) separately from the electrochromic medium 668 (which may be electrically powered via an electrical connector at a busbar or the like along a perimeter region of the rear substrate). Although described herein as comprising an OLED indicator, it is envisioned that the indicator may comprise any suitable material that may glow or emit light when energized or powered, while remaining within the spirit and scope of the present invention. Also, although shown and described as comprising an electrochromic reflective element assembly having an electrochromic medium, it is envisioned that the reflective element (with an indicator such as described above) may comprise other types of reflective elements or reflective element assemblies, such as other electro-optic reflective element assemblies or a liquid crystal reflective element assembly or the like, while remaining within the spirit and scope of the present invention.

[00277] Optionally, a compass display (such as a compass display disposed at or in an interior rearview mirror assembly of a vehicle or a console or instrument panel of a vehicle or an exterior rearview mirror of a vehicle) may be operable (such as responsive to a GPS system or a compass sensor or sensors or the like) to display a directional heading of the vehicle, and may display one or two alphanumeric characters (such as N, E, S, W, NE, SE, SW, NW) to inform the driver of the vehicle the general direction that the vehicle is heading. Such cardinal and inter-cardinal compass headings provide a general indication of the vehicle directional heading within eight distinct directional bands of about 45 degrees (for example, true north +/- about 22.5 degrees, northeast +/- about 22.5 degrees,

east +/- about 22.5 degrees and so on). In some applications, it is desirable to provide a more accurate compass display that may provide an indication of the vehicle heading within sixteen distinct bands or directional headings or 22.5 degree bands or ranges, such as by using three alphanumeric characters (such as N, NNE, NE, ENE, E, ESE, SE, SSE, S, SSW, SW, WSW, W, WNW, NW, NNW, and, for example, with "N" being displayed when the vehicle heading is true north +/- about 11.25 degrees). Such three character displays require a larger compass display and additional lighting elements or display character elements.

[00278] The present invention provides a compass display that is operable to display a sixteen point vehicle heading direction via a two character alphanumeric display. Thus, the compass display is operable to display the vehicle directional heading within sixteen approximately 22.5 degree bands or regions while utilizing only two alphanumeric characters. The octant or cardinal and primary inter-cardinal display headings (N, NE, E, SE, S, SW, W, NW, N) are displayed with either single characters or cardinal directions (N, E, S, W) or the two characters or inter-cardinal directions (NE, SE, SW, NW) with both characters having a constant or uniform intensity and/or color. When the vehicle is heading in a direction that is between two cardinal and primary inter-cardinal directional headings (such as in a north-north-easterly direction between north and northeast), the compass display may display "NE", but with the "N" at a greater intensity (or optionally a different color) than the "E", and when the vehicle is heading in a direction that is between north and east but further east (such as in an east-north-easterly direction), the display may display "NE", but with the "E" at a greater intensity (or optionally a different color) than the "N". The increased intensity of one of the characters provides an indication of the directional headings between adjacent cardinal and inter-cardinal headings, without resort to a third character of the display.

[00279] For example, and with reference to FIGS. 74A-F, when a vehicle is being driven in a generally northern direction (and within about 11.25 degrees in either direction of true north), the compass display displays "N", such as shown in FIG. 74A (and would display an "E", "S" or "W" when driven in a direction that is within about 11.25 degrees in either direction of true east, south or west, respectively). As the vehicle directional heading changes towards east, the compass display will display "NE", with the "N" being at a greater intensity than the "E" (such as shown in FIG. 74B), when the vehicle heading is

more than about 11.25 degrees east of north and less than about 33.75 degrees east of north (i.e., within about a 22.5 degree band that is representative of a north-north-east heading of the vehicle). As the vehicle directional heading changes further towards east (so that the heading is more than about 33.75 degrees east of north and less than about 56.25 degrees east of north, such that the directional heading is representative of a northeast inter-cardinal heading of the vehicle), the compass display will continue to display "NE", but with the "N" and "E" displayed at generally the same intensity (such as shown in FIG. 74C). As the vehicle directional heading changes further towards east (so that the heading is more than about 56.25 degrees east of north and less than about 78.75 degrees east of north, such that the directional heading is representative of an east-north-east heading of the vehicle), the compass display will continue to display "NE", but with the "E" being displayed at a greater intensity than the "N" (such as shown in FIG. 74D). As the vehicle directional heading changes further towards true east (so that the heading is more than about 78.75 degrees east of north and less than about 101.25 degrees east of north or about 11.25 degrees south of east, such that the directional heading is representative of an east heading of the vehicle), the compass display will display the cardinal directional heading "E" (such as shown in FIG. 74E). Similar intensity and display variations will occur with vehicle headings between east and south and between south and west and between north and west.

[00280] Thus, the present invention provides a two character directional heading compass display that varies the intensity (and/or optionally varies the color or font or size or shape or type style, such as italics or bold or underlined) of one of the characters of the display relative to another of the characters of the display to provide sixteen point directional heading display so that the driver of the vehicle has a more accurate vehicle heading display. For example, the primary direction indicator (such as the "N" when the vehicle is traveling in a generally north-northeast direction, such as shown in FIG. 74B) may be displayed in a higher intensity or brighter color or a larger size (such as shown in FIG. 74F) or a bolder font or in italics or may be flashed or modified or moved, or the characters of the display may be displayed with any other suitable indication or highlighting of one character as compared to the other (when the vehicle is traveling generally in a directional heading between a cardinal heading and an inter-cardinal heading), such that the driver readily recognizes and understands that the vehicle is heading generally in that particular

direction. Optionally, although discussed above and shown in FIG. 74F as having each directional heading band or range be the same degrees (such as 22.5 degrees), it is envisioned that some of the directional ranges may be larger/smaller, depending on the particular application (for example, the primary N, E, S, W headings could have a larger range or band size, so that the "N", for example, may be displayed when the vehicle is traveling within +/- 15 degrees of true north or the like, while the directional displays for directions between the cardinal and inter-cardinal headings are provided over a smaller band or heading range).

[00281] The compass display may be incorporated in an interior rearview mirror assembly and may comprise a display-on-demand compass display that is viewable, when activated, through a transflective mirror reflector of the mirror reflective element, or may comprise a compass display that is disposed at or behind a window established through the mirror reflector of the mirror reflective element, such that the compass display, when activated, is viewable through the window of the reflective element. Optionally, the compass display may be provided by a video display, such as a backlit video display screen, such as a backlit thin film transistor (TFT) video display screen that is backlit by a plurality of white light-emitting light emitting diodes or the like, wherein the video display may be operable to selectively display video images, such as video images captured by a camera of the vehicle, such as a rearward facing camera of the vehicle, whereby the video display screen may be operable to display rearward images responsive to the vehicle being maneuvered in a reversing direction. The compass display may utilize aspects of the compass displays described in PCT Application No. PCT/US2011/056295, filed Oct. 14, 2011 and published Apr. 19, 2012 as International Publication No. WO 2012/051500, and/or U.S. Pat. Nos. 7,370,983; 7,329,013; 7,308,341; 7,289,037; 7,249,860; 7,004,593; 4,546,551; 5,699,044; 4,953,305; 5,576,687; 5,632,092; 5,677,851; 5,708,410; 5,737,226; 5,802,727; 5,878,370; 6,087,953; 6,173,508; 6,222,460; 6,513,252 and/or 6,642,851, and/or European patent Publication No. EP 0 1043566, published Oct. 11, 2000, and/or U.S. patent application Ser. No. 11/226,628, filed Sep. 14, 2005 and published Mar. 23, 2006 as U.S. Publication No. 2006/0061008, which are all hereby incorporated herein by reference in their entireties.

[00282] Changes and modifications in the specifically described embodiments may be carried out without departing from the principles of the present invention, which is intended

to be limited only by the scope of the appended claims as interpreted according to the principles of patent law.

CLAIMS:

1. An exterior rearview mirror assembly configured for mounting at an exterior portion of a vehicle, said exterior rearview mirror assembly comprising:

a mirror head;

an exterior mirror reflective element fixedly attached at said mirror head;

an attachment portion configured for attachment at an exterior portion of a vehicle equipped with said exterior rearview mirror assembly;

a multi-axis adjustment mechanism comprising at least one electrically-operable actuator;

wherein said multi-axis adjustment mechanism is operable to move said mirror head, with said exterior mirror reflective element fixedly attached thereto, about multiple axes relative to said attachment portion; and

wherein said exterior mirror reflective element moves in tandem with movement of said mirror head relative to the exterior portion of the body of the equipped vehicle at which said exterior rearview mirror assembly is attached to adjust the rearward field of view of a driver of the equipped vehicle who views said exterior mirror reflective element when operating the equipped vehicle.

2. The exterior rearview mirror assembly of claim 1, wherein said mirror head comprises a mirror casing and wherein the outermost front perimeter edge of said exterior mirror reflective element is rounded.

3. The exterior rearview mirror assembly of claim 1, wherein said mirror head comprises a bracket to which said exterior mirror reflective element is fixedly attached.

4. The exterior rearview mirror assembly of claim 1, wherein said mirror head comprises a bracket to which said exterior mirror reflective element is fixedly attached by use of an adhesive.

5. The exterior rearview mirror assembly of claim 1, wherein said multi-axis adjustment mechanism comprises a support structure that is adjustable about multiple degrees of

freedom with respect to the exterior portion of the equipped vehicle at which said exterior rearview mirror assembly is attached via operation of said at least one electrically-operable actuator, and wherein said mirror head is disposed at one end of said support structure and wherein said attachment portion is at a distal other end of said support structure.

6. The exterior rearview mirror assembly of claim 5, wherein said mirror head comprises a bracket to which said exterior mirror reflective element is fixedly attached, and wherein said one end of said support structure attaches at said bracket.

7. The exterior rearview mirror assembly of claim 6, wherein a mirror casing attaches at said bracket and wherein said mirror casing adjusts in tandem with adjustment of said bracket to which said exterior mirror reflective element is fixedly attached.

8. The exterior rearview mirror assembly of claim 5, wherein said multi-axis adjustment mechanism comprises at least one pivot element.

9. The exterior rearview mirror assembly of claim 1, wherein said multi-axis adjustment mechanism is operable for yaw and roll adjustment of said exterior mirror reflective element relative to the exterior portion of the equipped vehicle at which said exterior rearview mirror assembly is attached.

10. The exterior rearview mirror assembly of claim 1, wherein said multi-axis adjustment mechanism is operable to adjust said exterior mirror reflective element about a first pivot axis and a second pivot axis, and wherein said first and second pivot axes are angled non-orthogonally relative to one another.

11. The exterior rearview mirror assembly of claim 10, wherein said first and second pivot axes are angled relative to one another at an angle that is greater than 15 degrees and is less than 90 degrees.

12. The exterior rearview mirror assembly of claim 1, wherein said at least one electrically-operable actuator comprises a first electrically-operable actuator and a second

electrically-operable actuator and wherein said first and second electrically-operable actuators are cooperatively operable to adjust said mirror head, with said exterior mirror reflective element fixedly attached thereto and moving in tandem therewith, relative to the exterior portion of the body of the equipped vehicle at which said exterior rearview mirror assembly is attached in order to enable a driver of the equipped to adjust his or her rearward field of view.

13. The exterior rearview mirror assembly of claim 12, wherein said first electrically-operable actuator is operable at a speed different than a speed of operation of said second electrically-operable actuator.

14. The exterior rearview mirror assembly of claim 1, wherein said exterior mirror reflective element comprises an electrochromic exterior mirror reflective element and wherein, when said exterior rearview mirror assembly is attached and operated at an equipped vehicle, signals to control dimming of said electrochromic exterior mirror reflective element are provided by an interior electrochromic rearview mirror assembly of the equipped vehicle that is mounted at an in-cabin surface of a windshield of the equipped vehicle, and wherein said interior electrochromic rearview mirror assembly comprises a mirror mount configured to attach said interior electrochromic rearview mirror assembly at the in-cabin surface of the windshield, and wherein said interior electrochromic rearview mirror assembly comprises a mirror casing having an interior electrochromic mirror reflective element disposed thereat and pivotally mounted at said mirror mount, and wherein a touch sensor device is disposed behind at least a portion of said interior electrochromic mirror reflective element and is operable to sense the presence of a person's finger at a touch zone of said interior electrochromic mirror reflective element proximate to said touch sensor device, and wherein a backlighting device is disposed behind said touch sensor device and is operable to backlight at least a portion of said touch sensor device, and wherein said touch sensor device comprises a generally light transmissive touch sensor substrate having a patterned electrically conductive trace established at said touch sensor substrate, and wherein said patterned electrically conductive trace is established at said touch sensor substrate in a pattern that allows light emanating from said backlighting device to pass through said touch sensor substrate, and

wherein said patterned electrically conductive trace comprises multiple spaced apart light absorbing and electrically conductive traces, and wherein said patterned electrically conductive trace comprises a non-light-transmitting icon disposed generally at said touch sensor substrate, and wherein, when said backlighting device is activated, light emanating from said backlighting device passes through light transmitting gaps between said spaced apart electrically conductive traces at said touch sensor substrate and illuminates said icon so that said icon is viewable through said interior electrochromic mirror reflective element by a driver of the vehicle when said interior electrochromic rearview mirror assembly is normally mounted at the equipped vehicle.

15. An exterior rearview mirror assembly configured for mounting at an exterior portion of a vehicle, said exterior rearview mirror assembly comprising:

a mirror head;

an exterior mirror reflective element fixedly attached at said mirror head;

an attachment portion configured for attachment at an exterior portion of a vehicle equipped with said exterior rearview mirror assembly;

a multi-axis adjustment mechanism comprising at least one electrically-operable actuator;

wherein said multi-axis adjustment mechanism comprises at least one pivot element;

wherein said multi-axis adjustment mechanism is operable to move said mirror head, with said exterior mirror reflective element fixedly attached thereto, about multiple axes relative to said attachment portion;

wherein said multi-axis adjustment mechanism comprises a support structure that is adjustable about multiple degrees of freedom with respect to the exterior portion of the equipped vehicle at which said exterior rearview mirror assembly is attached via operation of said at least one electrically-operable actuator; and

wherein said exterior mirror reflective element moves in tandem with movement of said mirror head relative to the exterior portion of the body of the equipped vehicle at which said exterior rearview mirror assembly is attached to adjust the rearward field of view of a driver of the equipped vehicle who views said exterior mirror reflective element when operating the equipped vehicle.

16. The exterior rearview mirror assembly of claim 15, wherein said exterior mirror reflective element comprises an electro-optic exterior mirror reflective element, and wherein said electro-optic exterior mirror reflective element comprises a front glass substrate and a rear substrate sandwiching an electro-optic medium capable of electrically-variable light transmission, and wherein said front glass substrate has an outer first side separated from an inner second side by the plate thickness of said front glass substrate, and wherein the perimeter circumferential edge of said outer first side of said front glass substrate is rounded.

17. The exterior rearview mirror assembly of claim 16, wherein said electro-optic exterior mirror reflective element is fixedly attached to a bracket by at least one of (i) mechanical attachment and (ii) adhesive attachment using an adhesive.

18. The exterior rearview mirror assembly of claim 17, wherein said electro-optic exterior mirror reflective element is fixedly attached to the bracket by use of an adhesive.

19. The exterior rearview mirror assembly of claim 17, wherein said electro-optic exterior mirror reflective element comprises an electrochromic exterior mirror reflective element.

20. The exterior rearview mirror assembly of claim 19, wherein said mirror head is disposed at one end of said support structure and wherein said attachment portion is at a distal other end of said support structure.

21. The exterior rearview mirror assembly of claim 15, wherein said mirror head comprises a bracket to which said exterior mirror reflective element is fixedly attached, and wherein said one end of said support structure attaches at said bracket.

22 The exterior rearview mirror assembly of claim 21, wherein a mirror casing attaches at said bracket, and wherein said mirror casing adjusts in tandem with adjustment of said bracket to which said exterior mirror reflective element is fixedly attached.

23. The exterior rearview mirror assembly of claim 22, wherein said multi-axis adjustment mechanism is operable to adjust said exterior mirror reflective element about a first pivot axis and a second pivot axis, and wherein said first and second pivot axes are angled non-orthogonally relative to one another.

24. The exterior rearview mirror assembly of claim 15, wherein said at least one electrically-operable actuator comprises a first electrically-operable actuator and a second electrically-operable actuator, and wherein said first and second electrically-operable actuators are cooperatively operable to adjust said mirror head, with said exterior mirror reflective element fixedly attached thereto and moving in tandem therewith, relative to the exterior portion of the body of the equipped vehicle at which said exterior rearview mirror assembly is attached in order to enable a driver of the equipped to adjust his or her rearward field of view.

25. The exterior rearview mirror assembly of claim 24, wherein said multi-axis adjustment mechanism is operable for yaw and roll adjustment of said exterior mirror reflective element relative to the exterior portion of the equipped vehicle at which said exterior rearview mirror assembly is attached.

26. An exterior rearview mirror assembly configured for mounting at an exterior portion of a vehicle, said exterior rearview mirror assembly comprising:

a mirror head;

an electrochromic exterior mirror reflective element fixedly attached at said mirror head;

an attachment portion configured for attachment at an exterior portion of a vehicle equipped with said electrochromic exterior rearview mirror assembly;

a multi-axis adjustment mechanism comprising at least one electrically-operable actuator;

wherein said multi-axis adjustment mechanism comprises at least one pivot element;

wherein said multi-axis adjustment mechanism is operable to move said mirror head, with said electrochromic exterior mirror reflective element fixedly attached thereto, about multiple axes relative to said attachment portion;

wherein said multi-axis adjustment mechanism comprises a support structure that is adjustable about multiple degrees of freedom with respect to the exterior portion of the equipped vehicle at which said exterior rearview mirror assembly is attached via operation of said at least one electrically-operable actuator;

wherein said mirror head is disposed at one end of said support structure and wherein said attachment portion is at a distal other end of said support structure;

wherein said one end of said support structure attaches at said mirror head, and wherein the rearward field of view of said electrochromic exterior mirror reflective element is adjustable by said multi-axis adjustment mechanism over multiple degrees of freedom to allow a driver of the equipped vehicle to adjust his or her rearward field of view; and

wherein said electrochromic exterior mirror reflective element moves in tandem with movement of said mirror head relative to the exterior portion of the body of the equipped vehicle at which said exterior rearview mirror assembly is attached to adjust the rearward field of view of a driver of the equipped vehicle who views said electrochromic exterior mirror reflective element when operating the equipped vehicle.

27. The exterior rearview mirror assembly of claim 26, wherein said at least one electrically-operable actuator comprises a first electrically-operable actuator and a second electrically-operable actuator, and wherein said first and second electrically-operable actuators are cooperatively operable to adjust said mirror head, with said electrochromic exterior mirror reflective element fixedly attached thereto and moving in tandem therewith, relative to the exterior portion of the body of the equipped vehicle at which said exterior rearview mirror assembly is attached in order to enable a driver of the equipped to adjust his or her rearward field of view.

28. The exterior rearview mirror assembly of claim 27, wherein said first electrically-operable actuator is operable at a speed different than a speed of operation of said second electrically-operable actuator.

29. The exterior rearview mirror assembly of claim 26, wherein said mirror head comprises a bracket to which said electrochromic exterior mirror reflective element is fixedly attached, and wherein said one end of said support structure attaches at said bracket.

30. The exterior rearview mirror assembly of claim 29, wherein a mirror casing attaches at said bracket and wherein said mirror casing adjusts in tandem with adjustment of said bracket to which said electrochromic exterior mirror reflective element is fixedly attached.

31. The exterior rearview mirror assembly of claim 30, wherein said multi-axis adjustment mechanism is operable for yaw and roll adjustment of said electrochromic exterior mirror reflective element relative to the exterior portion of the equipped vehicle at which said exterior rearview mirror assembly is attached.

32. The exterior rearview mirror assembly of claim 26, wherein said electrochromic exterior mirror reflective element comprises a front glass substrate and a rear substrate sandwiching an electrochromic medium capable of electrically-variable light transmission, and wherein said front glass substrate has an outer first side separated from an inner second side by the plate thickness of said front glass substrate, and wherein said mirror head comprises a bracket at which said electrochromic exterior mirror reflective element is fixedly attached, and wherein a heater is disposed between said rear substrate of said electrochromic exterior mirror reflective element and said bracket.

33. The exterior rearview mirror assembly of claim 32, wherein the perimeter circumferential edge of said outer first side of said front glass substrate is rounded.

34. The exterior rearview mirror assembly of claim 26, wherein said multi-axis adjustment mechanism is operable to adjust said electrochromic exterior mirror reflective element about a first pivot axis and a second pivot axis, and wherein said first and second pivot axes are angled non-orthogonally relative to one another.

35. The exterior rearview mirror assembly of claim 34, wherein said first and second pivot axes are angled relative to one another at an angle that is greater than 15 degrees and is less than 90 degrees.

36. The exterior rearview mirror assembly of claim 34, wherein said multi-axis adjustment mechanism is operable for yaw and roll adjustment of said electrochromic exterior mirror reflective element relative to the exterior portion of the equipped vehicle at which said exterior rearview mirror assembly is attached.

ABSTRACT

An exterior rearview mirror assembly for a vehicle includes a mirror head and an exterior mirror reflective element fixedly attached at the mirror head. An attachment portion is configured for attachment at an exterior portion of the vehicle. The mirror assembly includes a multi-axis adjustment mechanism having at least one electrically-operable actuator. The multi-axis adjustment mechanism is operable to move the mirror head, with the exterior mirror reflective element fixedly attached thereto, about multiple axes relative to the attachment portion. The exterior mirror reflective element moves in tandem with movement of the mirror head relative to the exterior portion of the body of the vehicle to adjust the rearward field of view of a driver of the vehicle who views the exterior mirror reflective element when operating the vehicle.

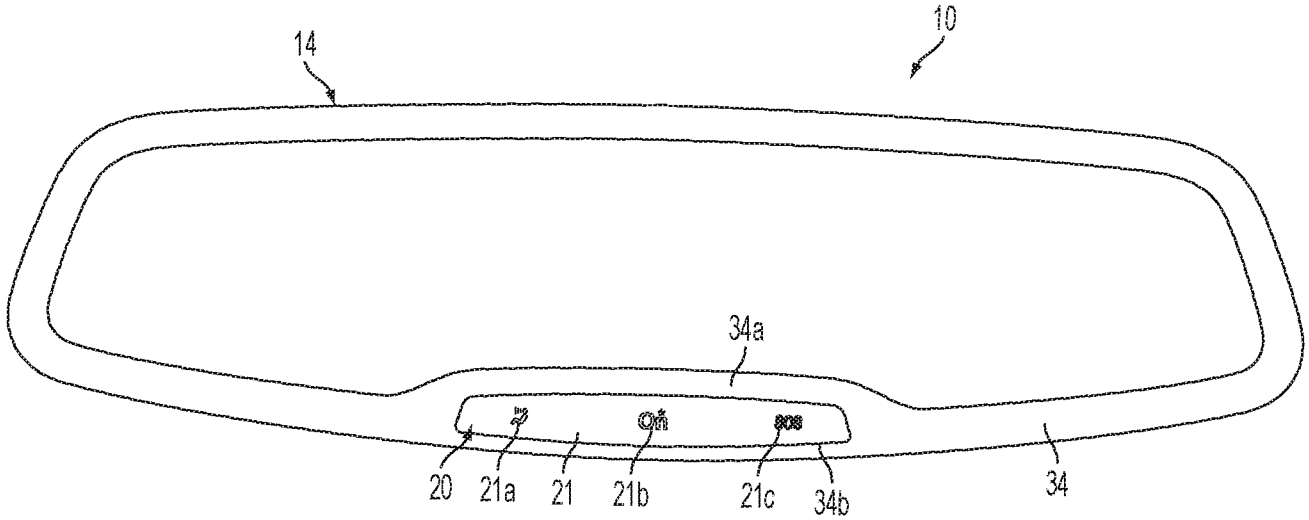
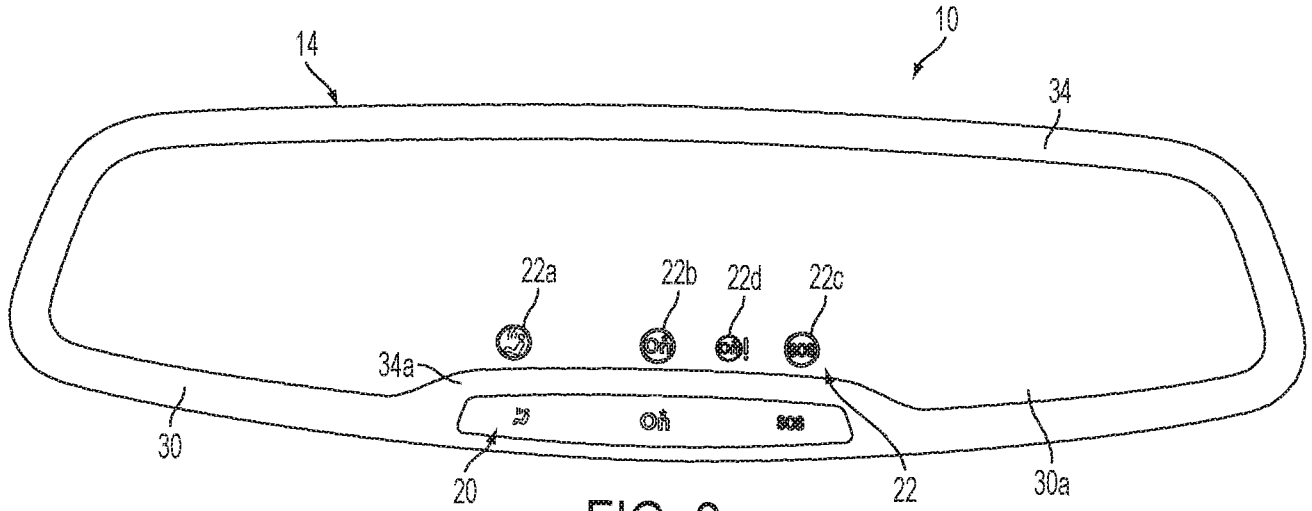

14
10
34a
20
21a
21
21b
21c
34b
34

FIG. 1


14
10
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22a
22b
22d
22c
34a
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20
22
30a

FIG. 2

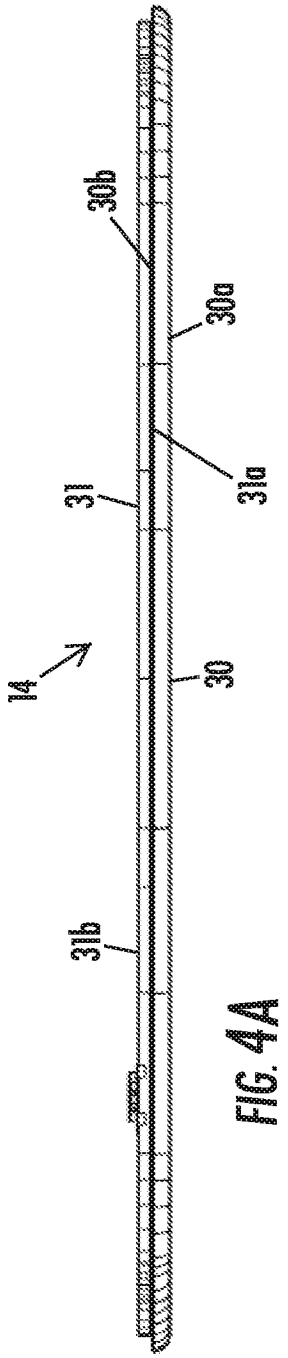

FIG. 4A

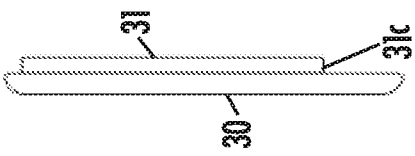

FIG. 4B

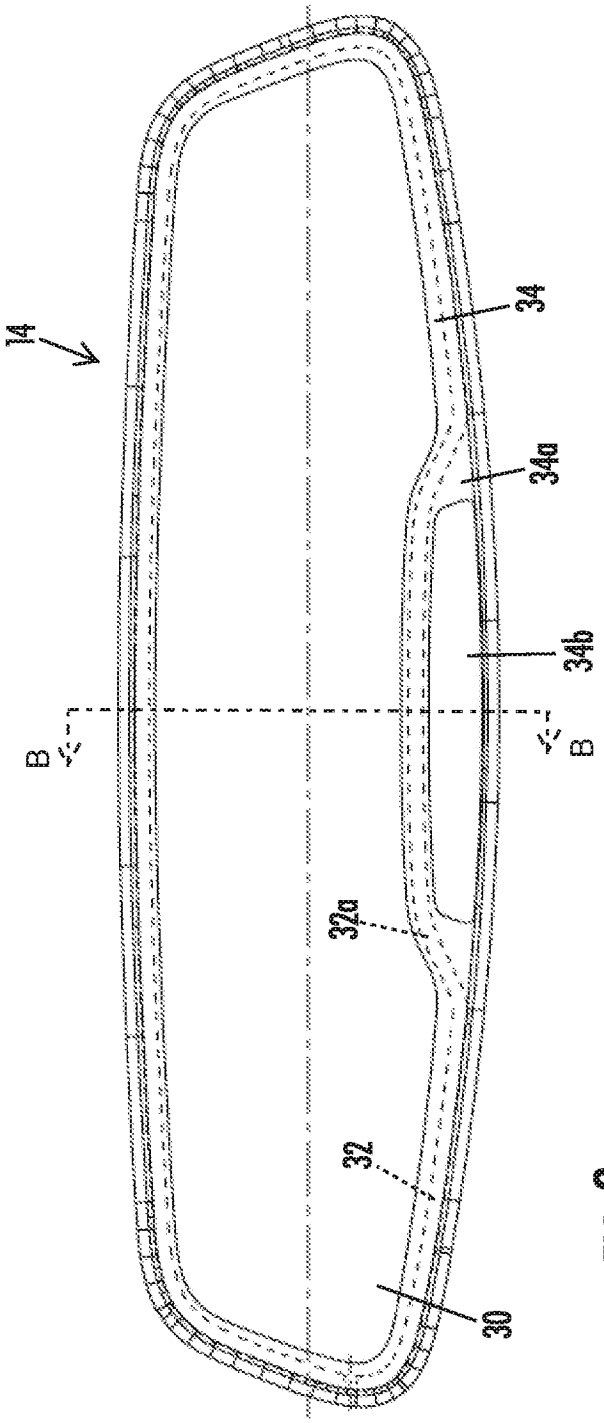

FIG. 3

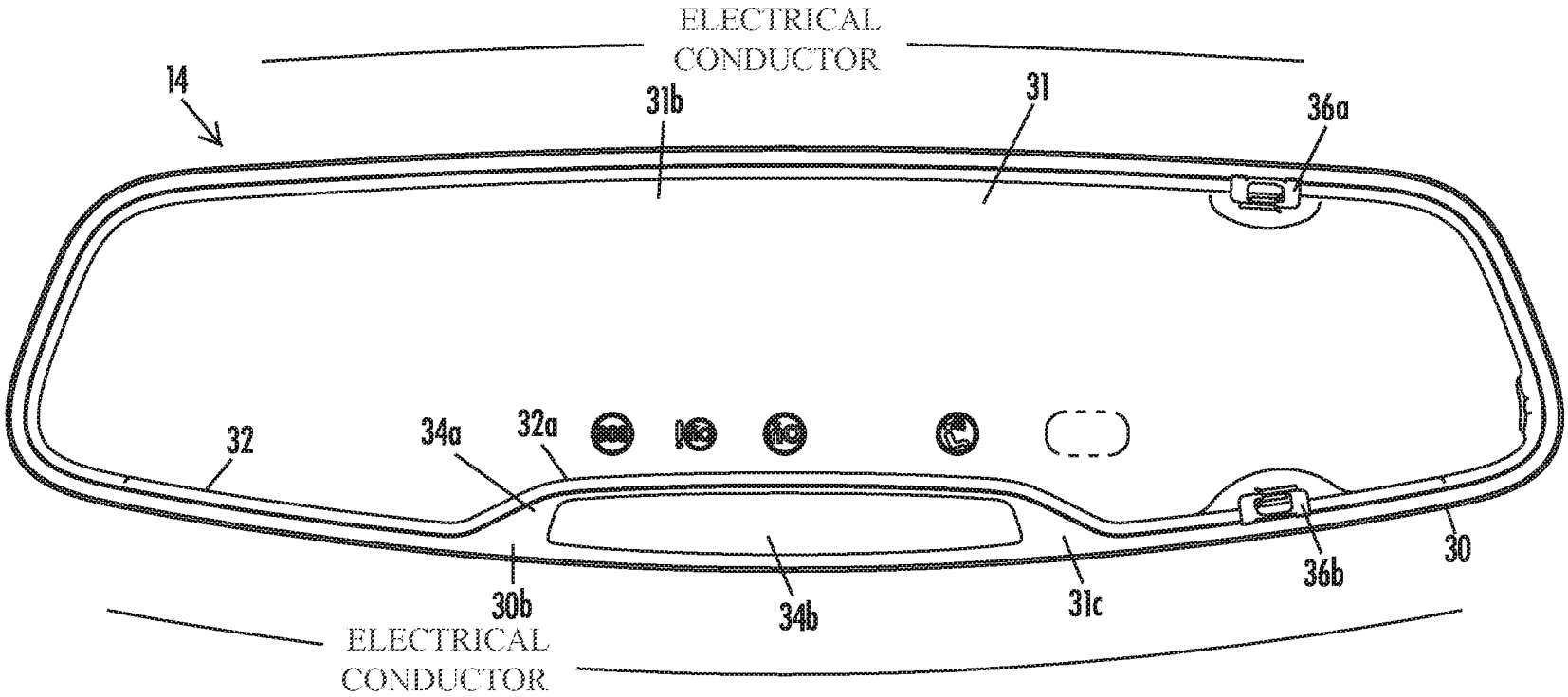

FIG. 5

Inventors: John T. Uken et al.
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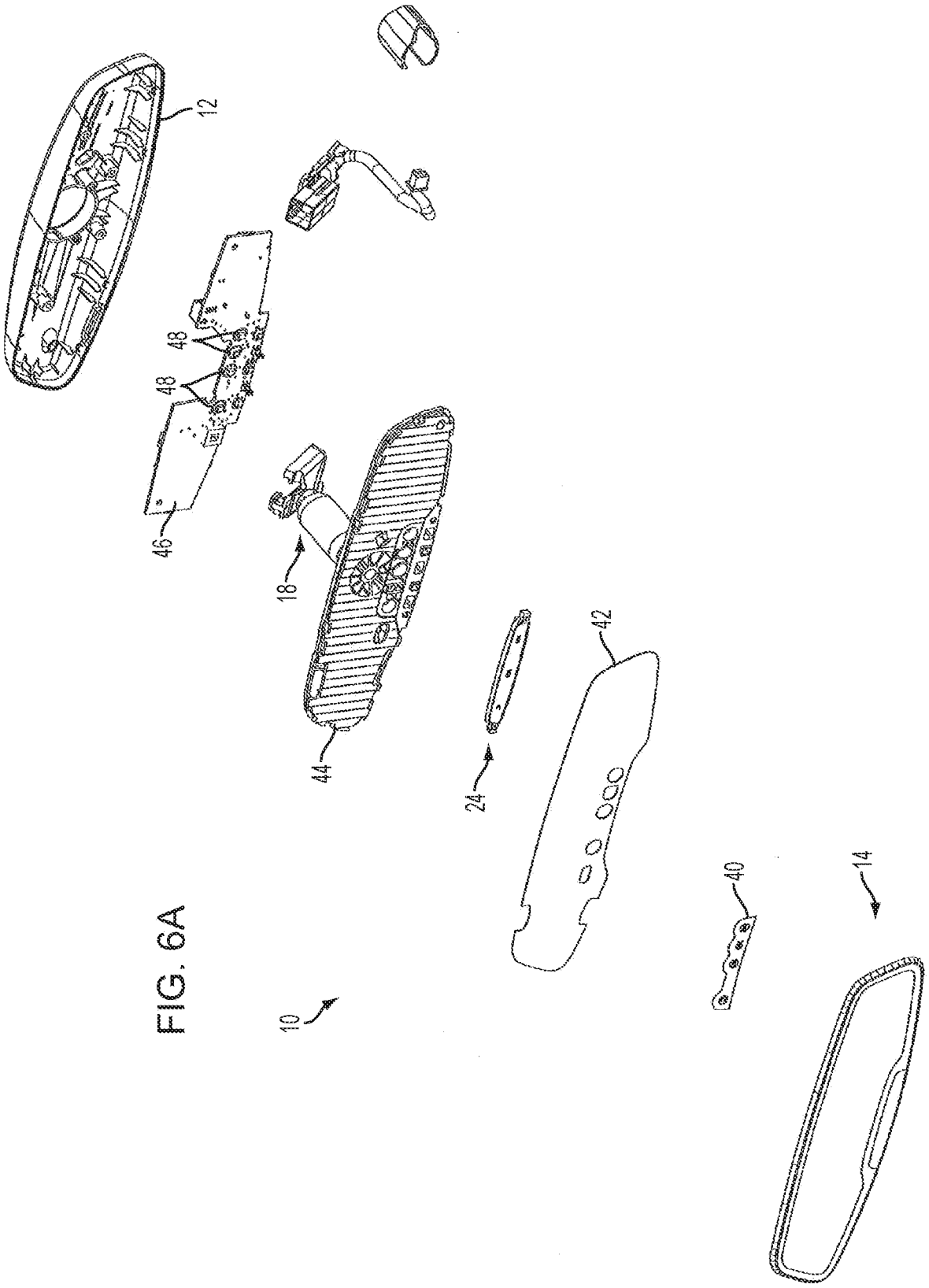

FIG. 6A

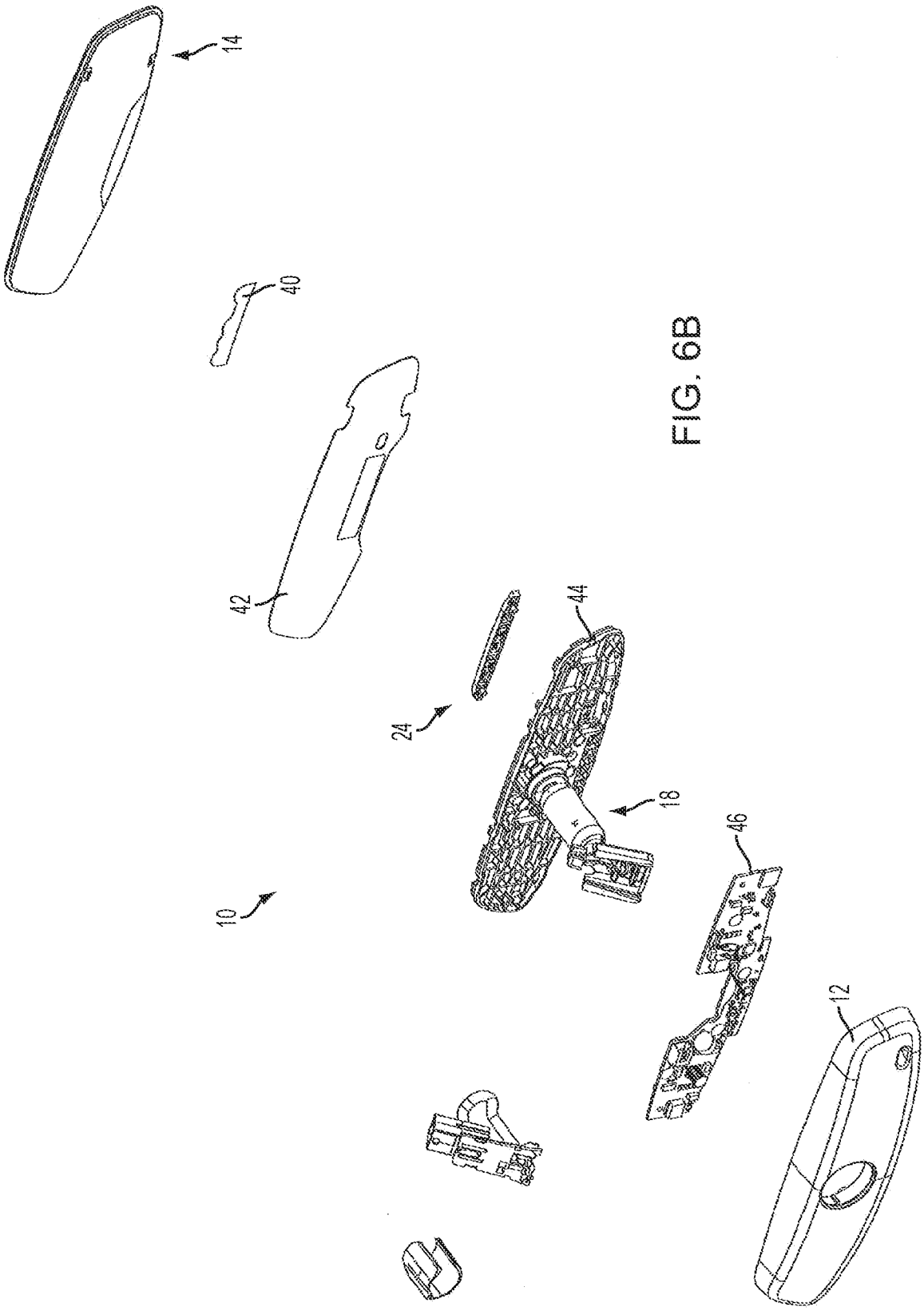

FIG. 6B

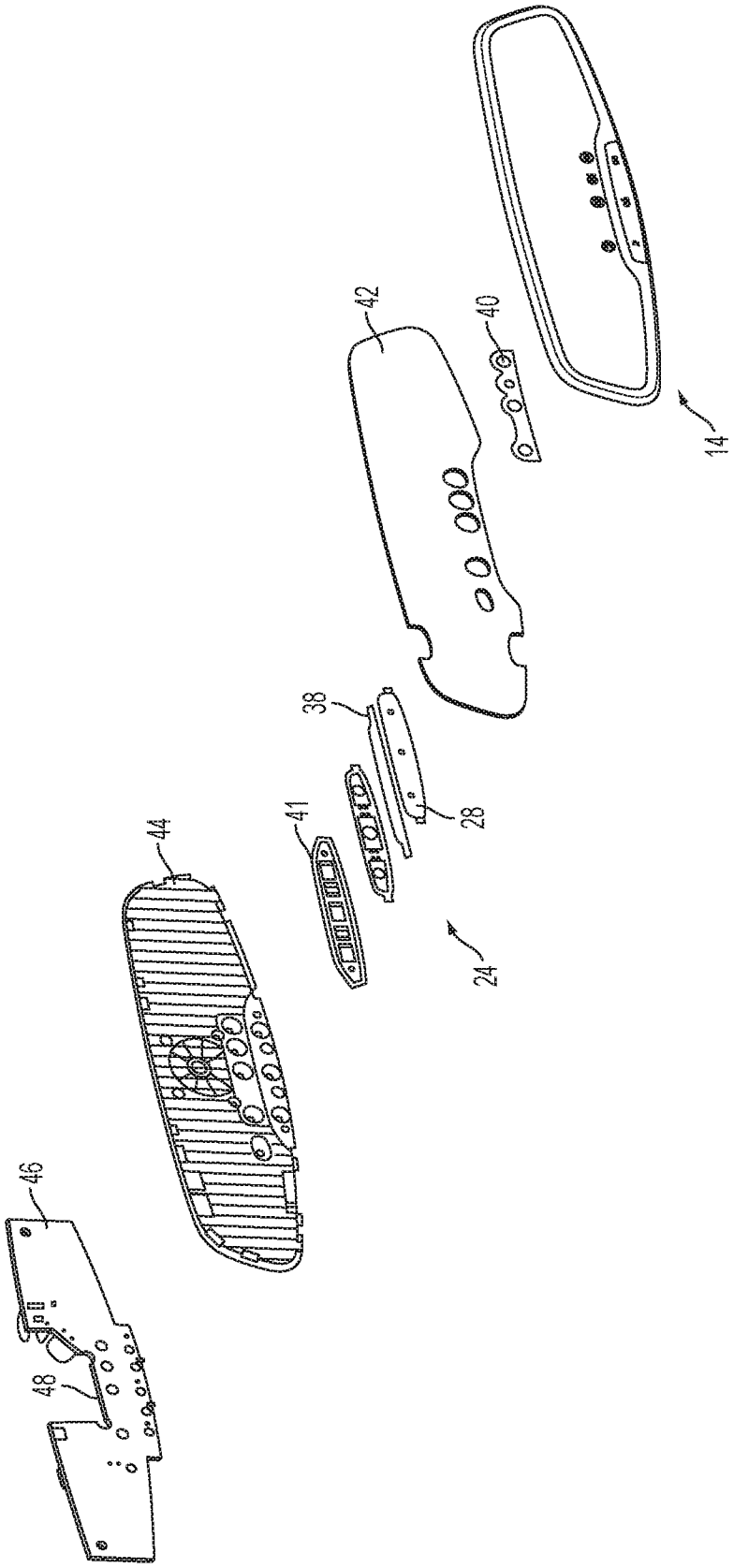

FIG. 6C

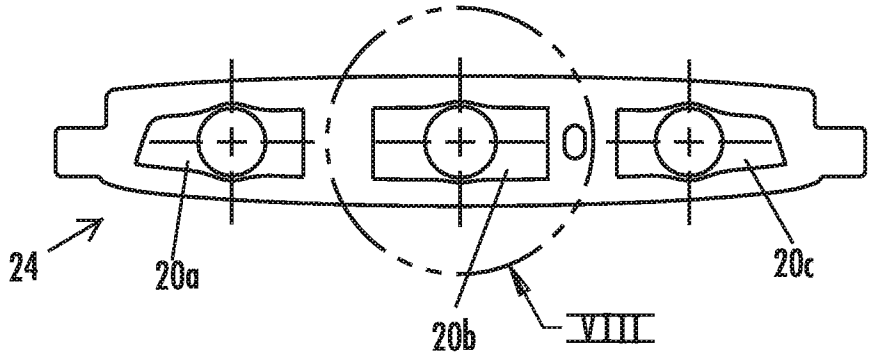

FIG. 7

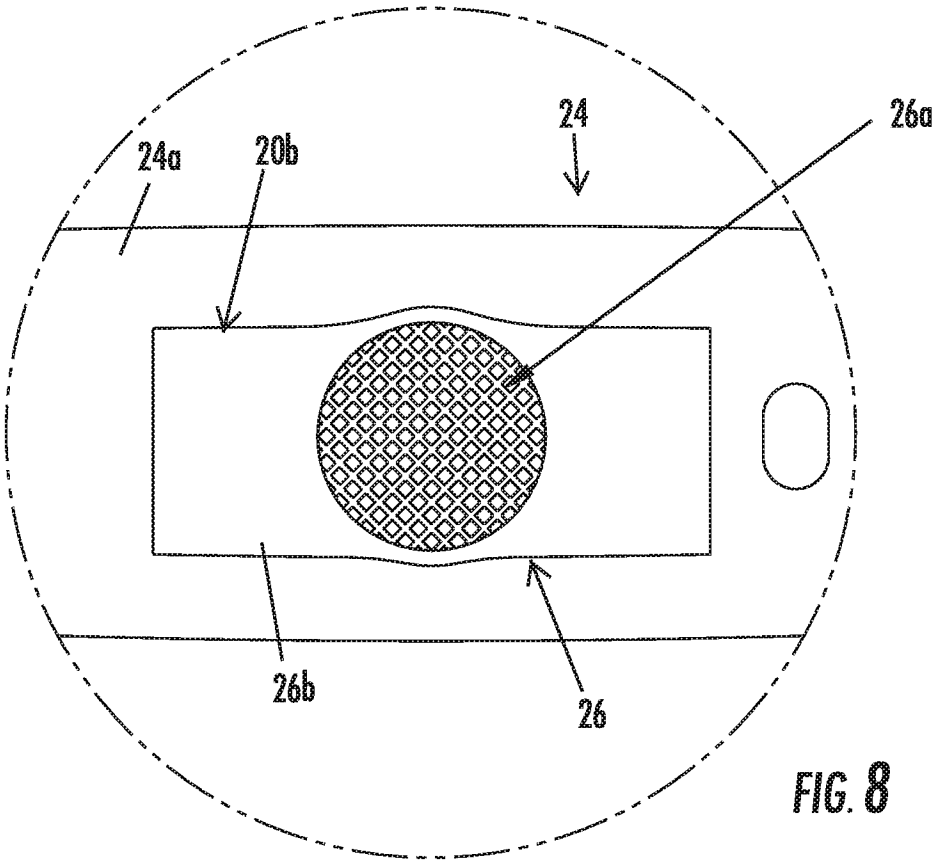

FIG. 8

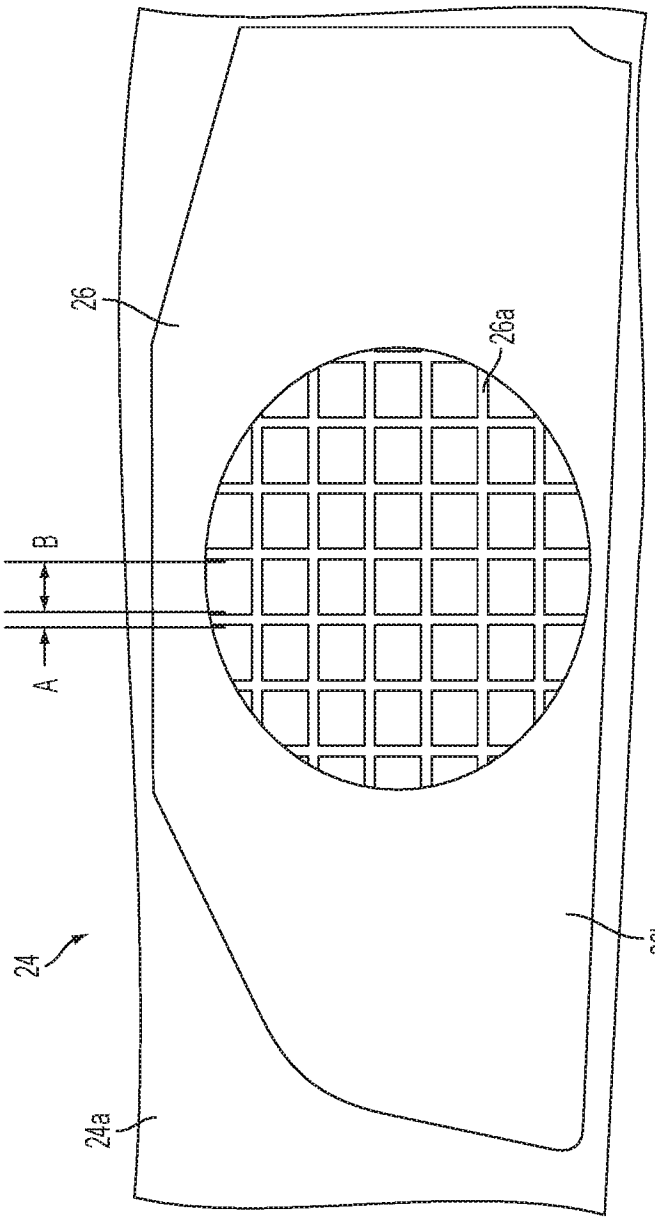

FIG. 9

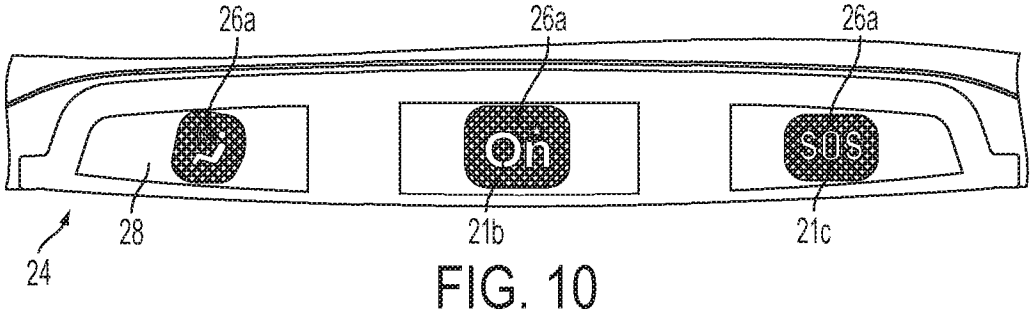

FIG. 10

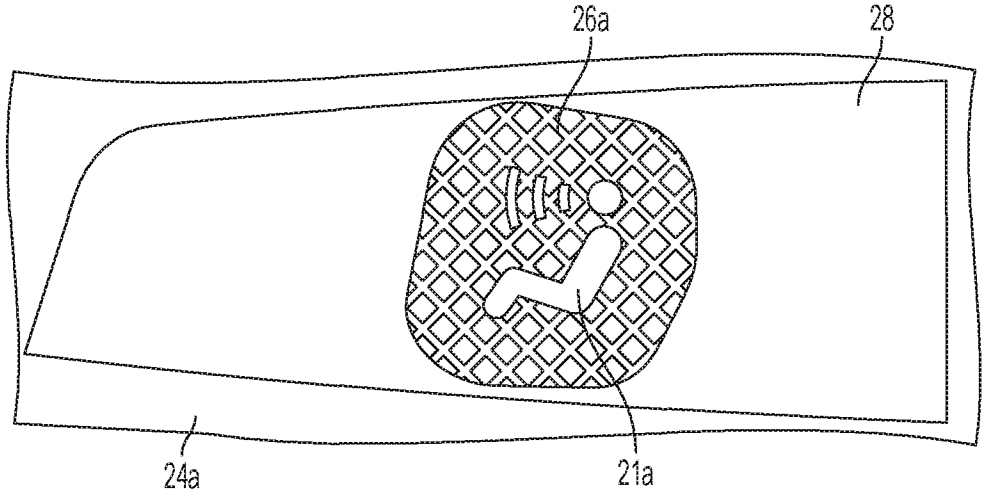

FIG. 11

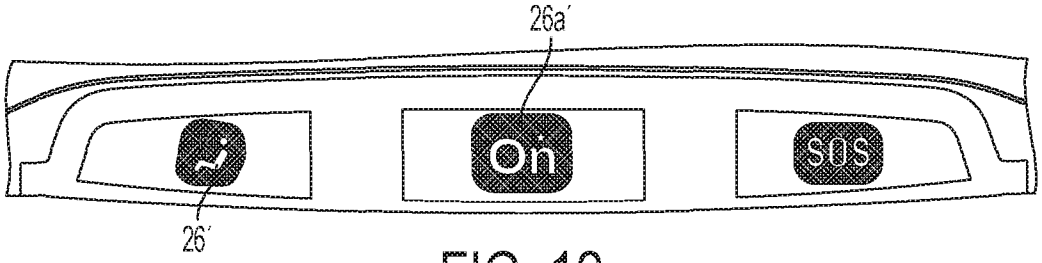

FIG. 12

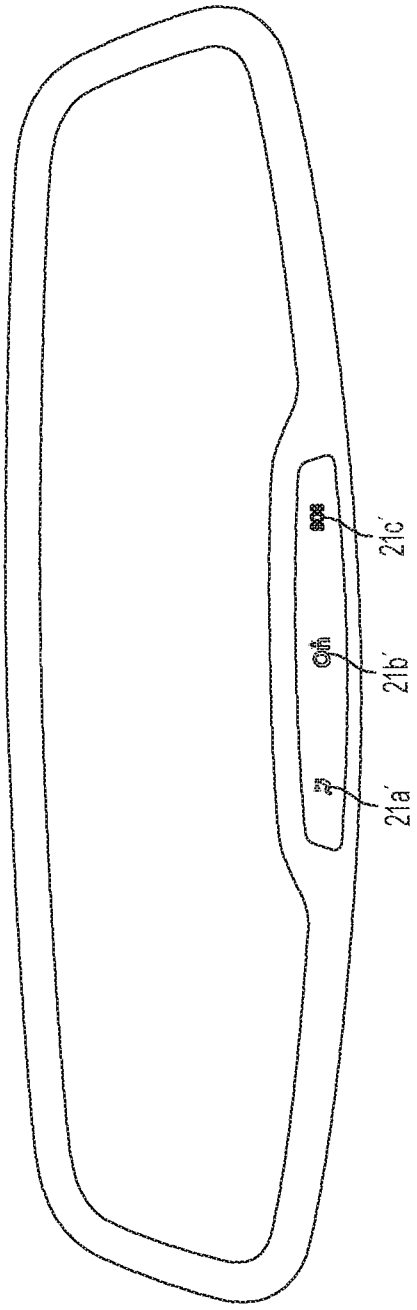

FIG. 13

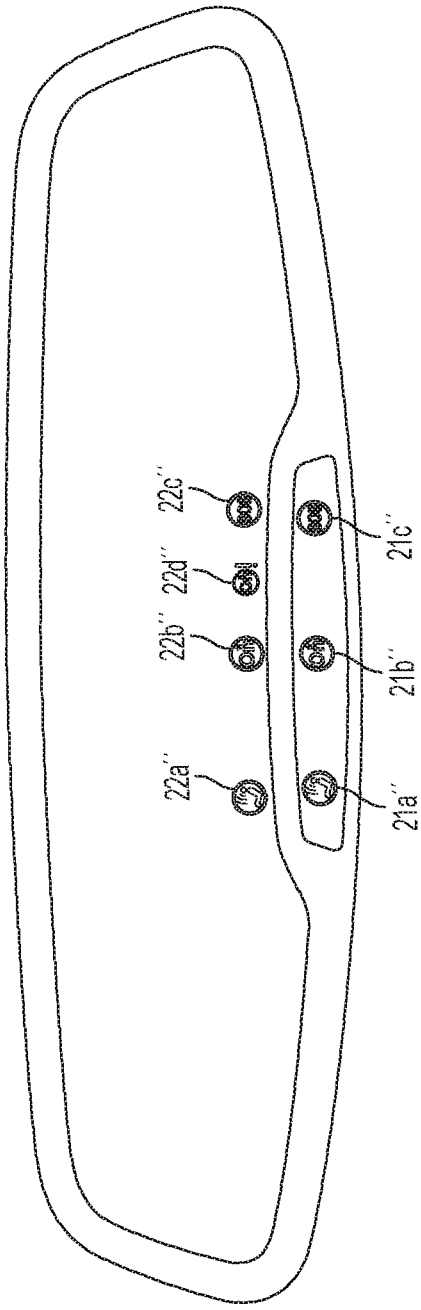

FIG. 14

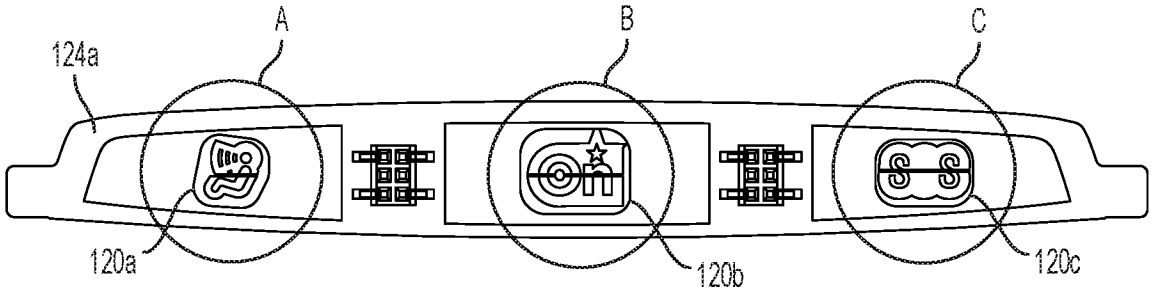

FIG. 15

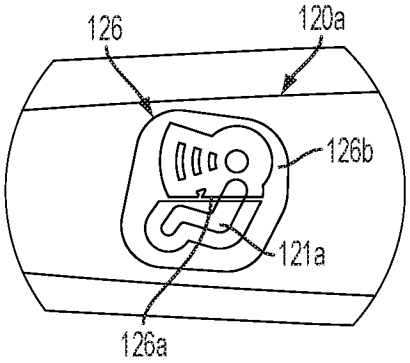

FIG. 15A

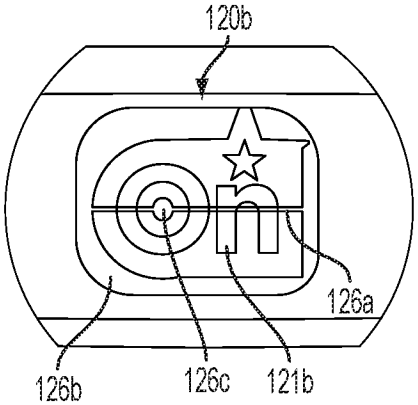

FIG. 15B

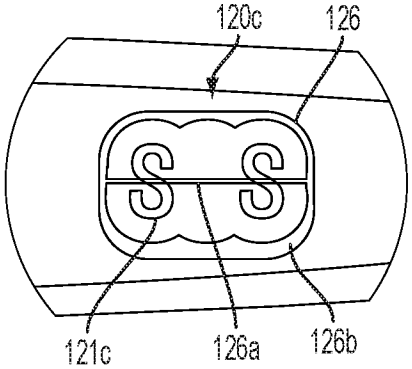

FIG. 15C

Inventors: John T. Uken et al.
Title: EXTERIOR REARVIEW MIRROR ASSEMBLY
Docket No.: DON01 P-2803
Sheet No.: 11/74

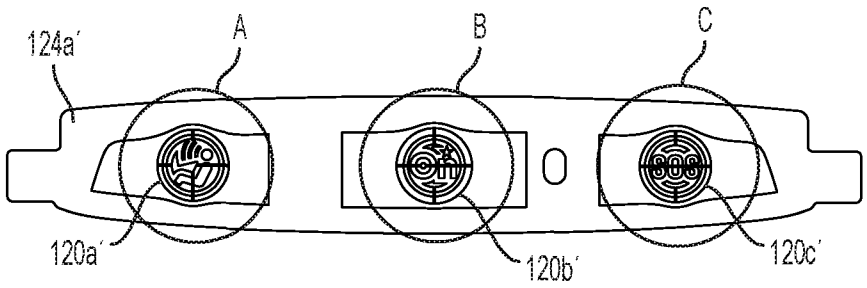

FIG. 16

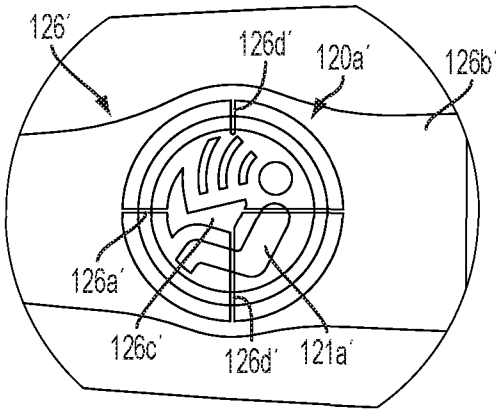

FIG. 16A

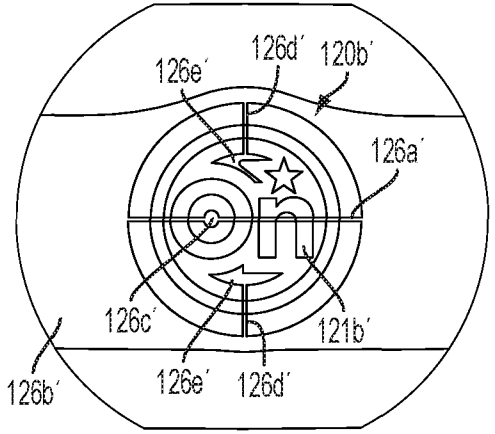

FIG. 16B

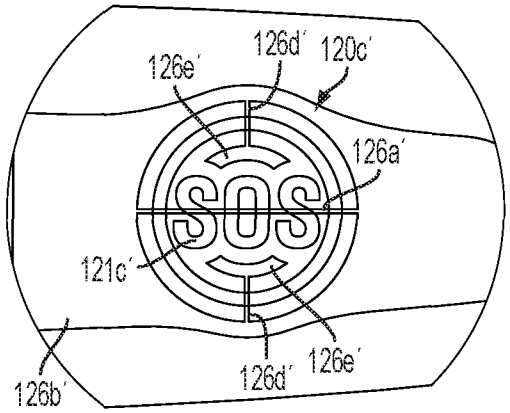

FIG. 16C

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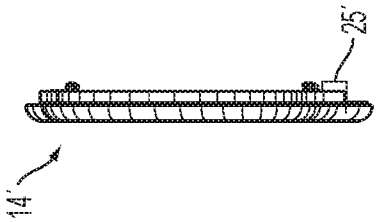

FIG. 18

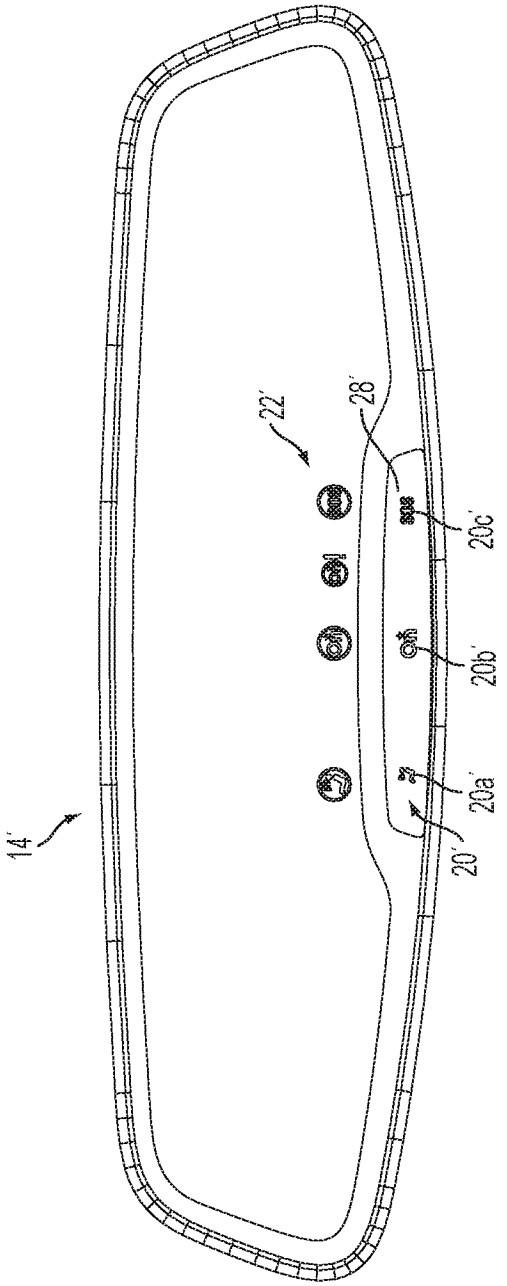

FIG. 17

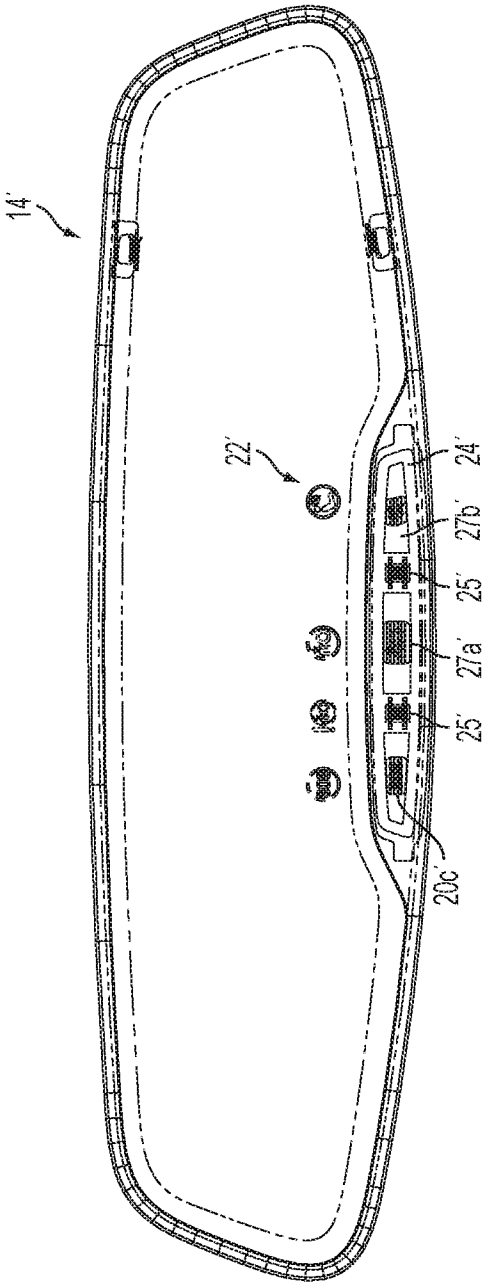

FIG. 19

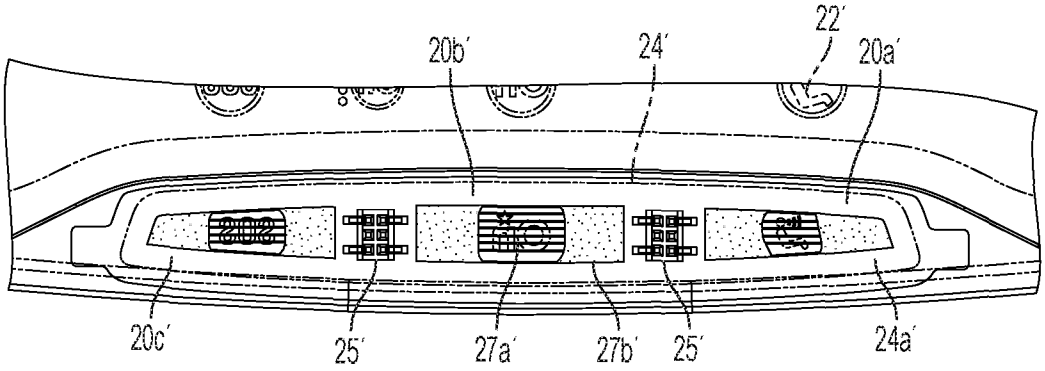

FIG. 20

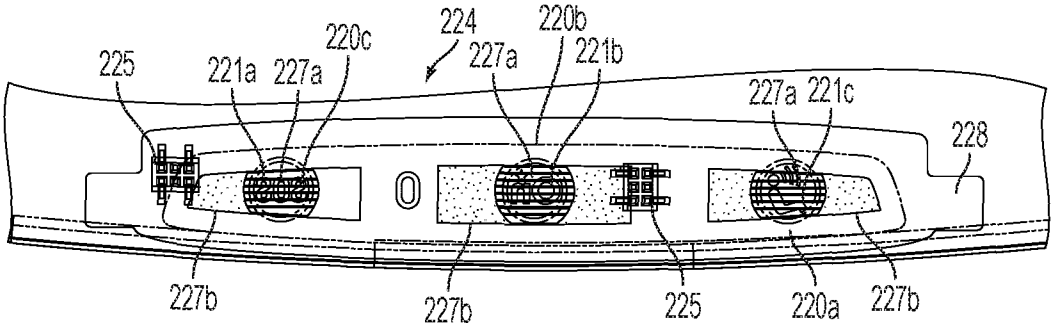

FIG. 24

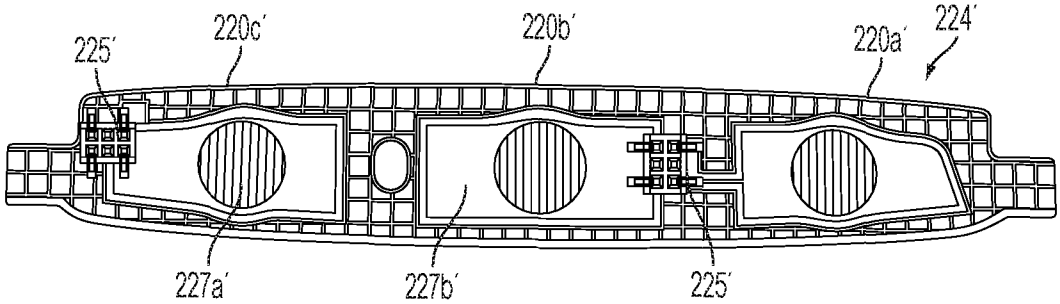

FIG. 24A

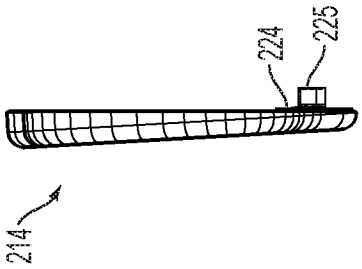

FIG. 22

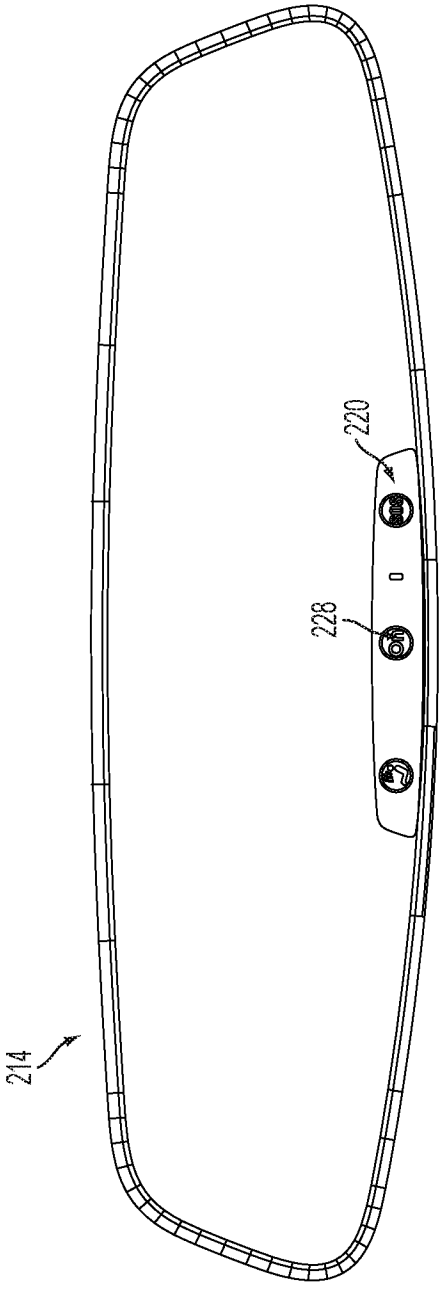

FIG. 21

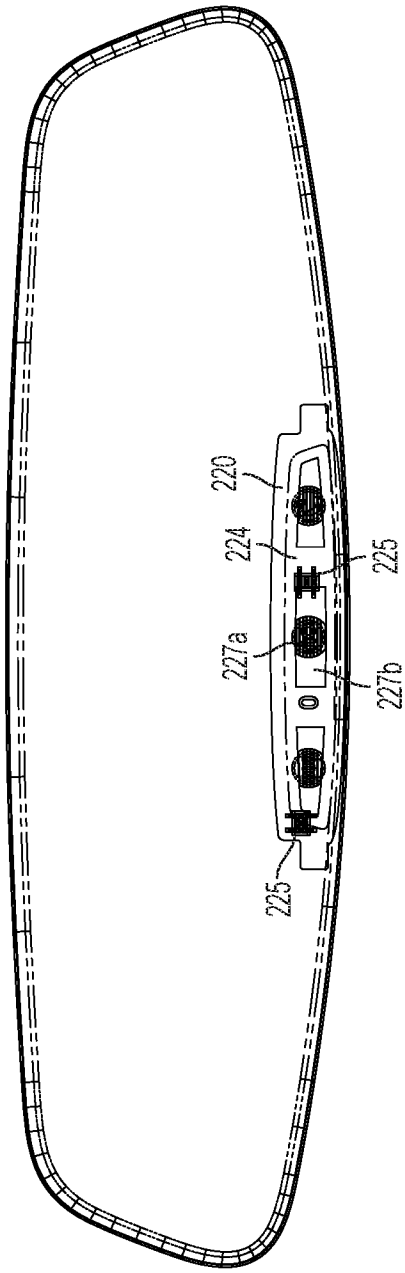

FIG. 23

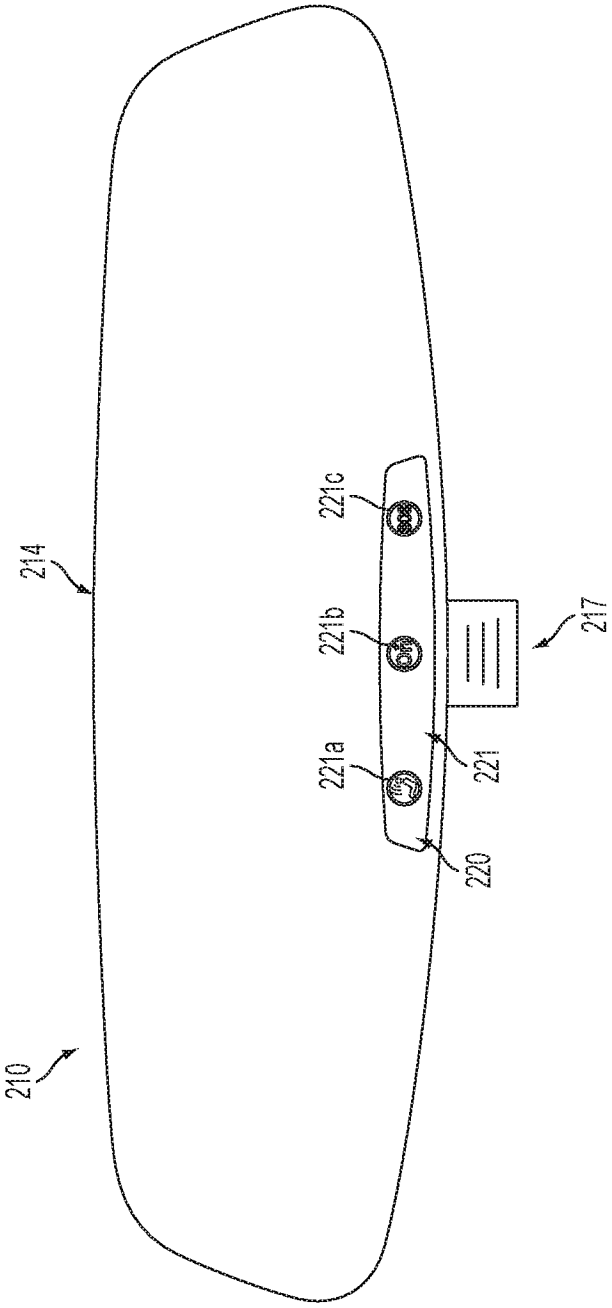

FIG. 25

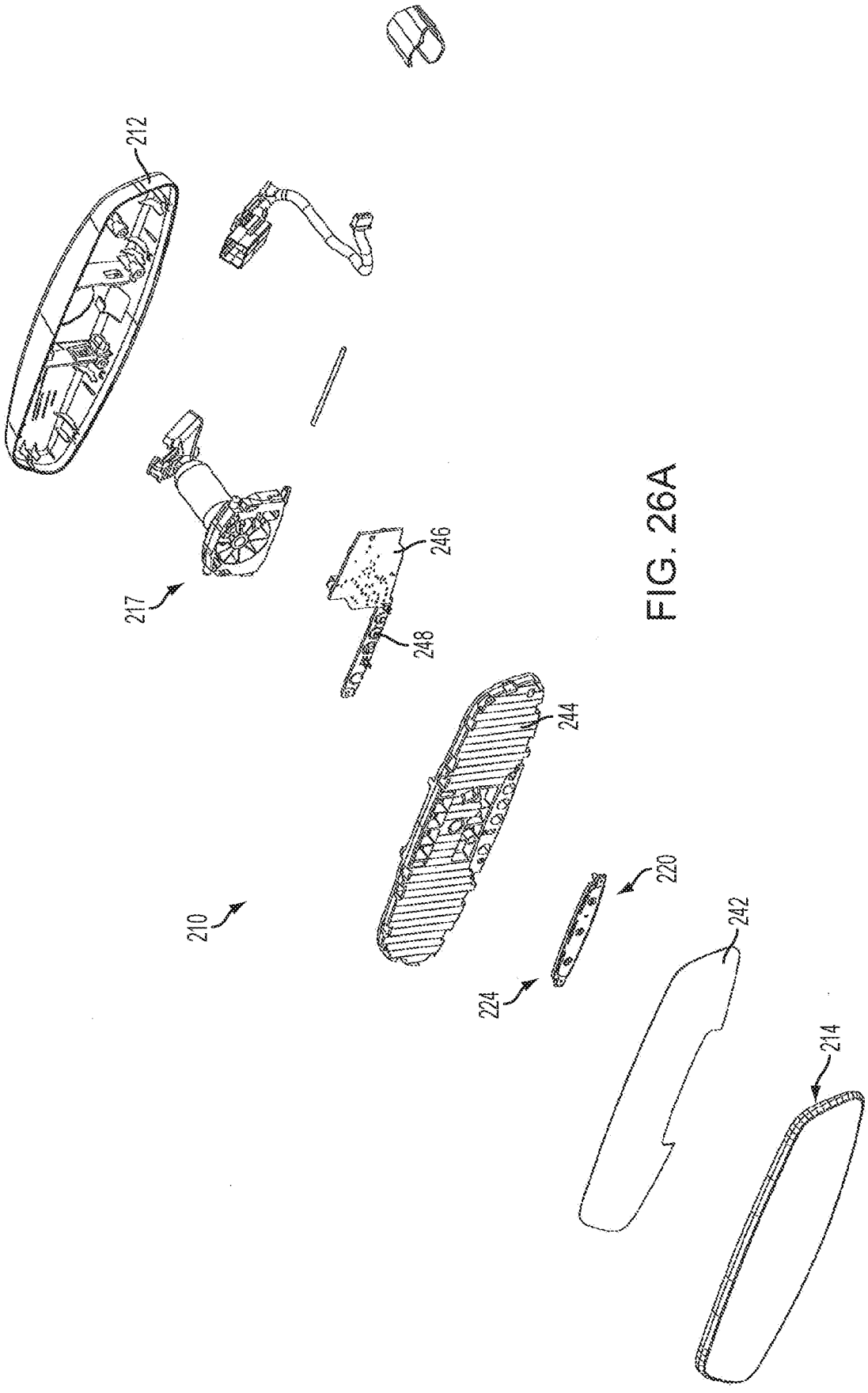

FIG. 26A

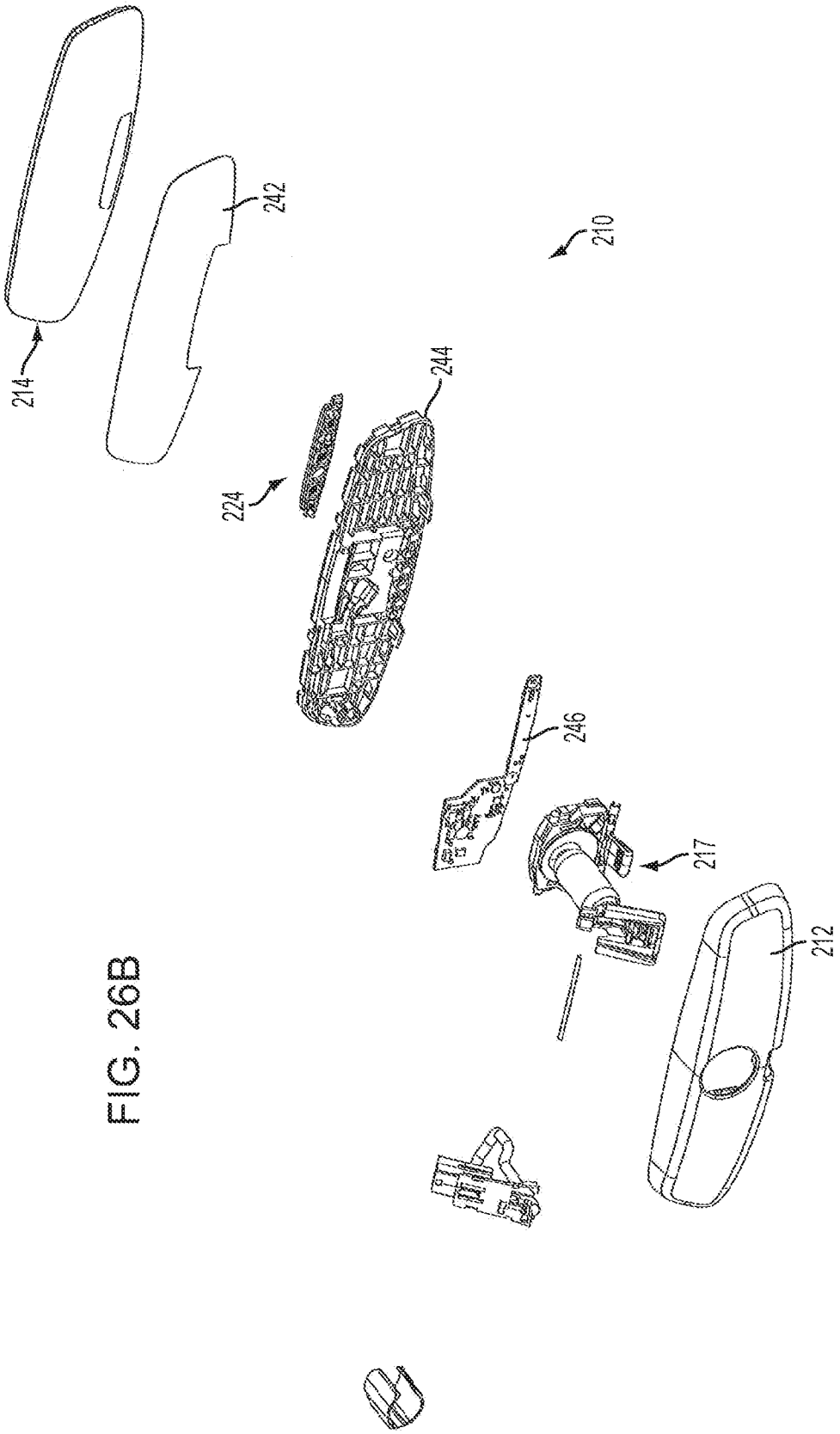

FIG. 26B

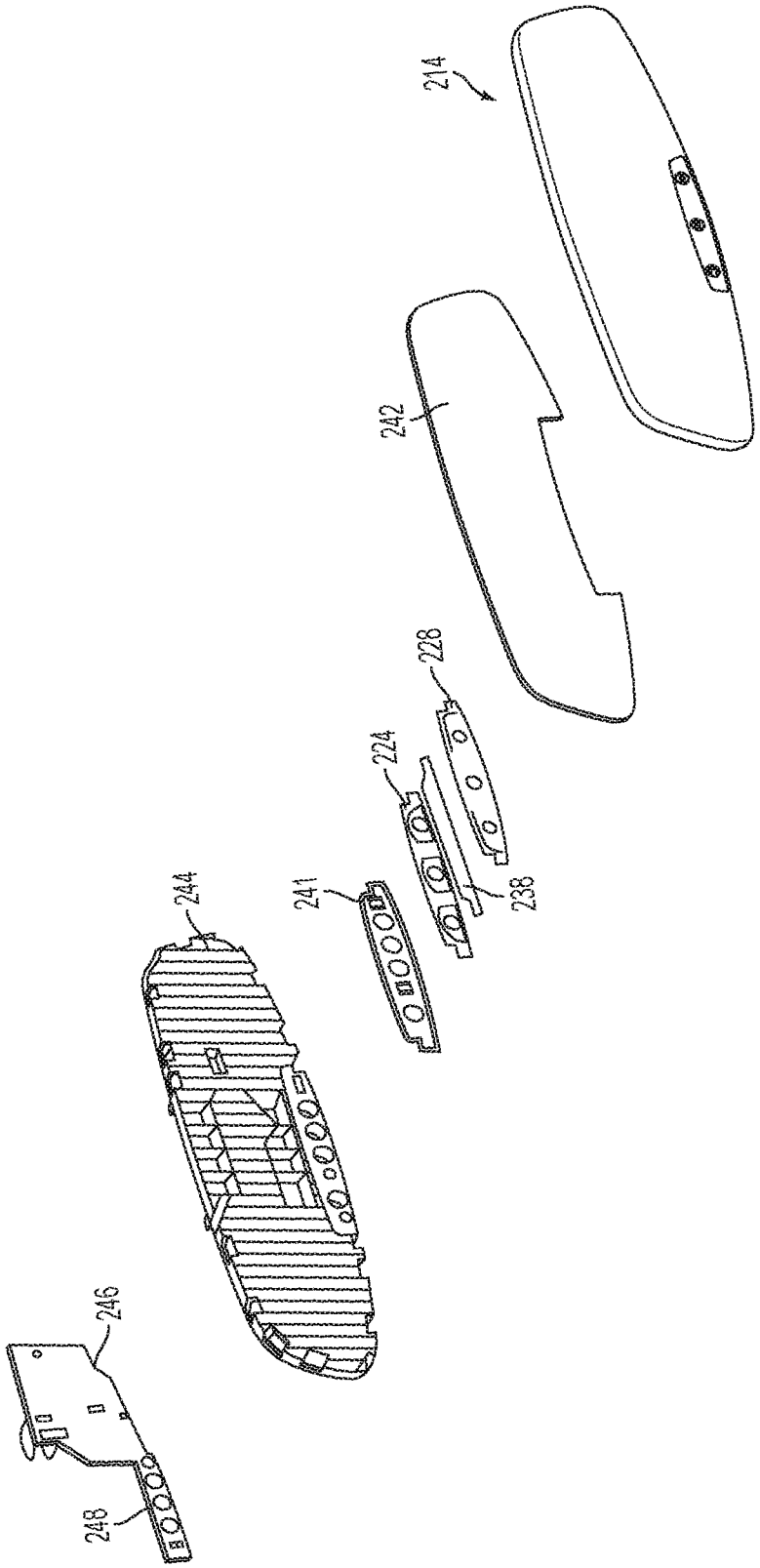

FIG. 26C

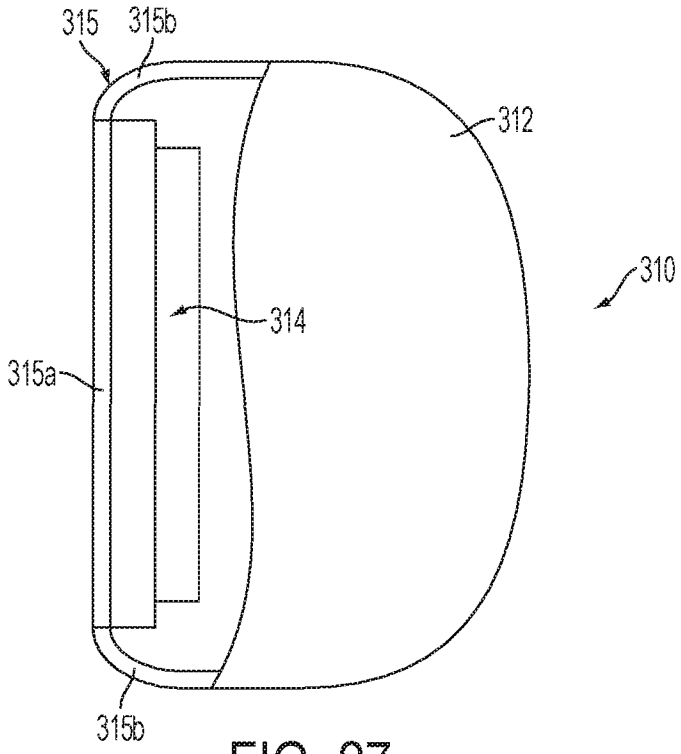

FIG. 27

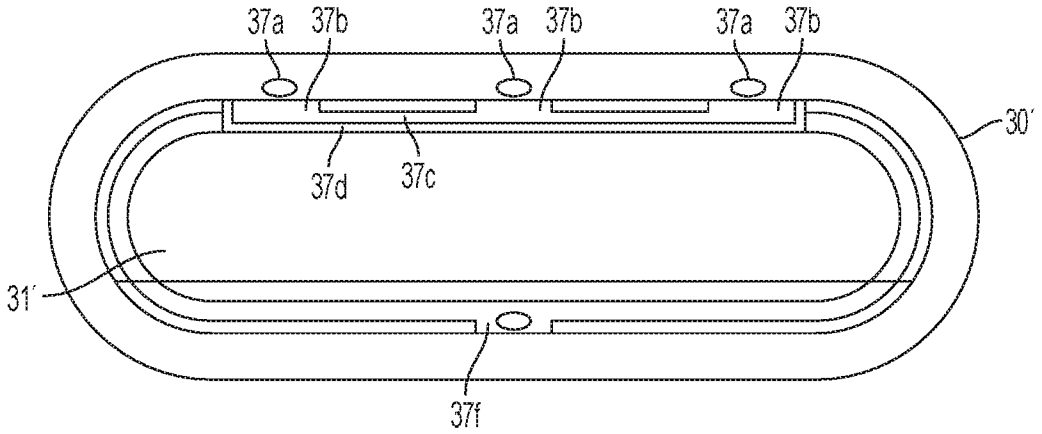
37a
37b
37a
37b
37a
37b
30'
37d
37c
31'
37f

FIG. 28

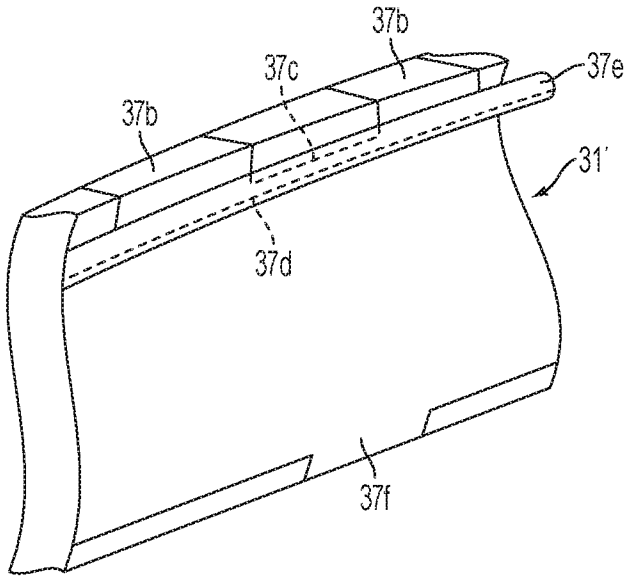
37b
37c
37e
37b
31'
37d
37f

FIG. 29

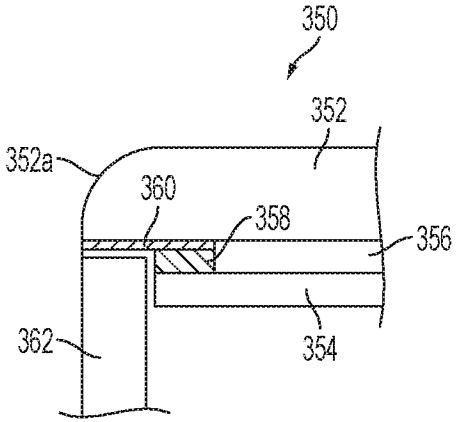

FIG. 30

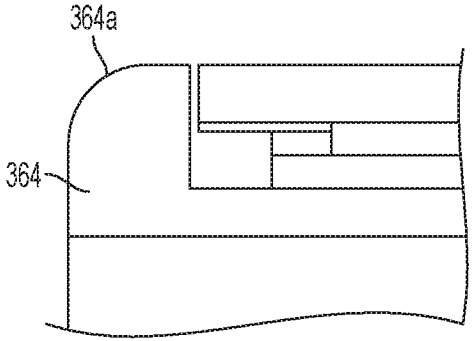

FIG. 31

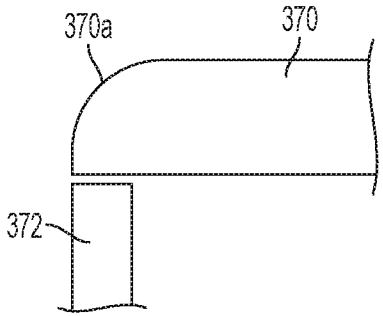

FIG. 35

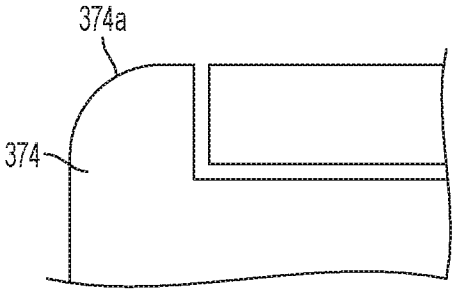

FIG. 36

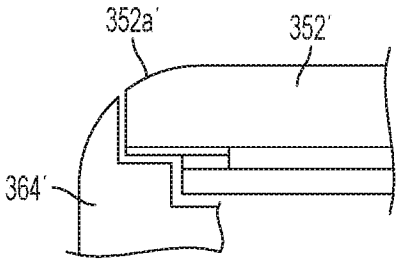

FIG. 32

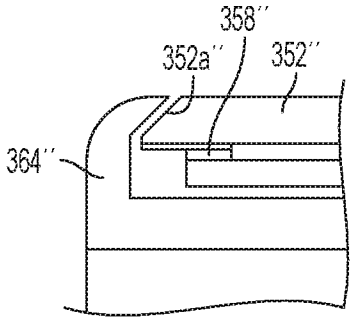

FIG. 33

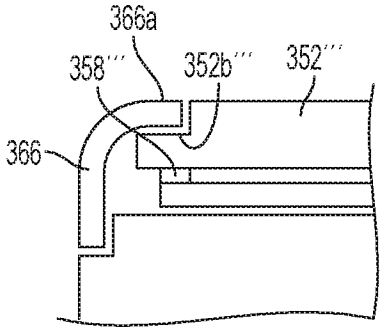

FIG. 34

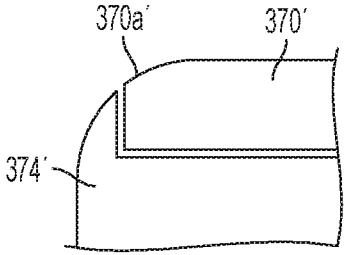

FIG. 37

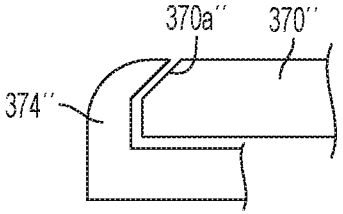

FIG. 38

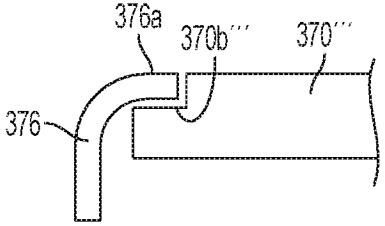

FIG. 39

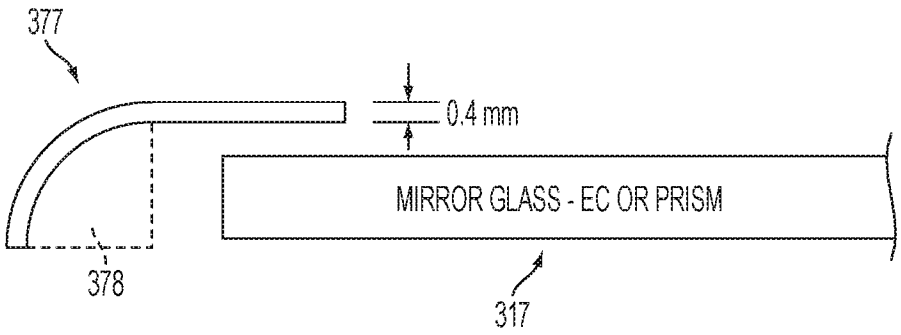

FIG. 40

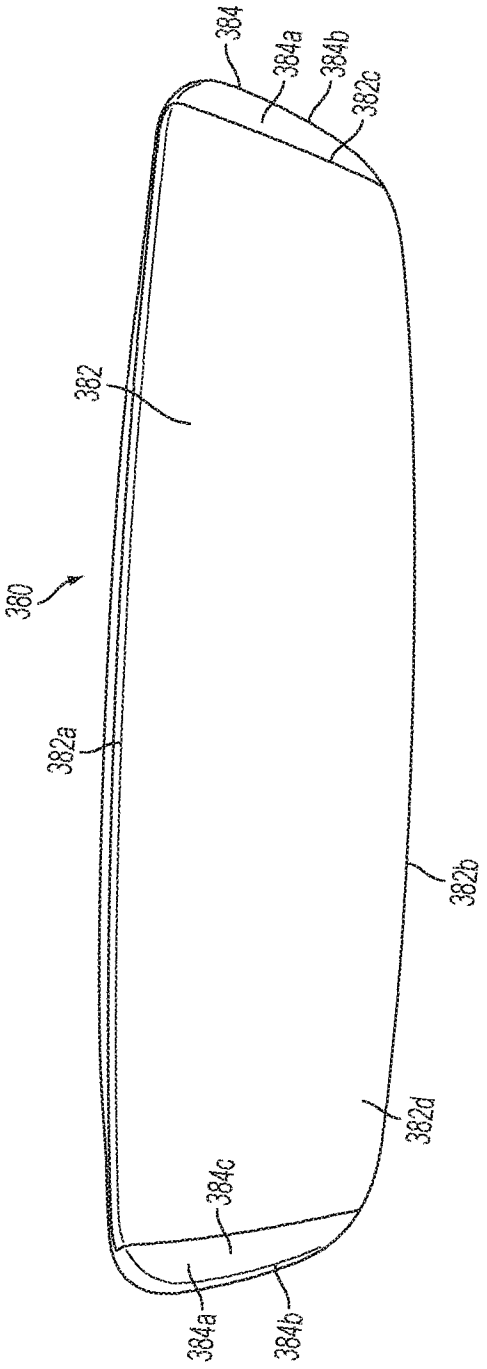

FIG. 41A

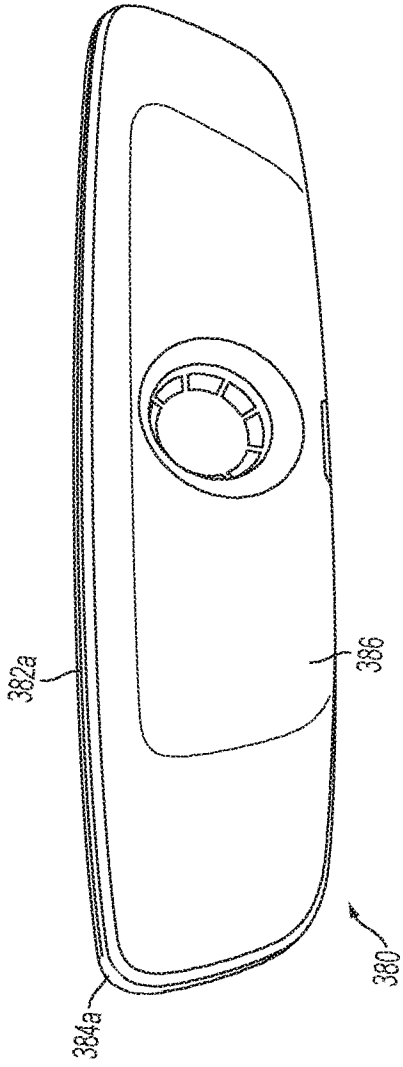

FIG. 41B

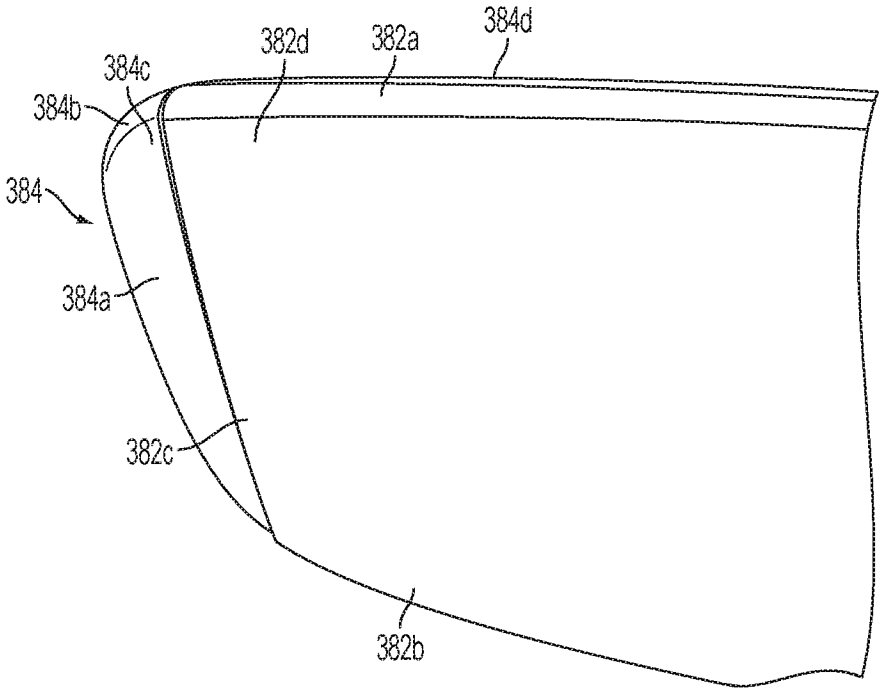

FIG. 42

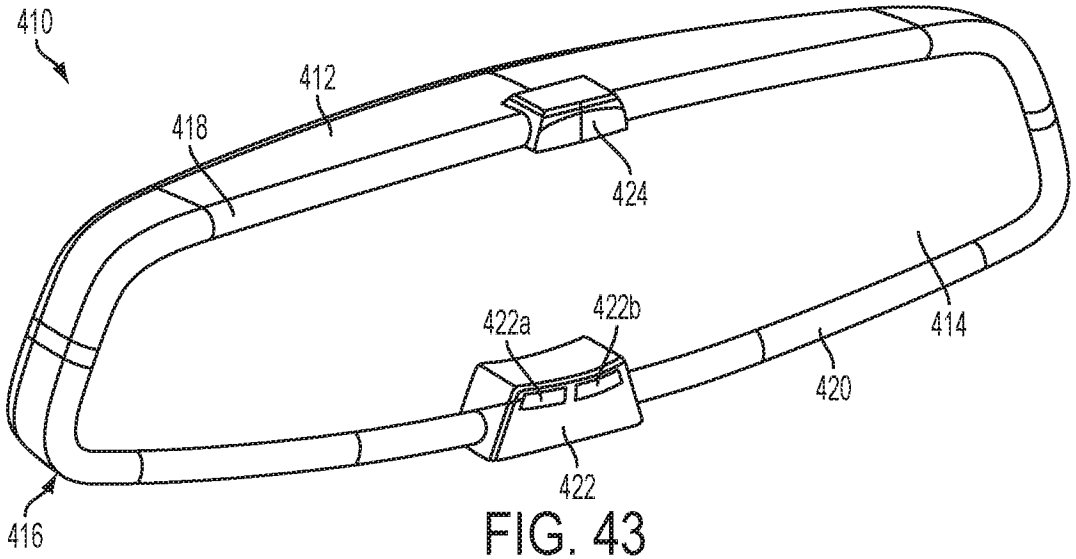
410
412
418
424
422a
422b
414
420
422
416

FIG. 43

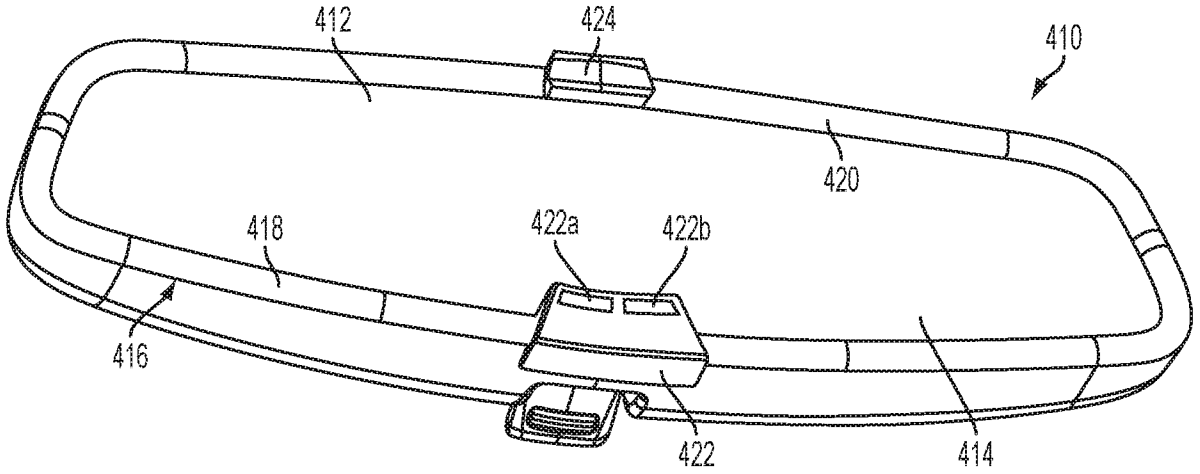
412
424
410
420
418
422a
422b
416
422
414

FIG. 44

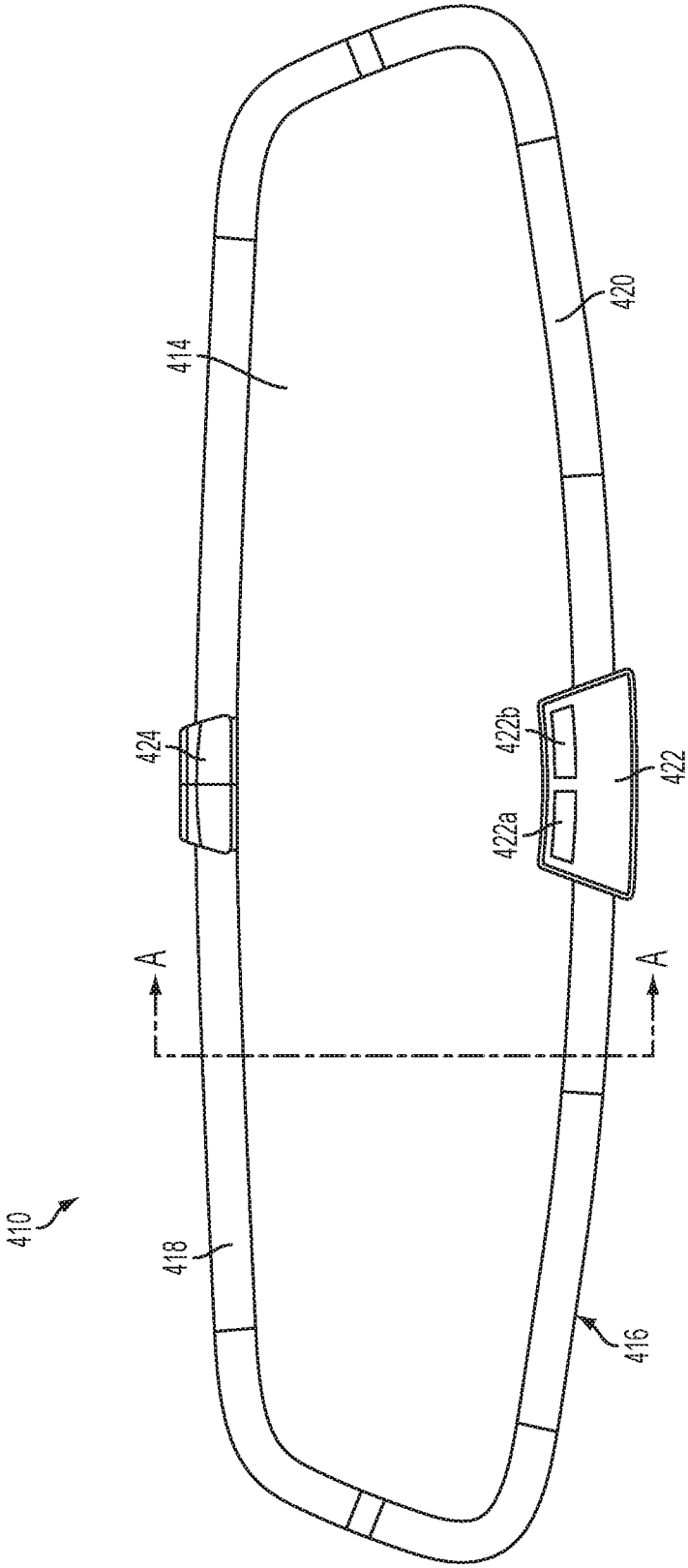

FIG. 45

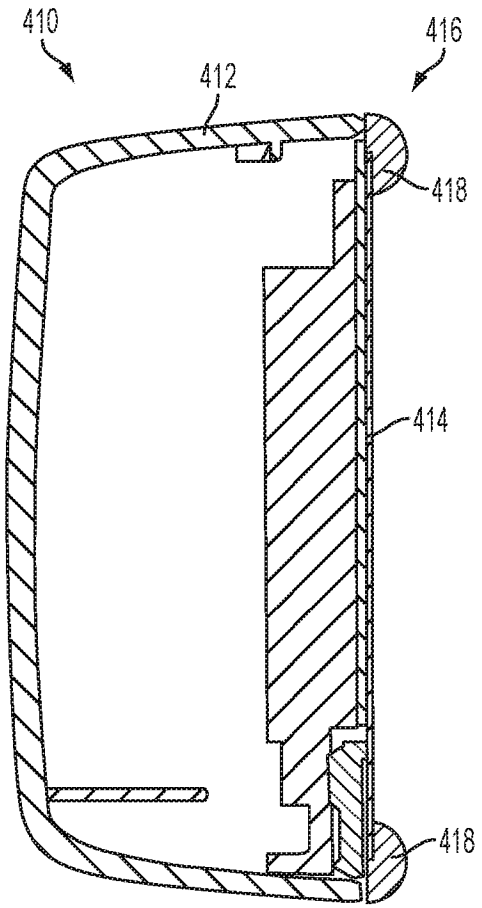

FIG. 45A

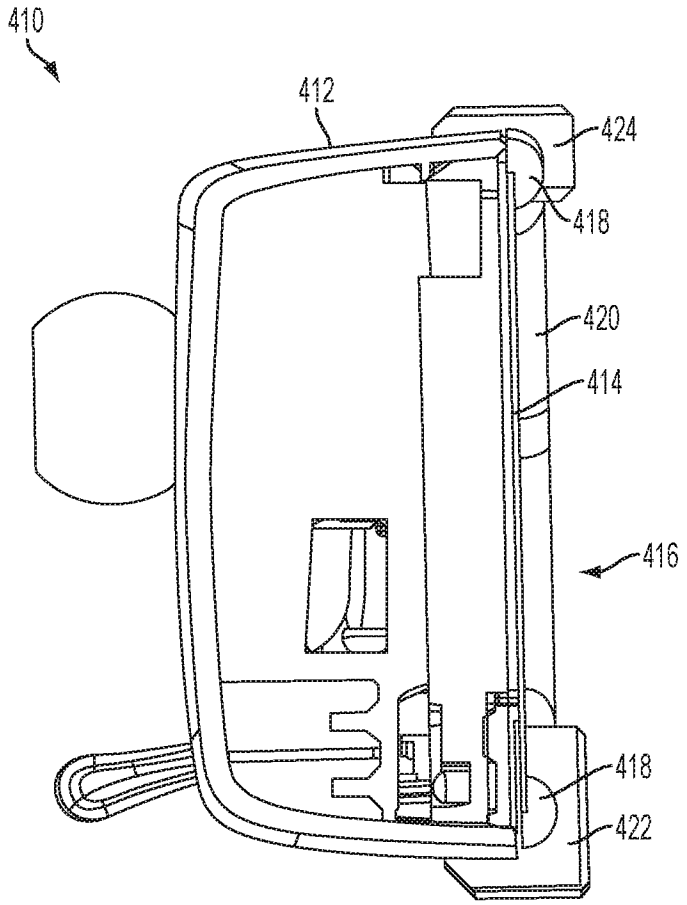

FIG. 45B

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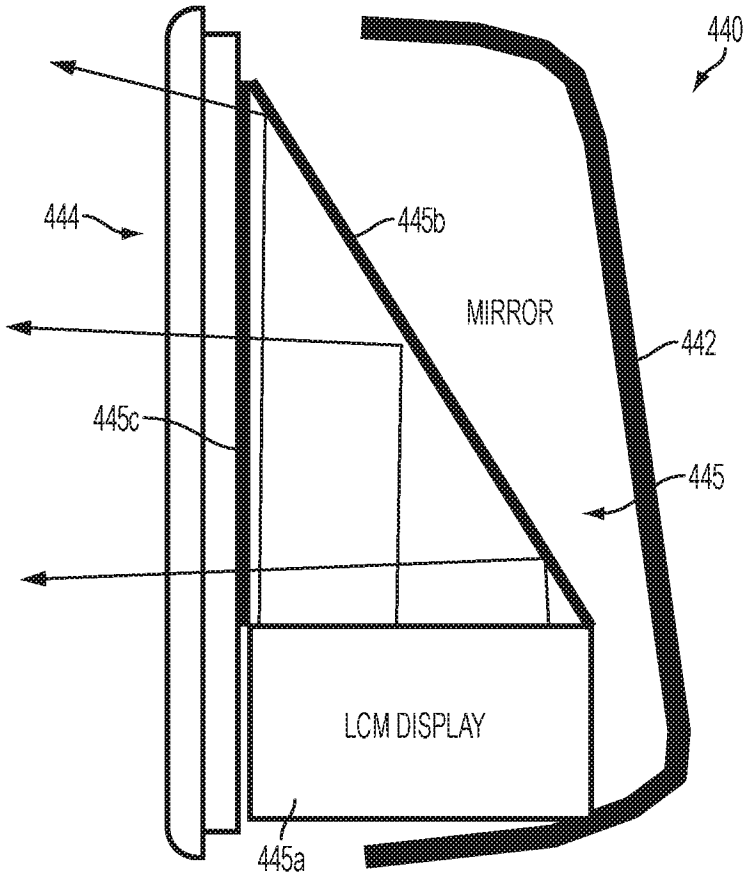

FIG. 46

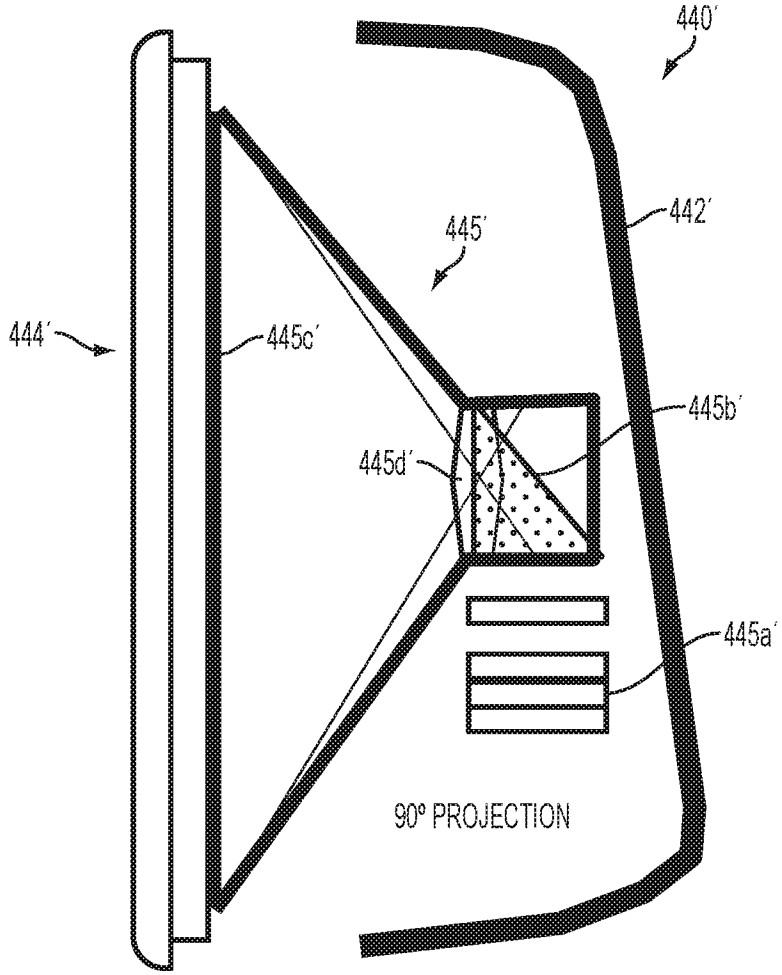

FIG. 47

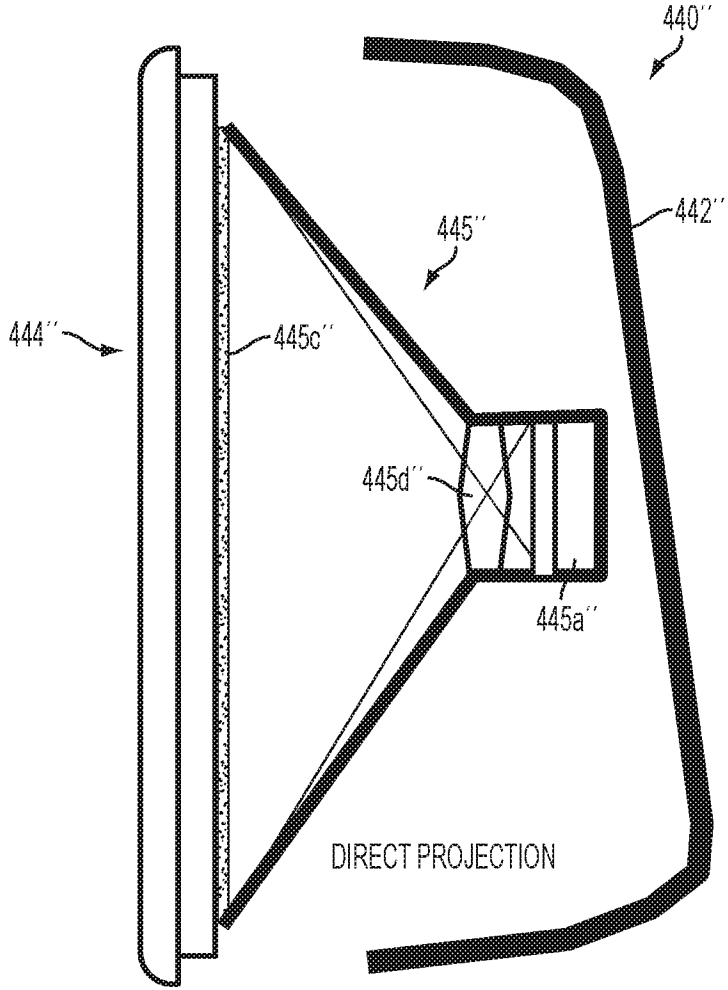

FIG. 48

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Title: EXTERIOR REARVIEW MIRROR ASSEMBLY
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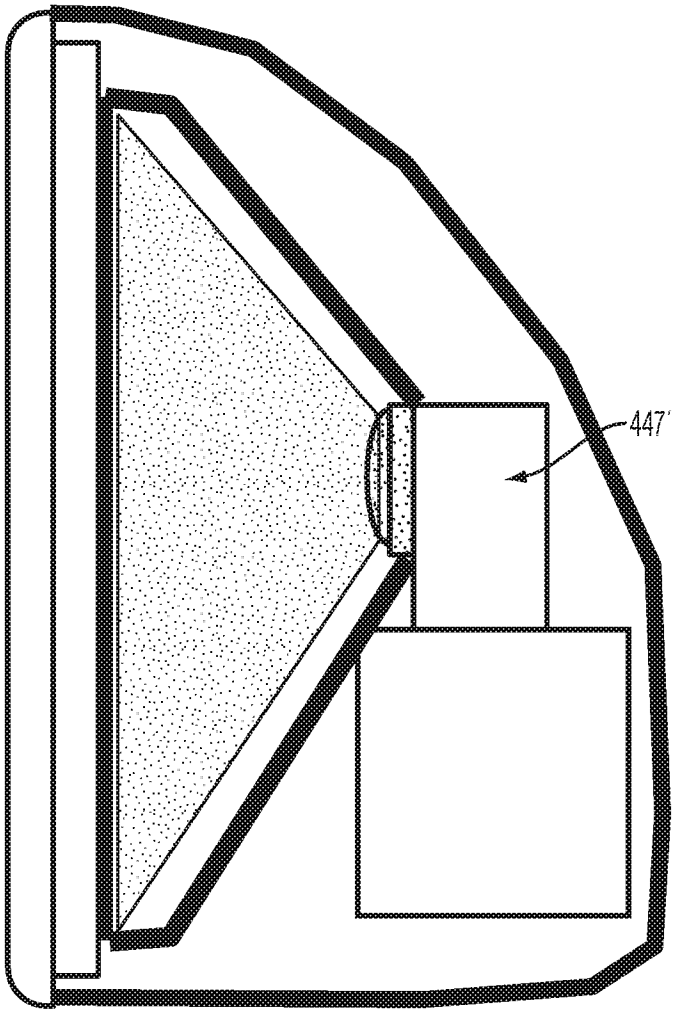


FIG. 49

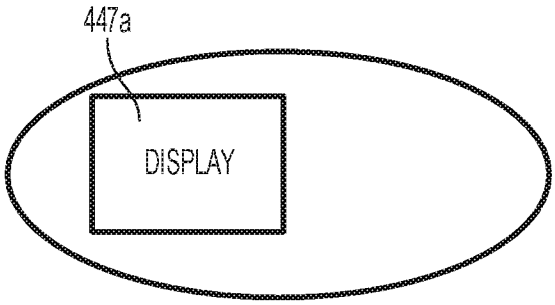


FIG. 50A

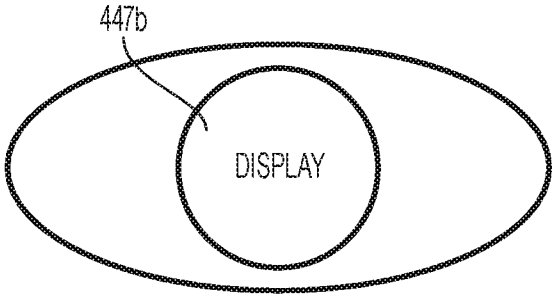


FIG. 50B

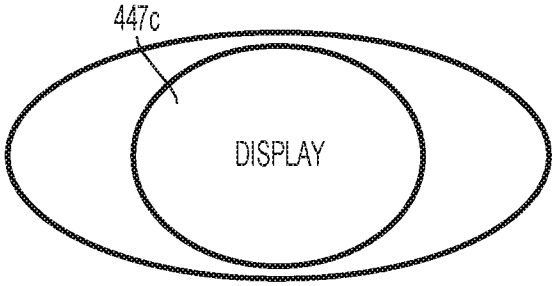


FIG. 50C

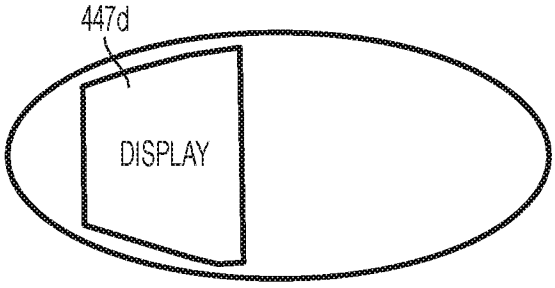


FIG. 50D

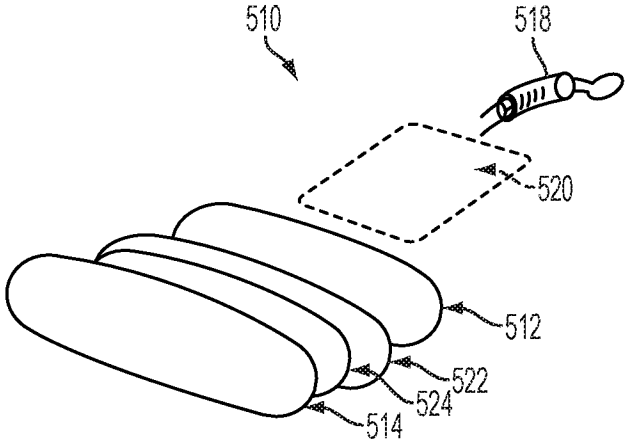


FIG. 51

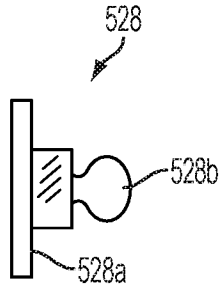


FIG. 52A

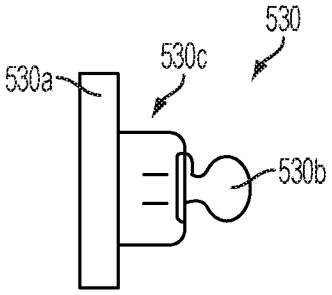


FIG. 52B

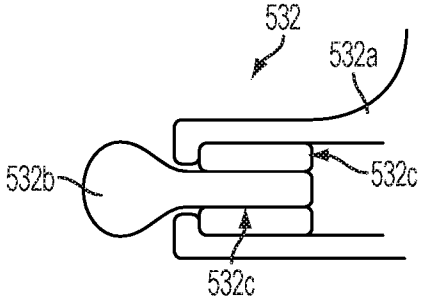


FIG. 52C

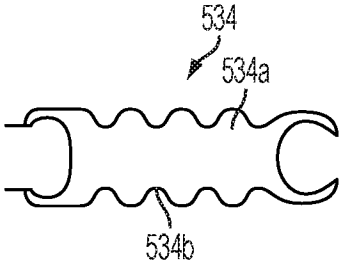


FIG. 52D

- COIL SPRING TO REPLACE CURRENT "C" SPLIT RING SPRING
- EAU SCENARIOS:
  - 100K
  - 200K
  - 500K
  - 1M
- MATERIAL: MUSIC WIRE ASTM A228
  - Ø0.086" (Ø2.1844mm) STARTING POINT
- FINISH: BLACK ZINC OR BLACK OXIDE - TBD
- INSIDE DIAMETER ~26.3mm
- **KEY RING STYLE FORMING**
  - FLAT / PARALLEL END PRODUCT
  - ~4.37mm OVERALL HEIGHT

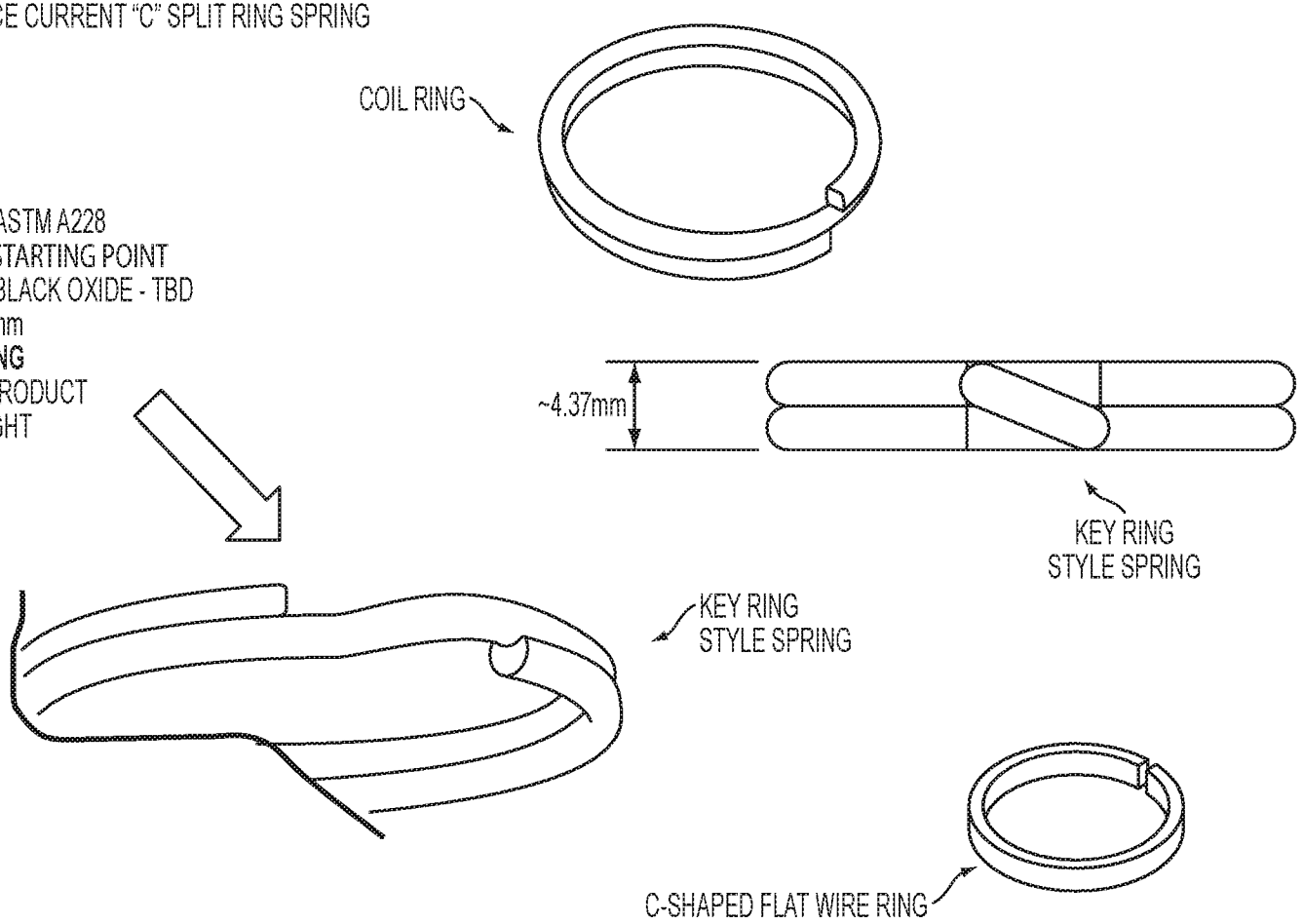


FIG. 52E

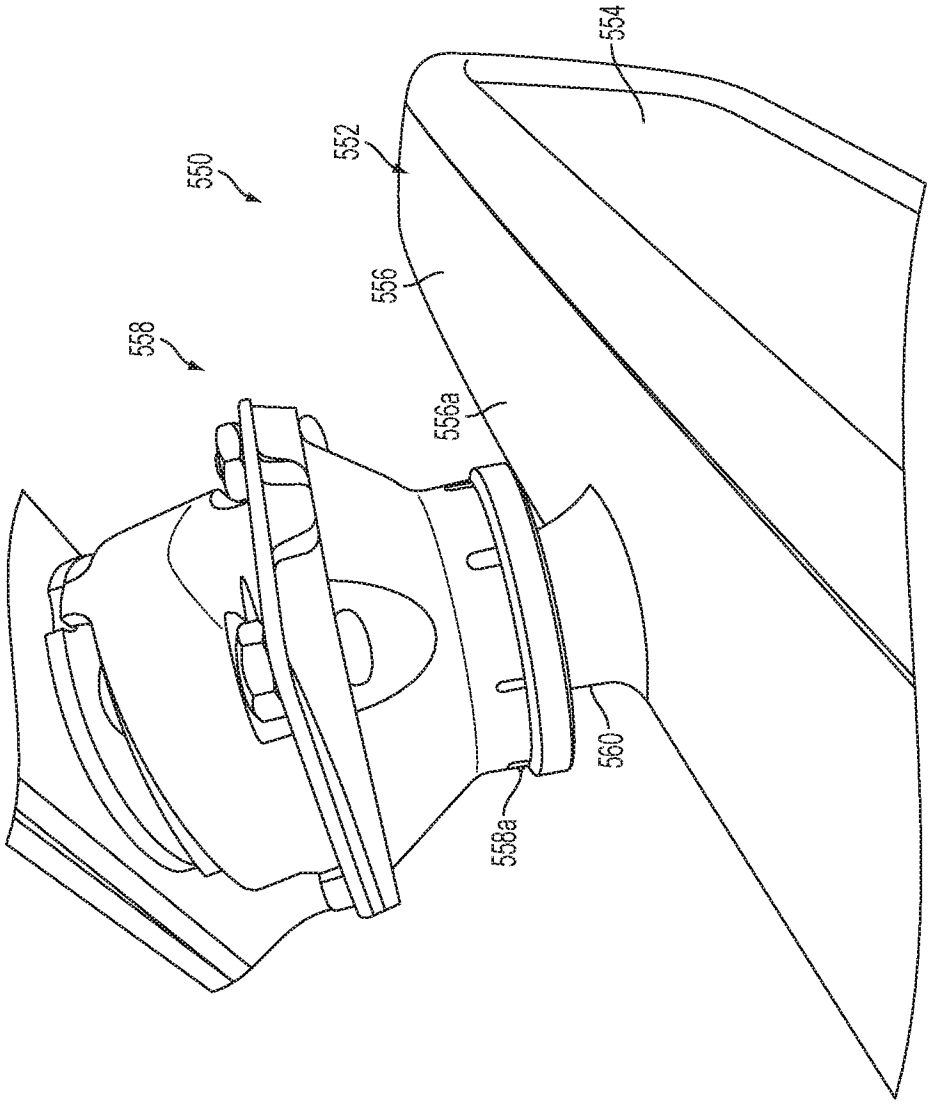


FIG. 53

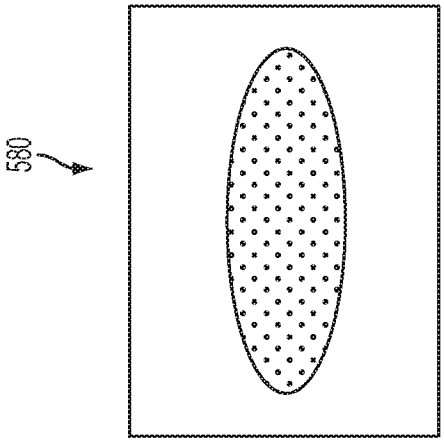


FIG. 55

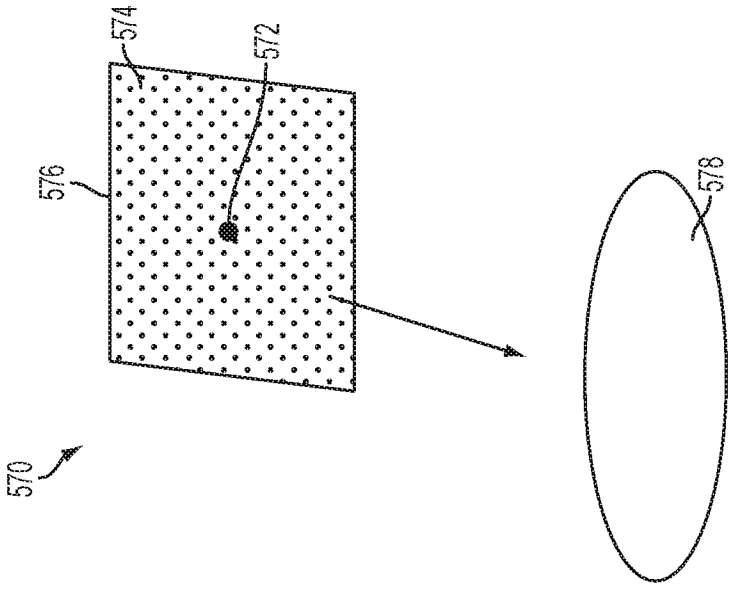


FIG. 54

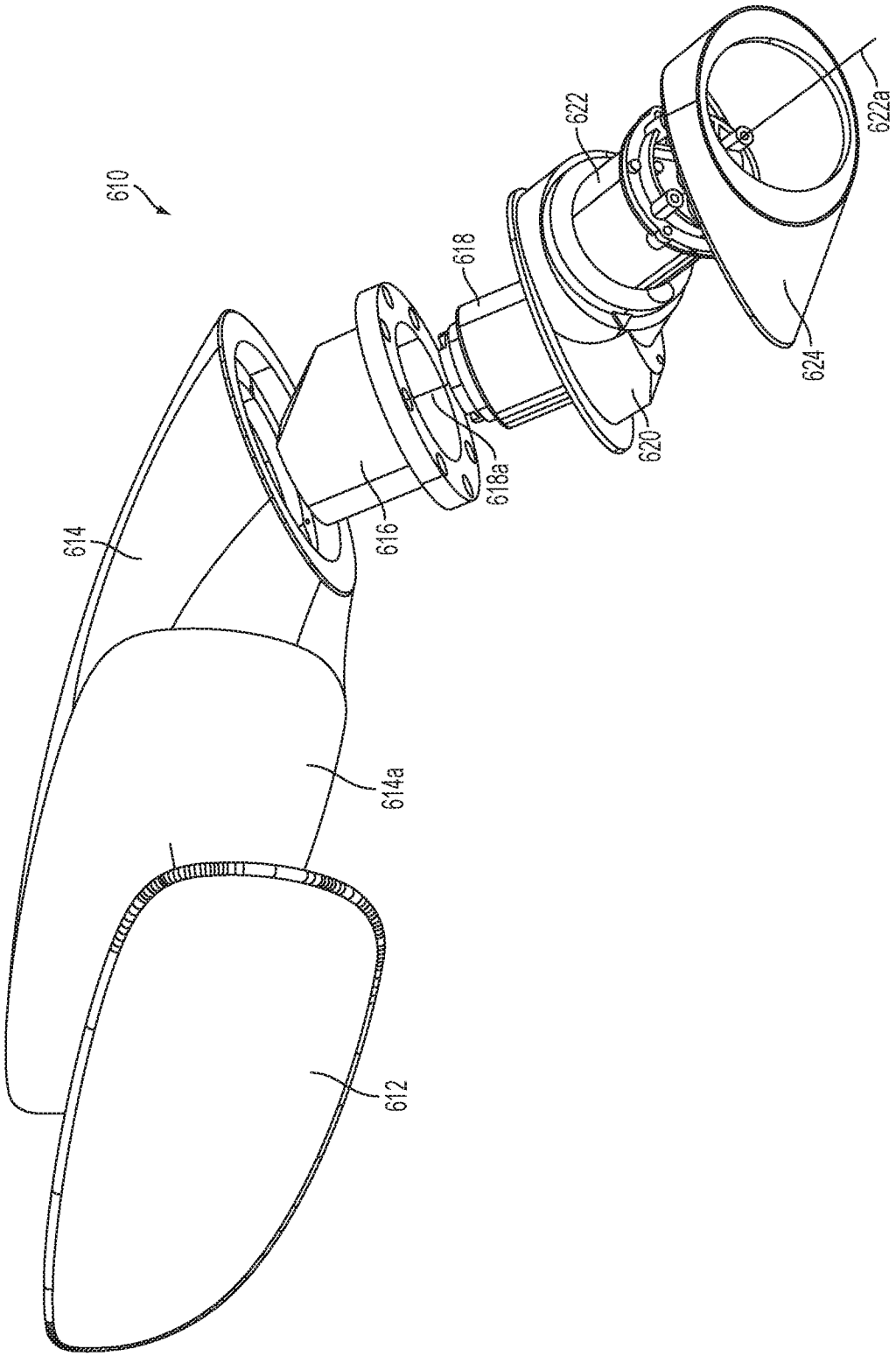


FIG. 56

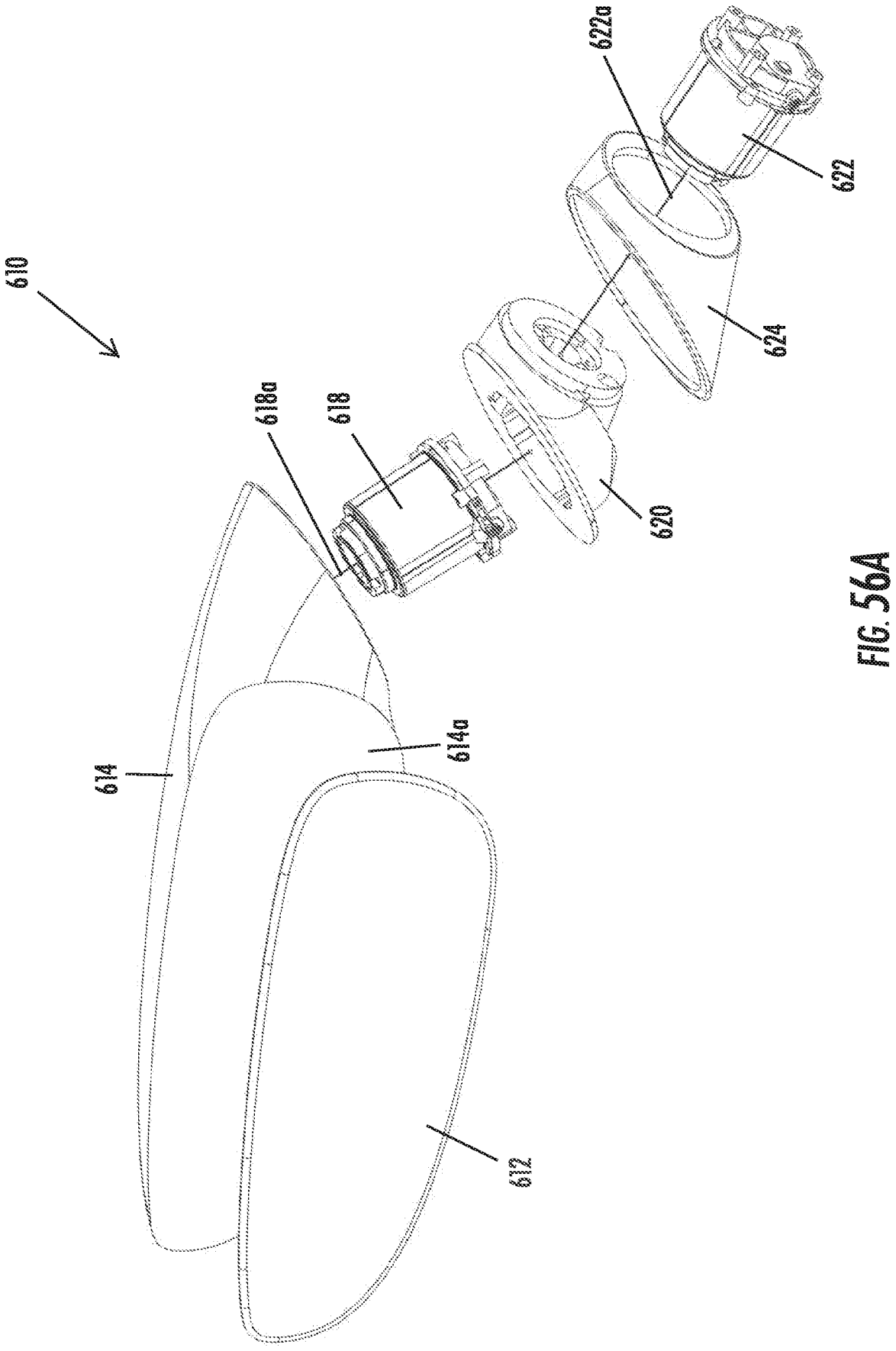


FIG. 56A

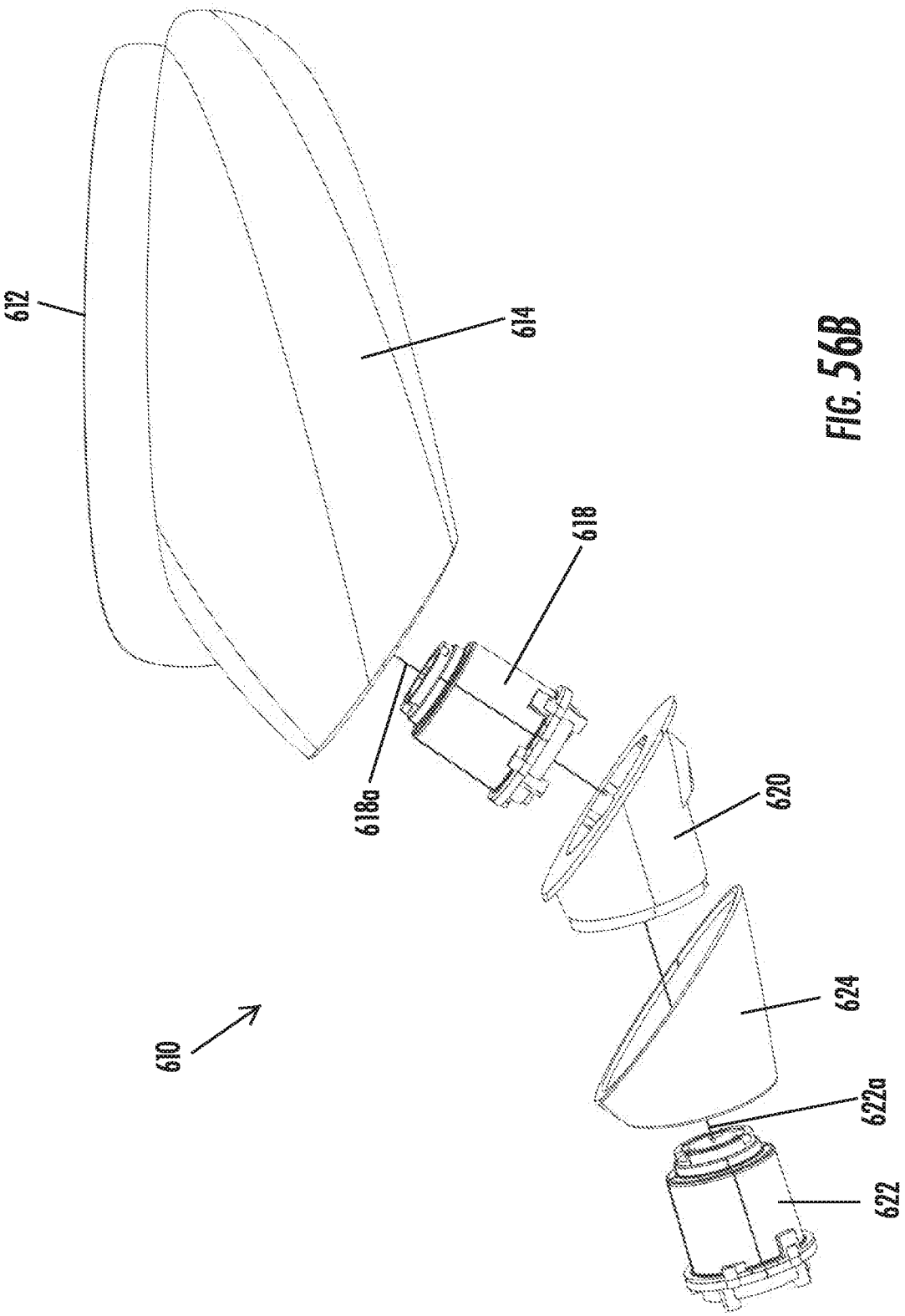


FIG. 56B

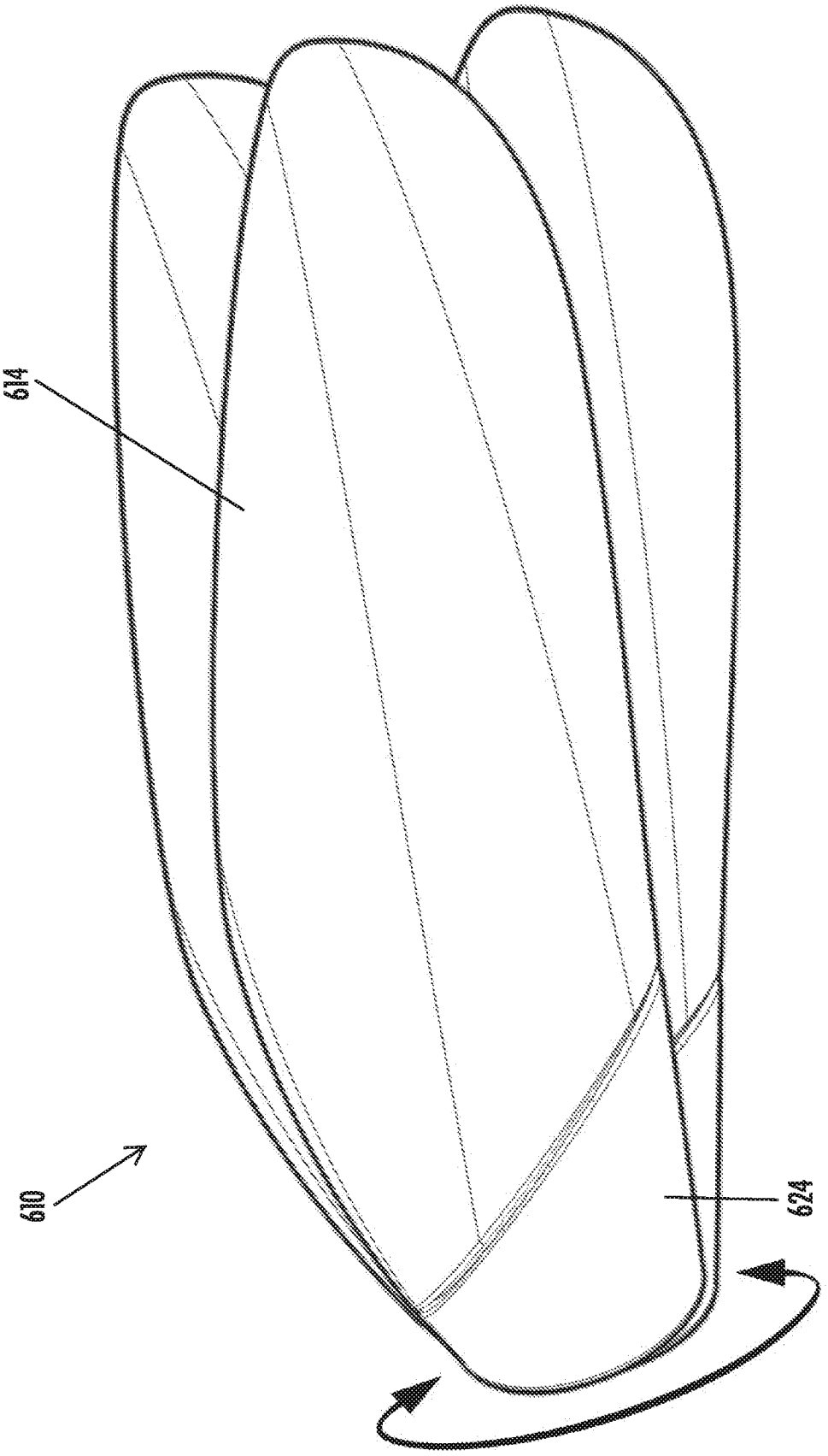


FIG. 57 +/-15 degree tip (only tip actuator required)

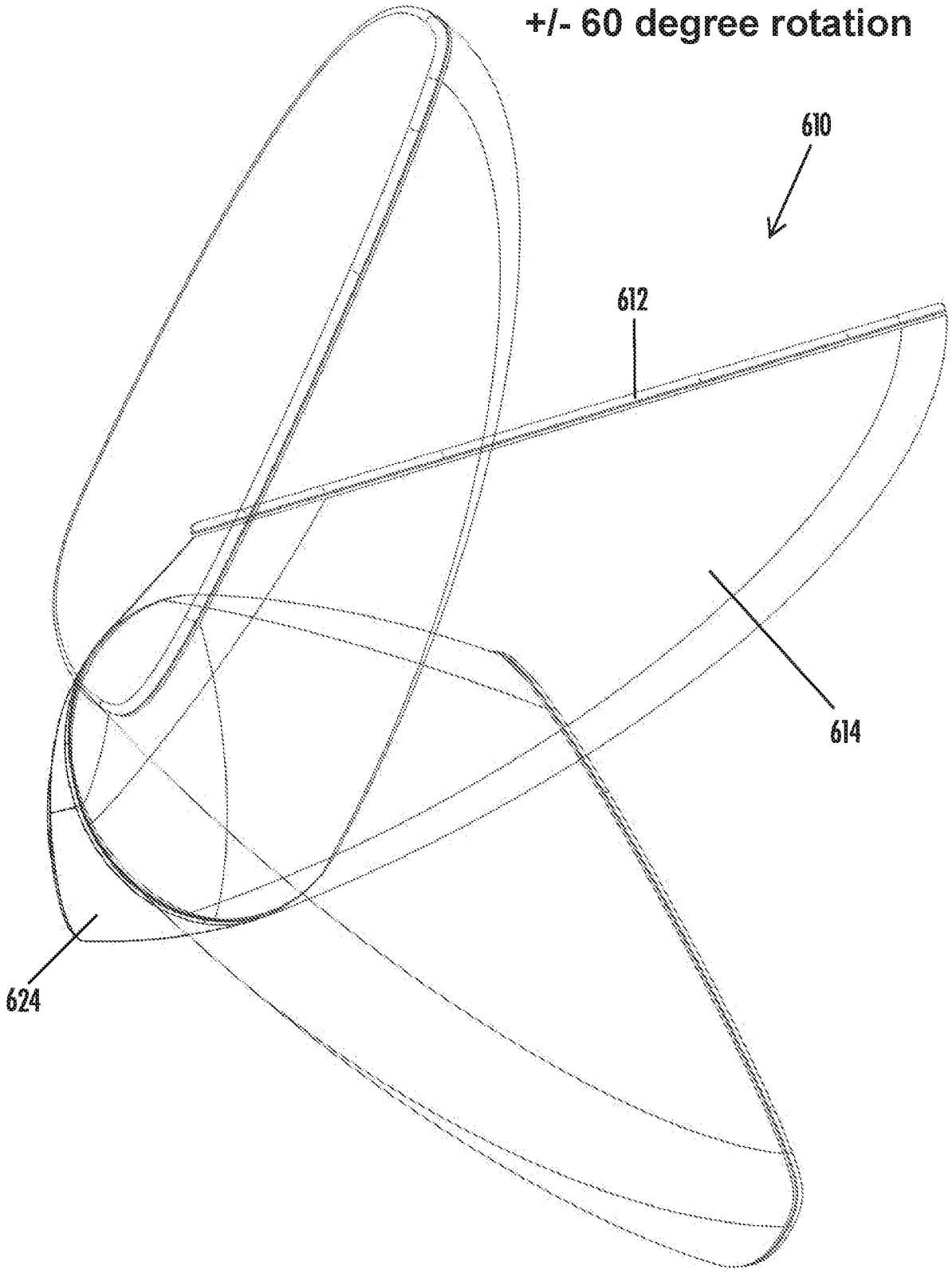
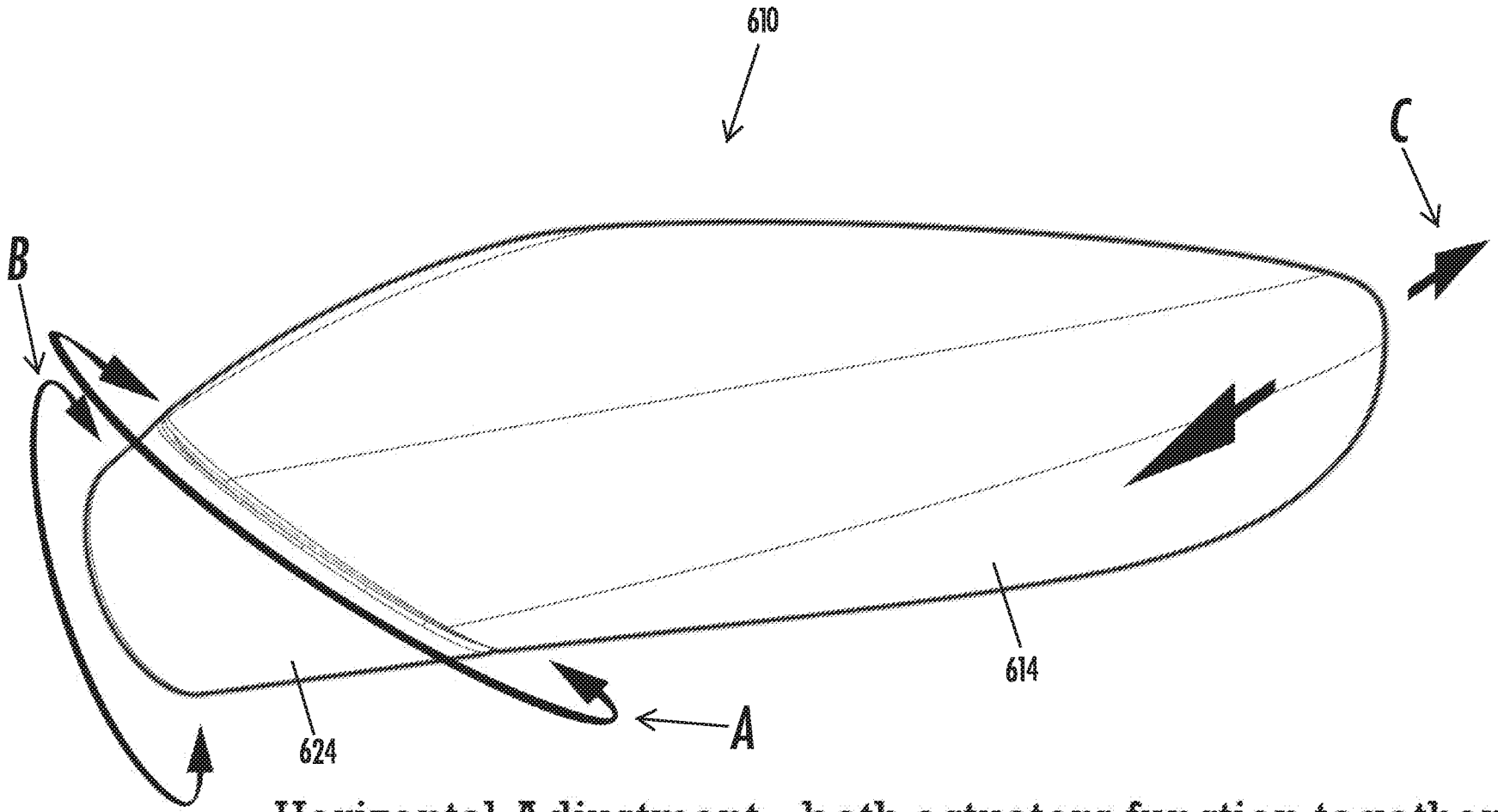


FIG. 58A



Horizontal Adjustment - both actuators function together at different speeds to maintain constant tip angle.

FIG. 58B

Inventors: John T. Uken et al.
Title: EXTERIOR REARVIEW MIRROR ASSEMBLY
Docket No.: DON01 P-2803
Sheet No.: 43/74

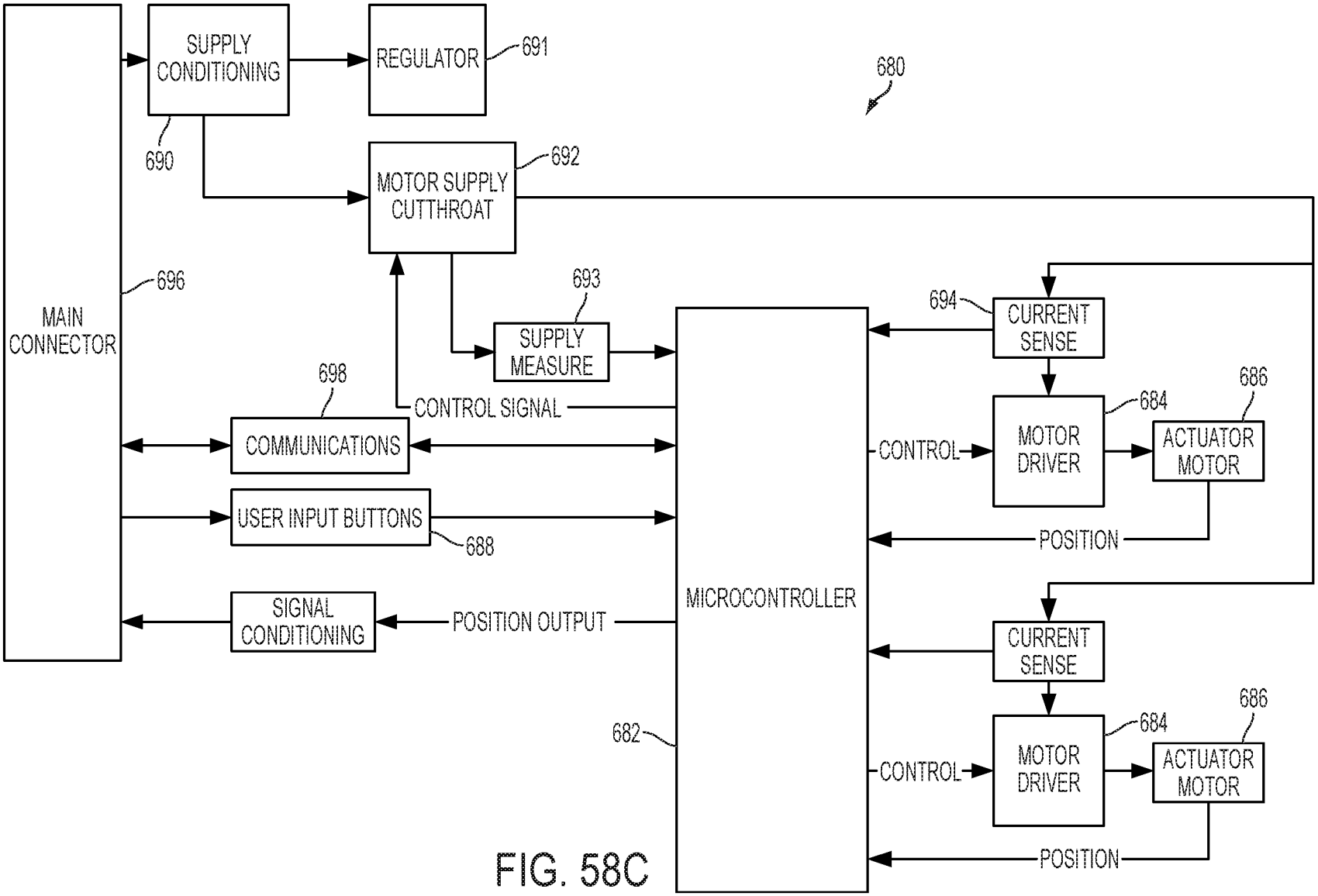


FIG. 58C

Inventors: John T. Uken et al.
Title: EXTERIOR REARVIEW MIRROR ASSEMBLY
Docket No.: DON01 P-2803
Sheet No.: 44/74

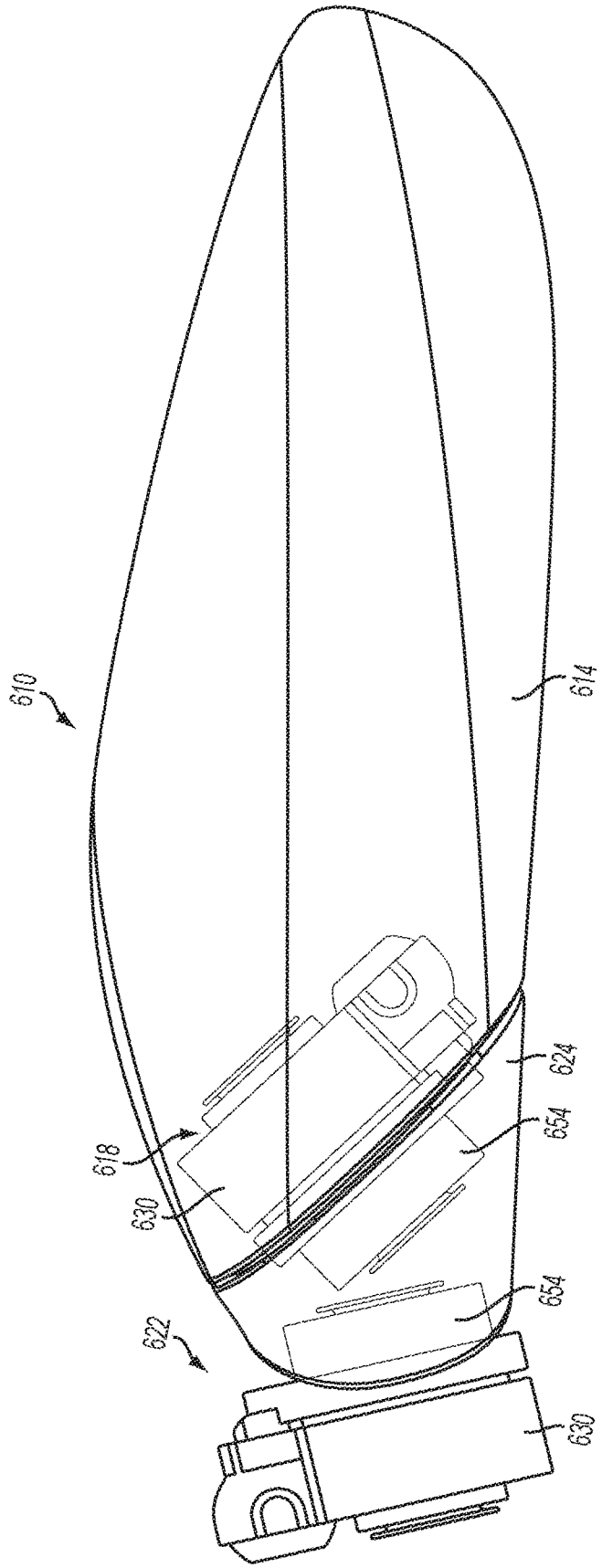


FIG. 59

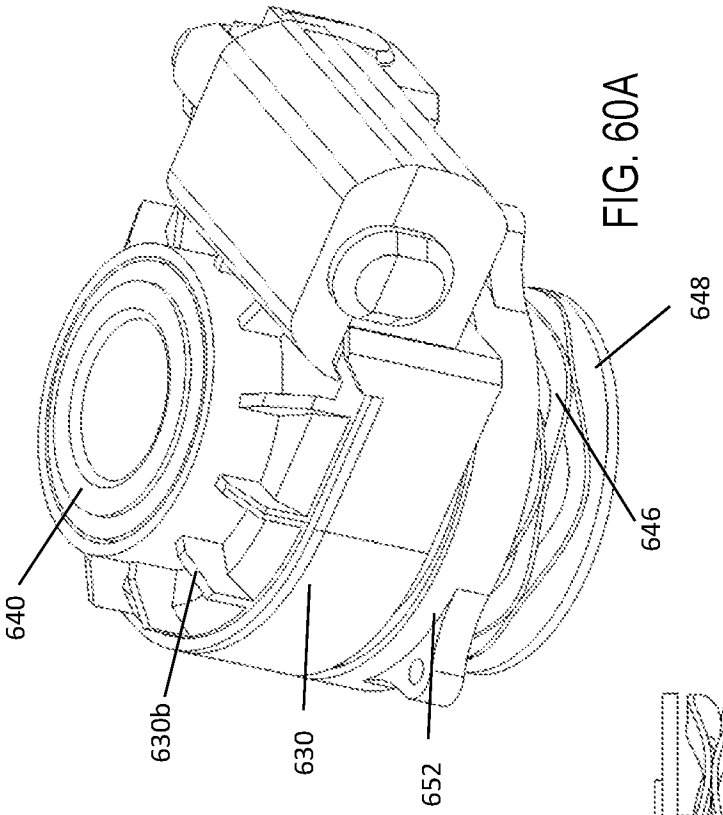


FIG. 60A

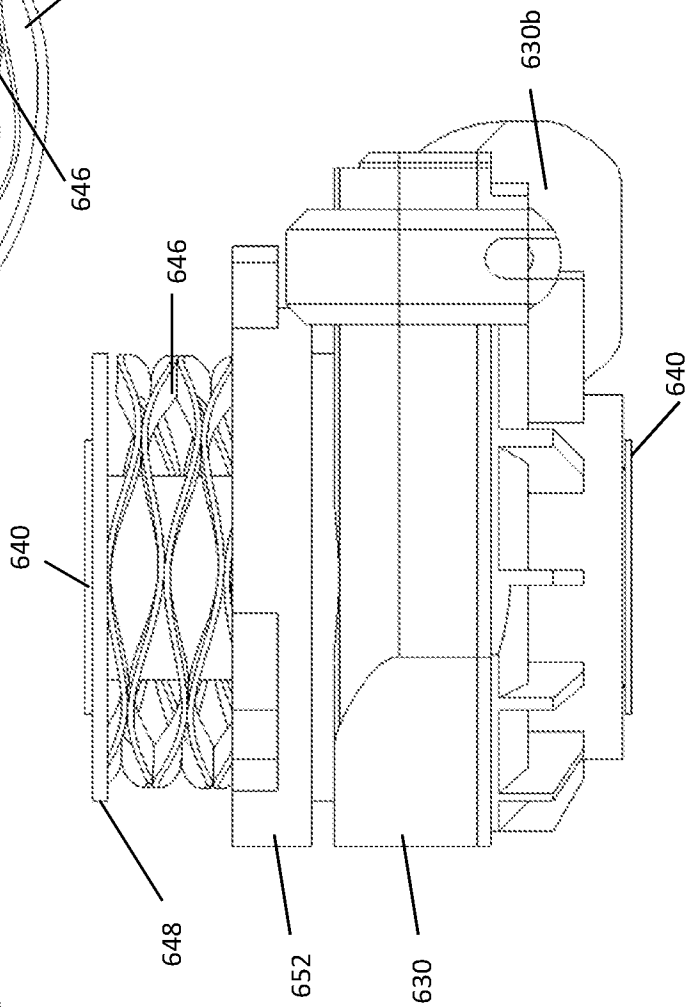


FIG. 60B

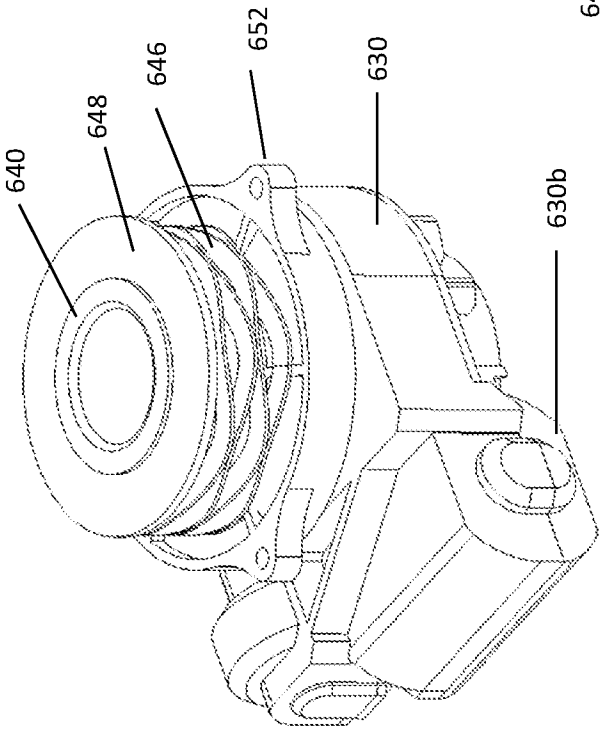
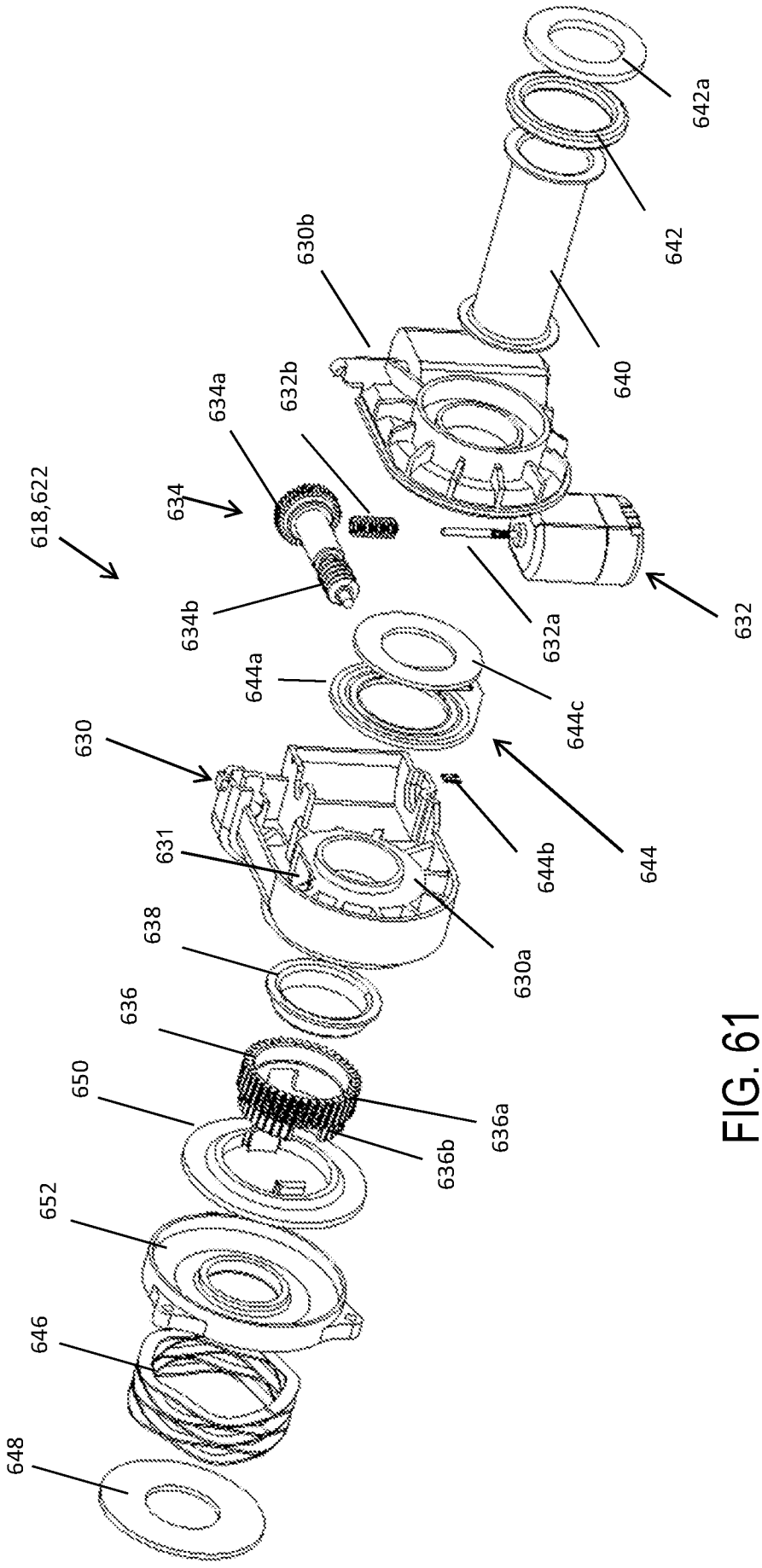


FIG. 60C


642a
642
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634a
632b
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618,622
634b
632a
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644a
644c
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644b
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631
638
630a
636
650
636a
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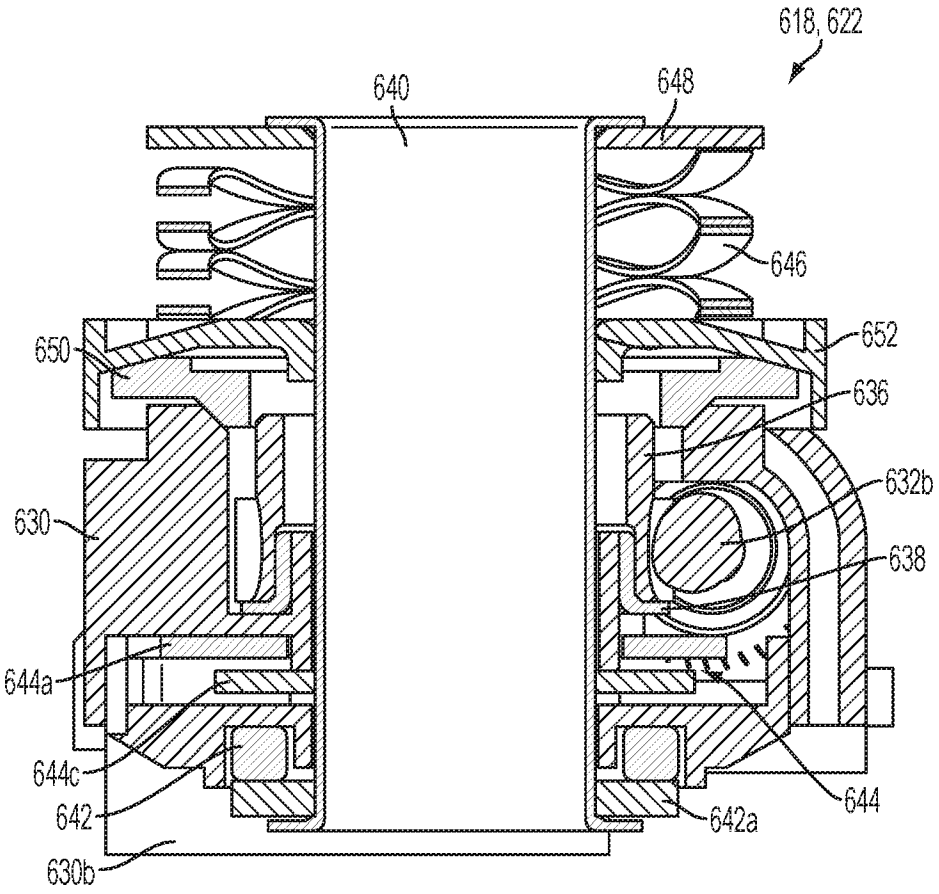
652
646
648

FIG. 61


618, 622
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646
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632b
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638
644a
644c
642
644
642a
630b

FIG. 62

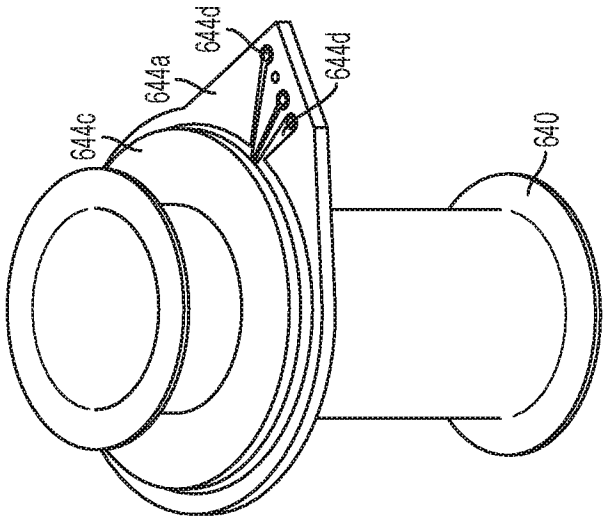


FIG. 64

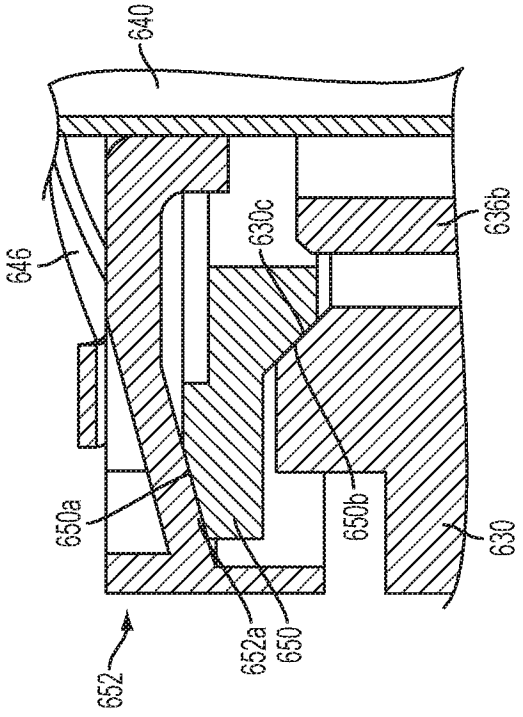


FIG. 63

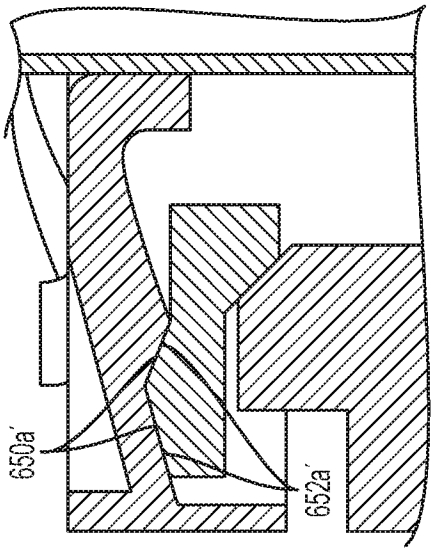


FIG. 63A

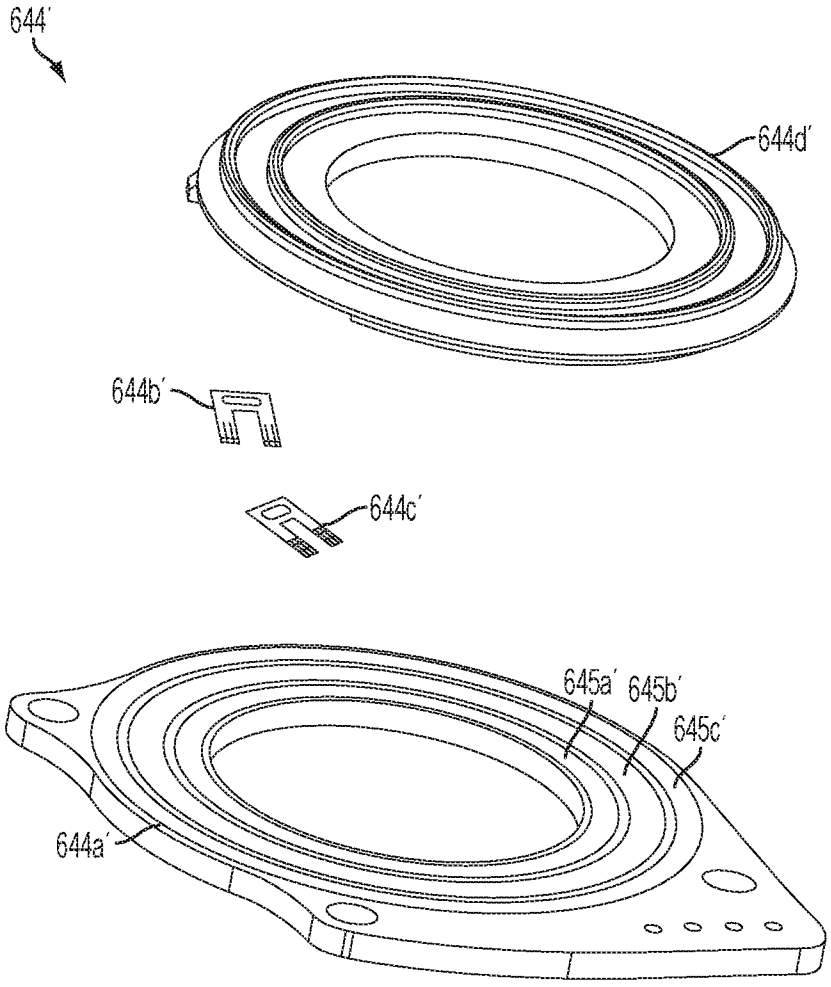


FIG. 64A

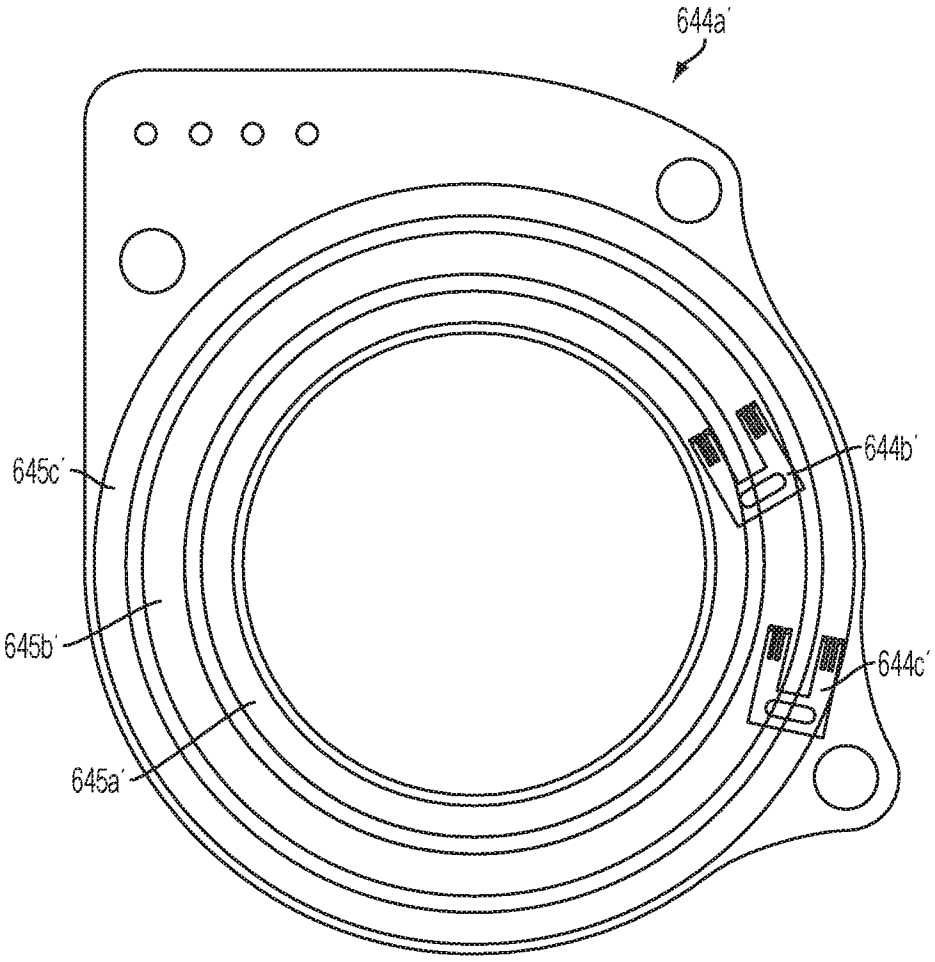


FIG. 64B

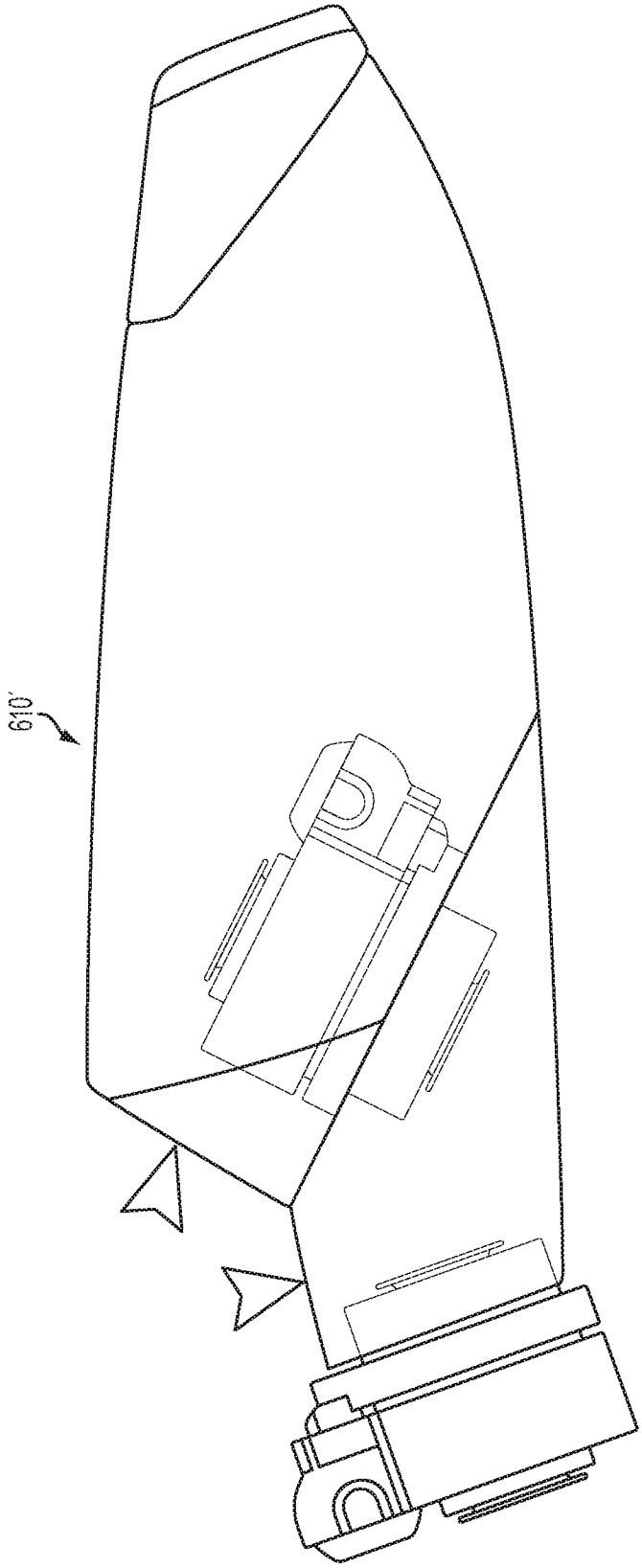


FIG. 65A

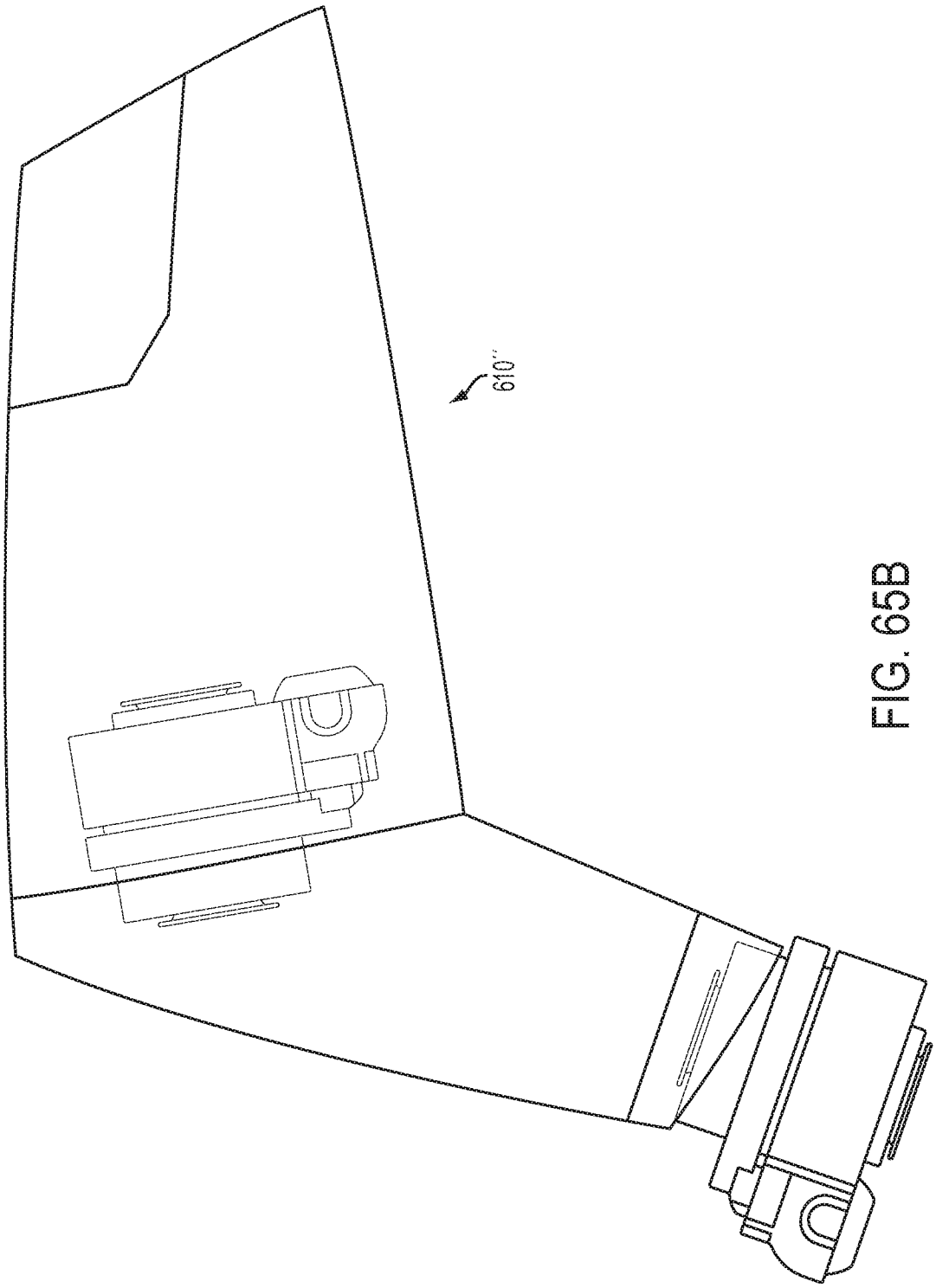


FIG. 65B

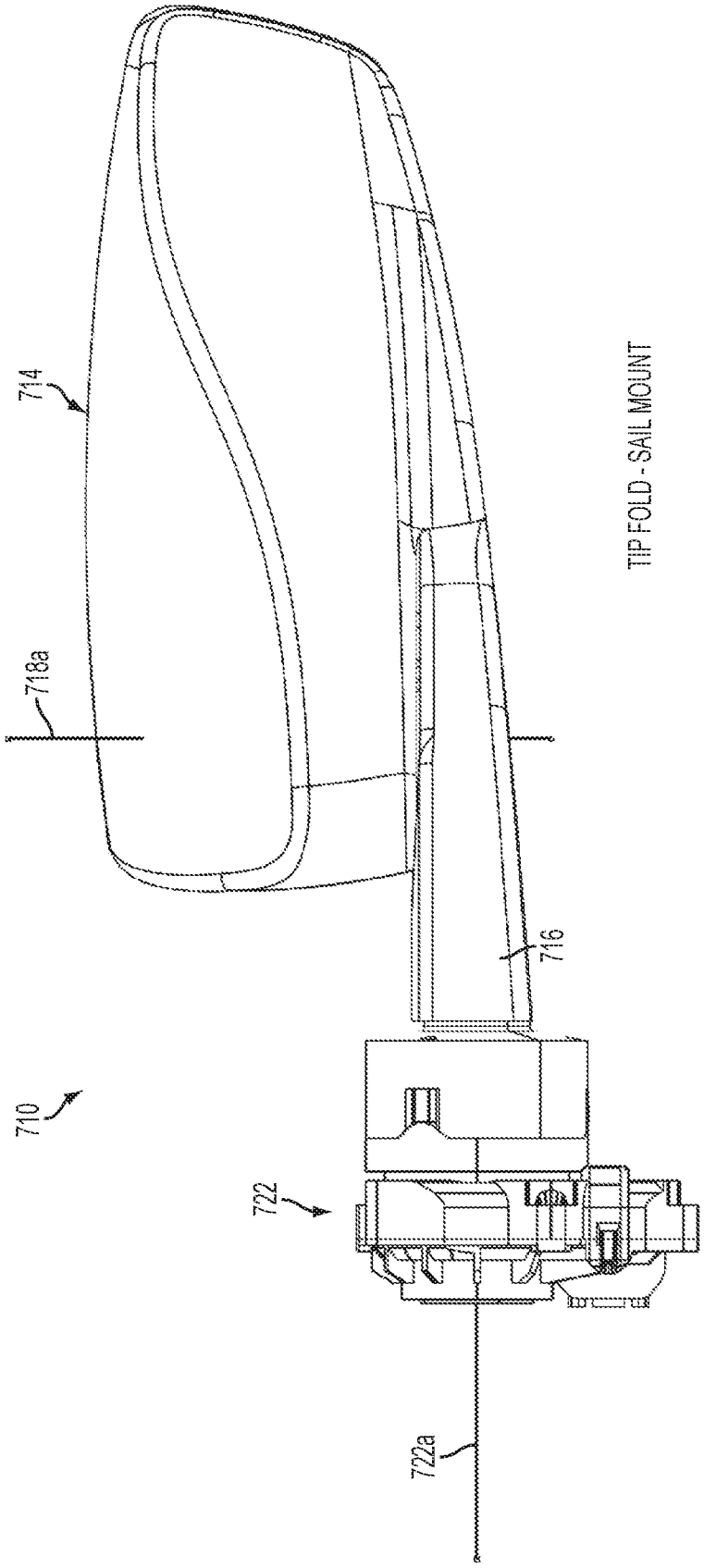


FIG. 66A

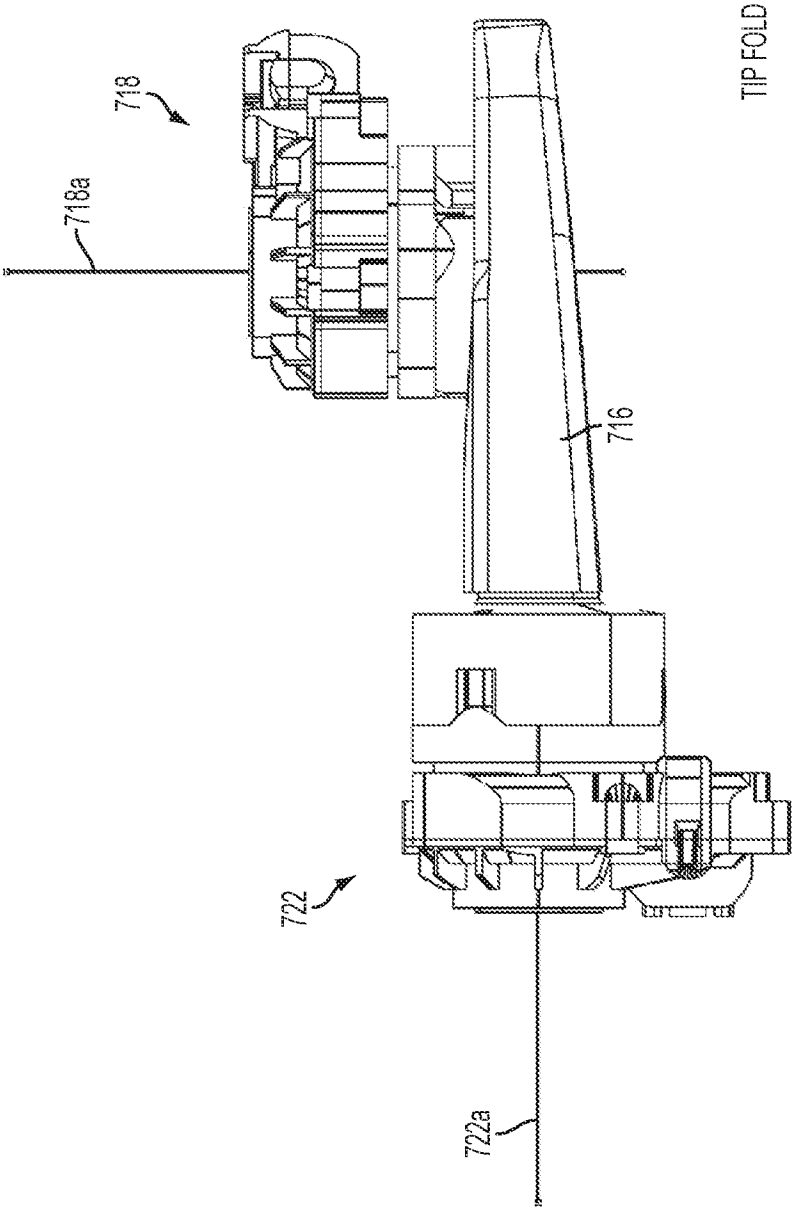


FIG. 66B

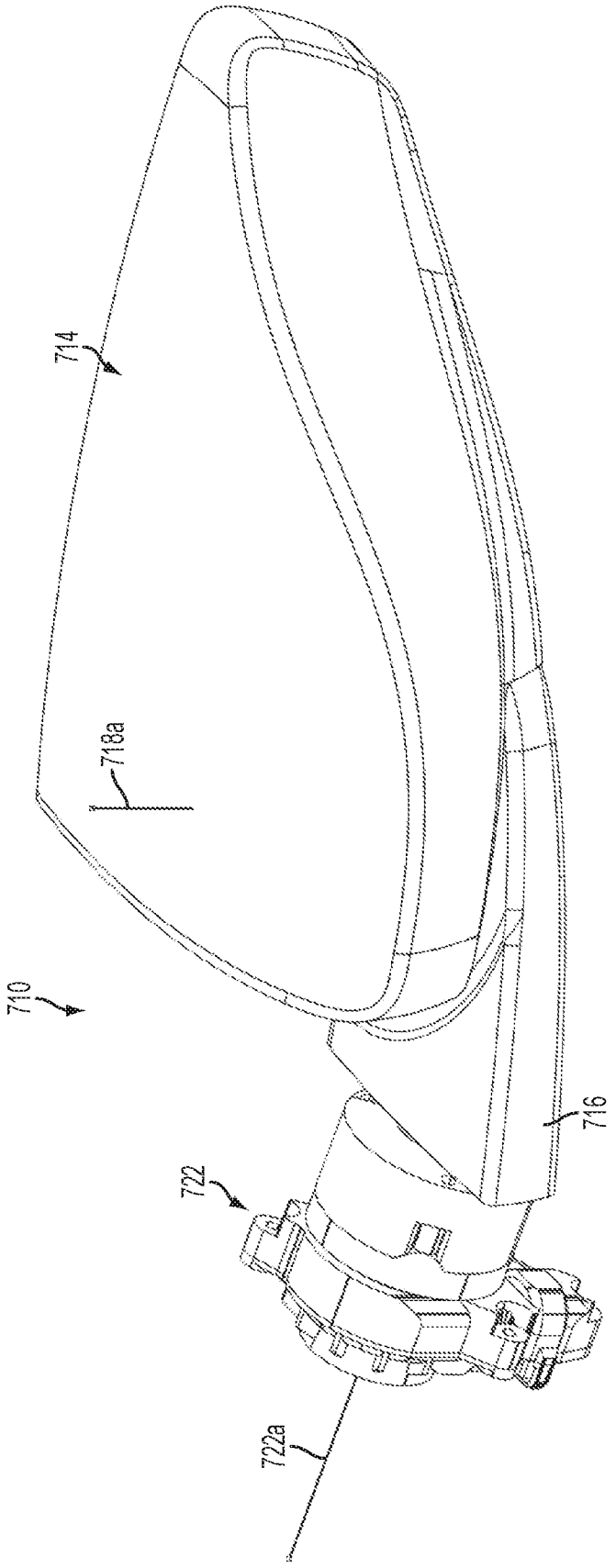


FIG. 66C

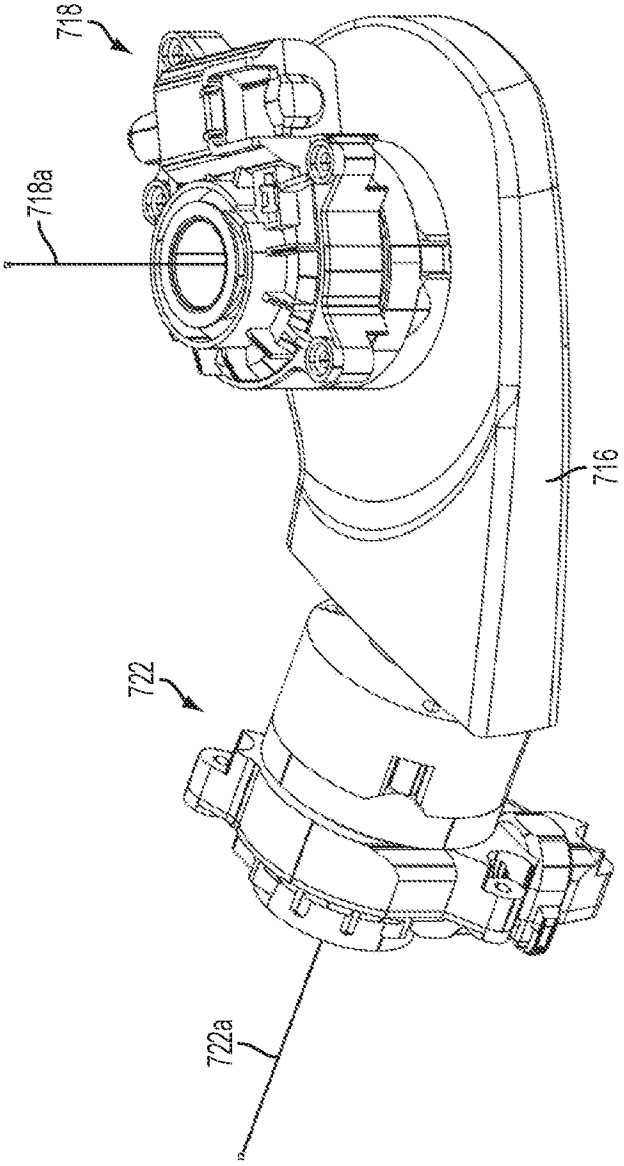


FIG. 66D

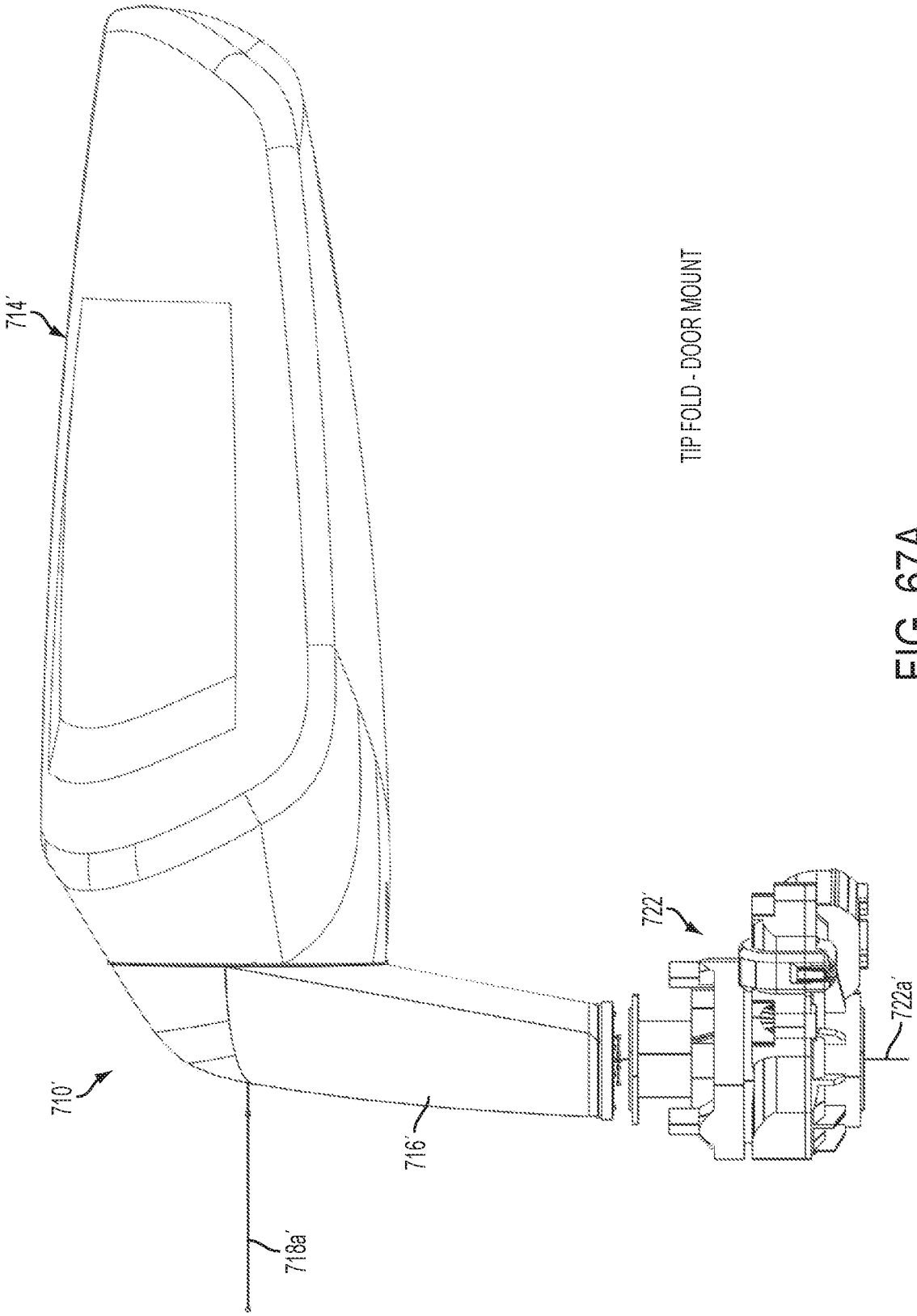


FIG. 67A

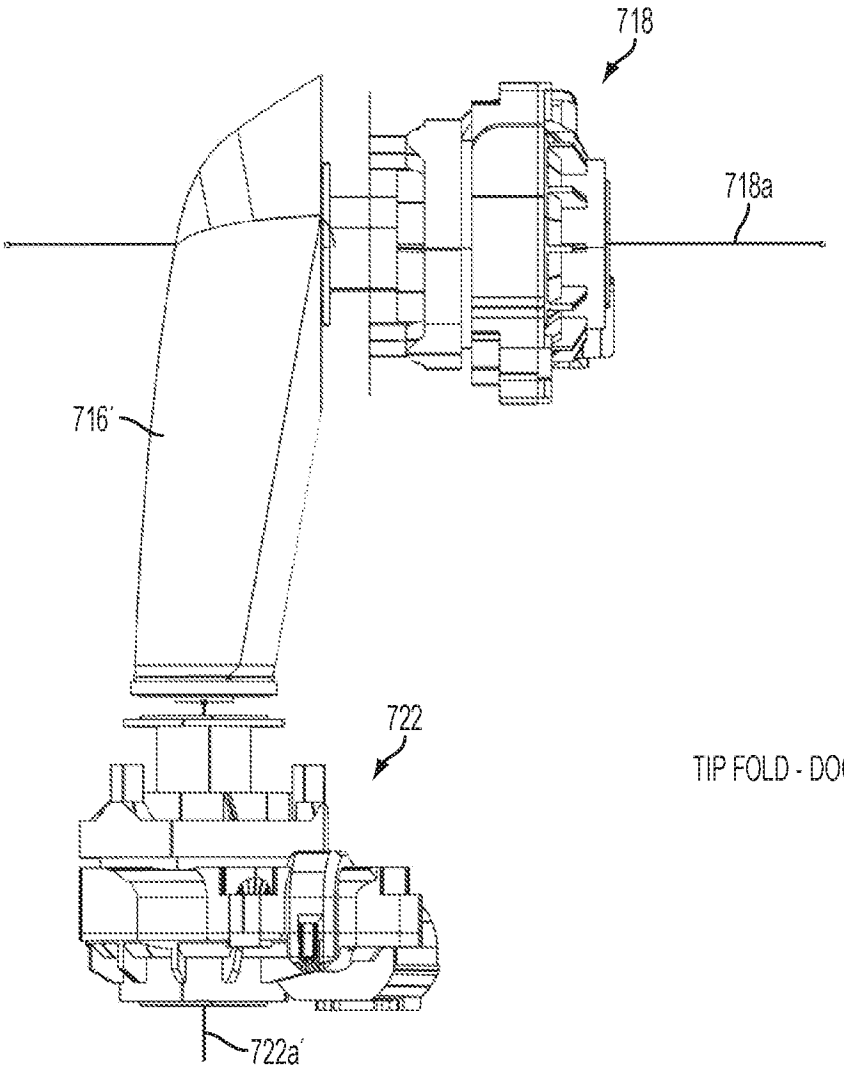


FIG. 67B

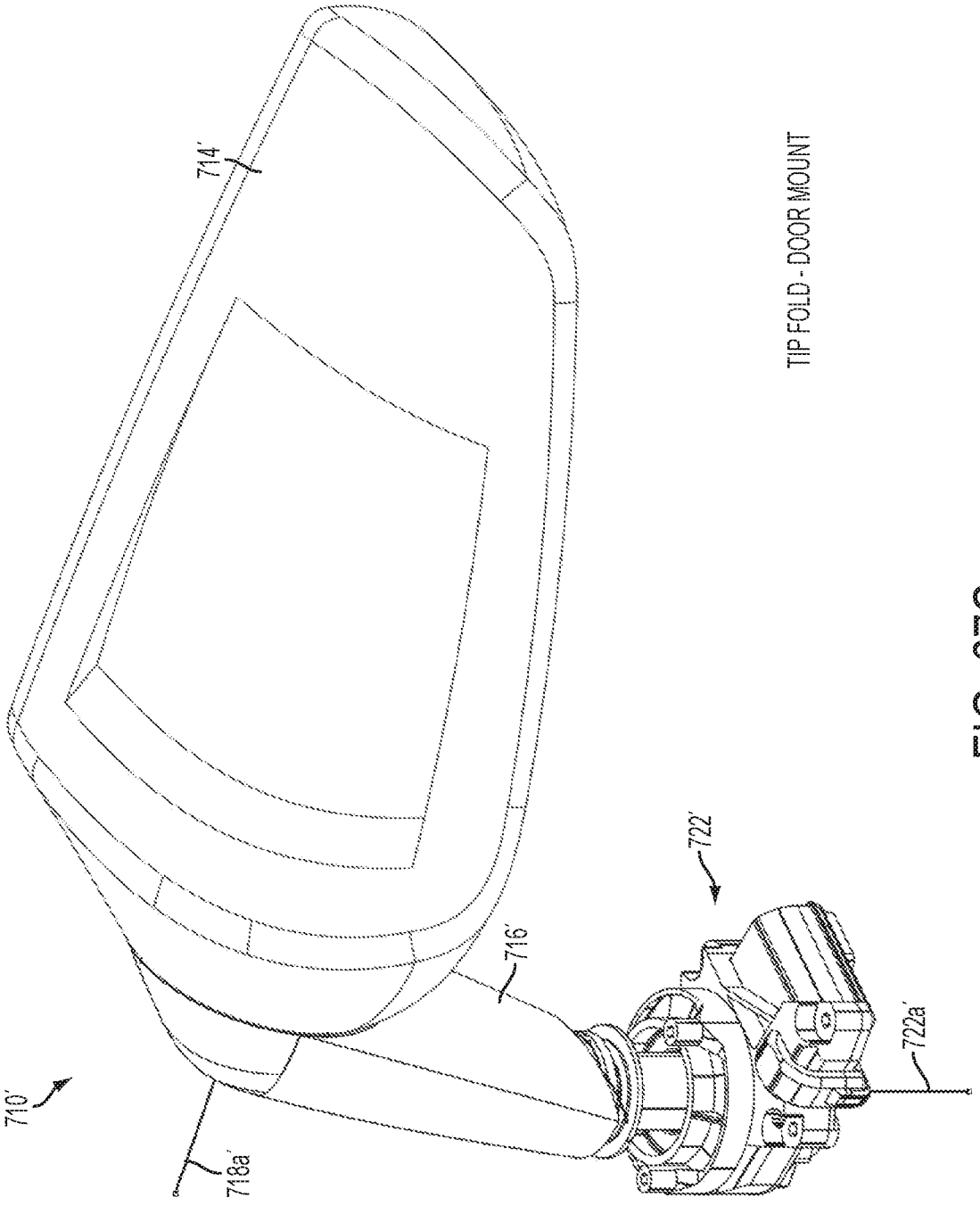


FIG. 67C

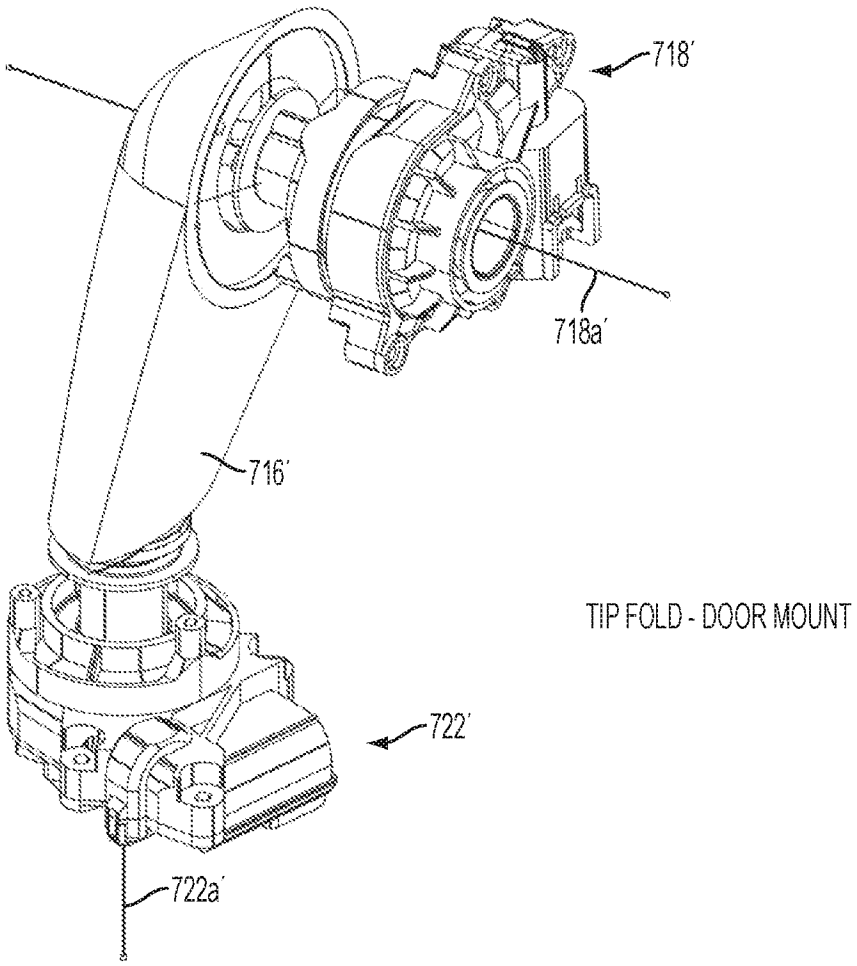


FIG. 67D

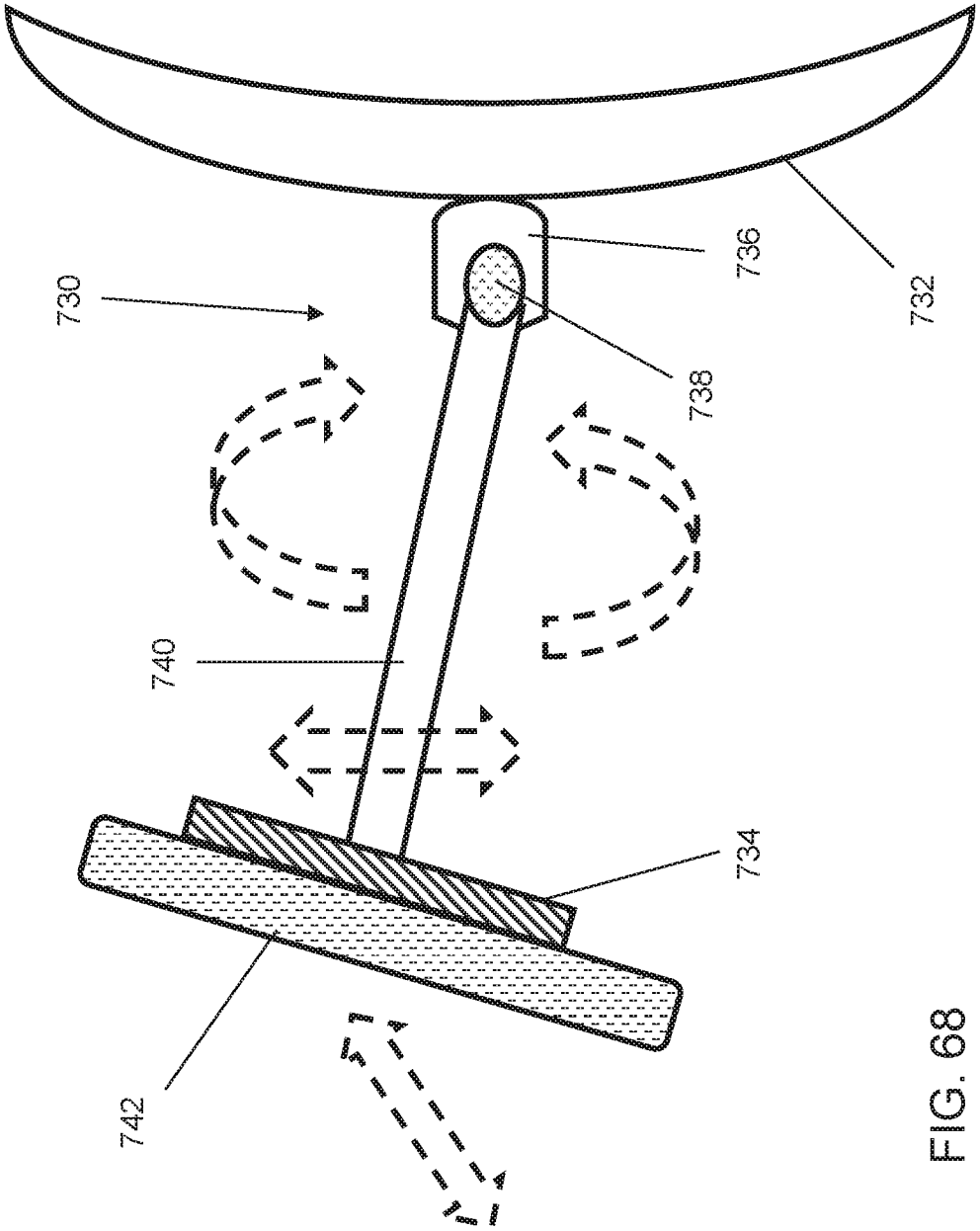


FIG. 68

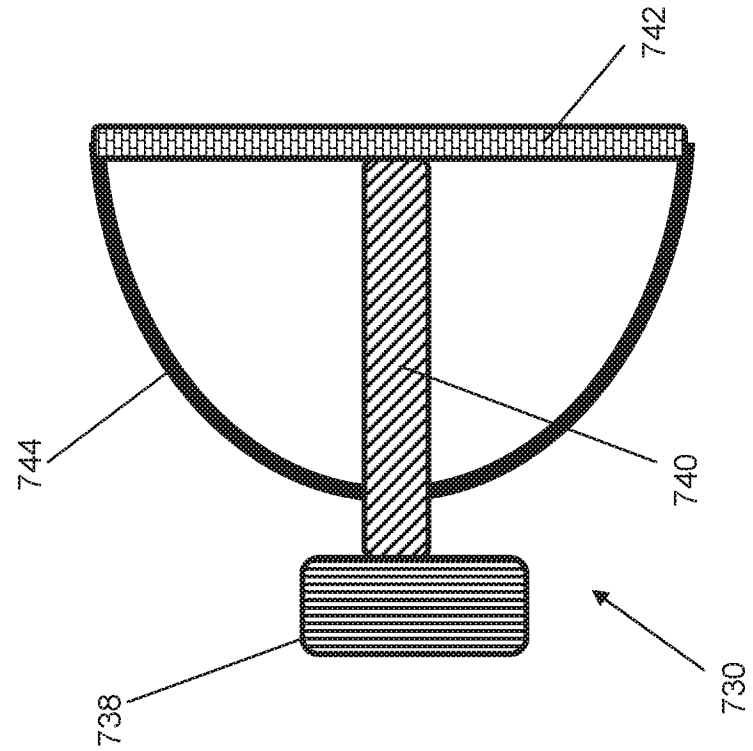


FIG. 68A

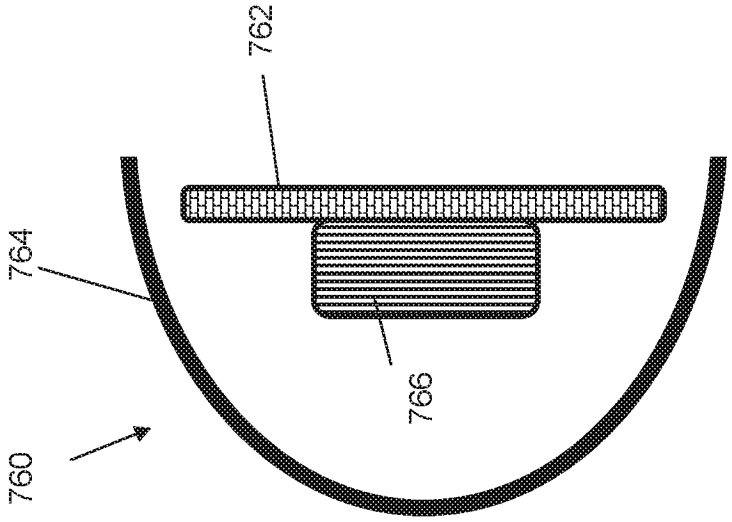


FIG. 68B

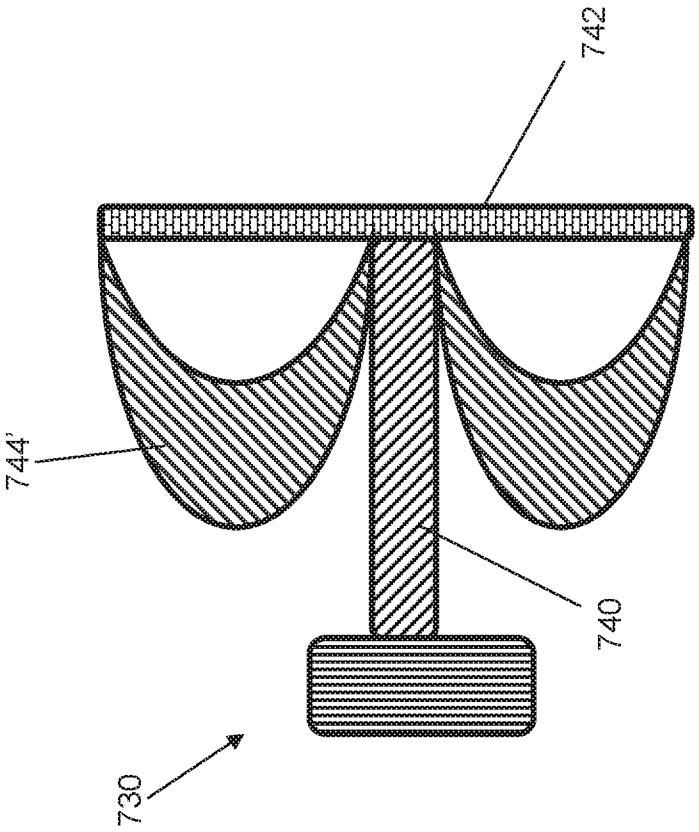


FIG. 68C

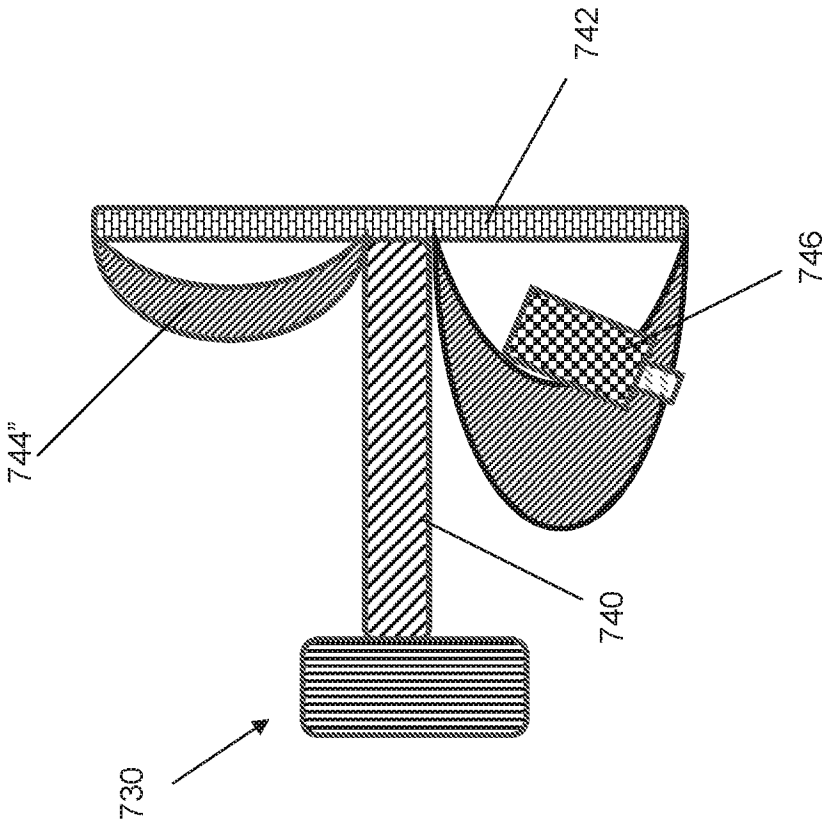


FIG. 68D

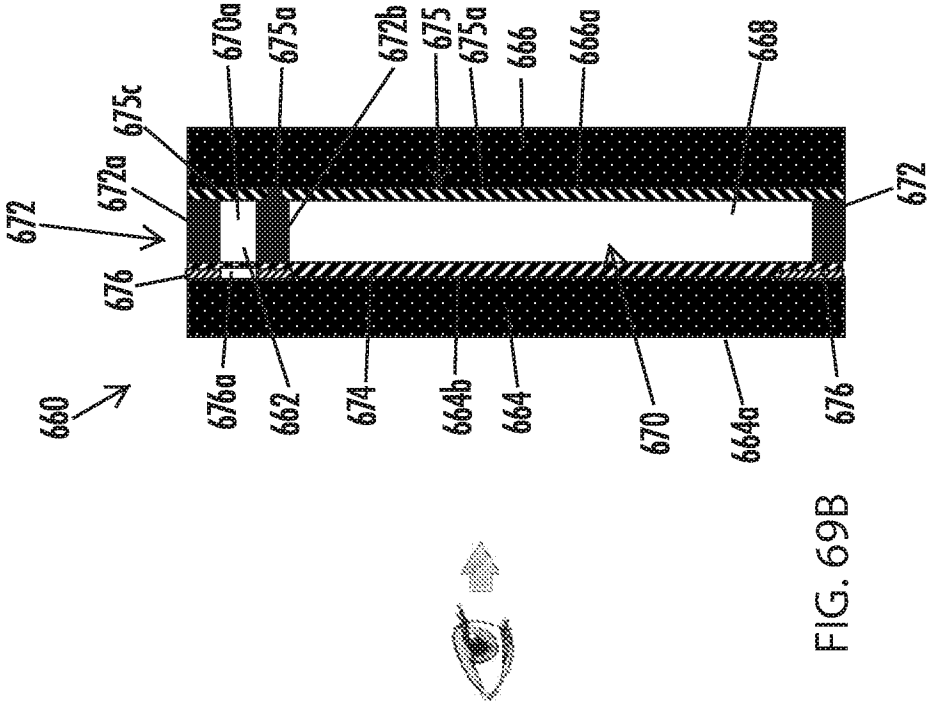


FIG. 69B

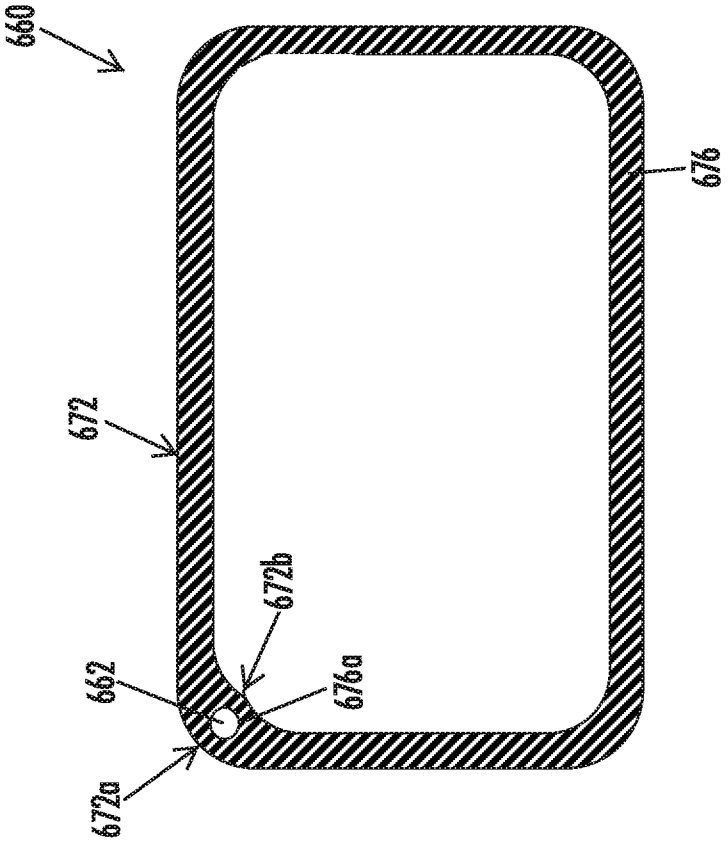


FIG. 69A

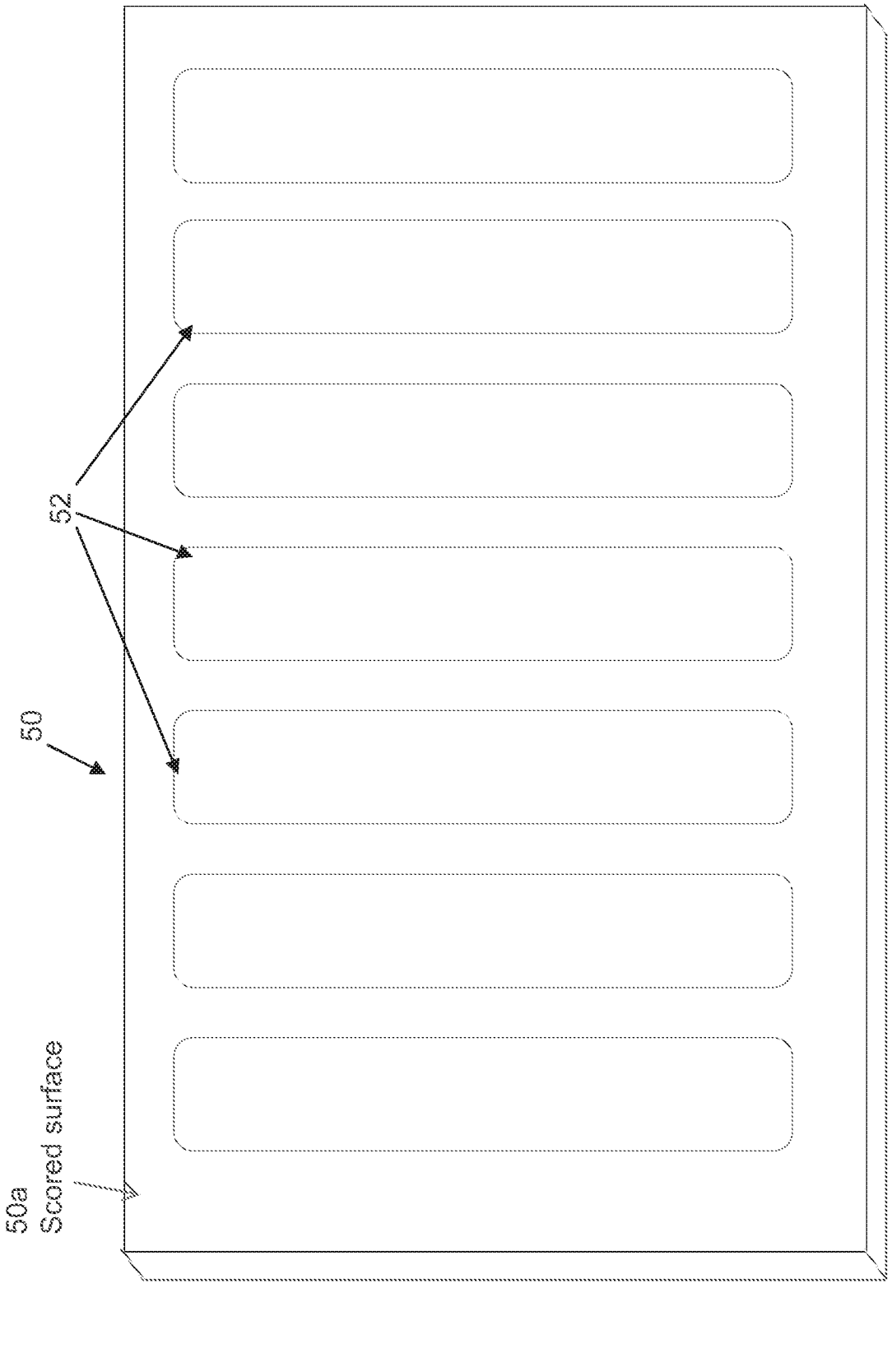


FIG. 70

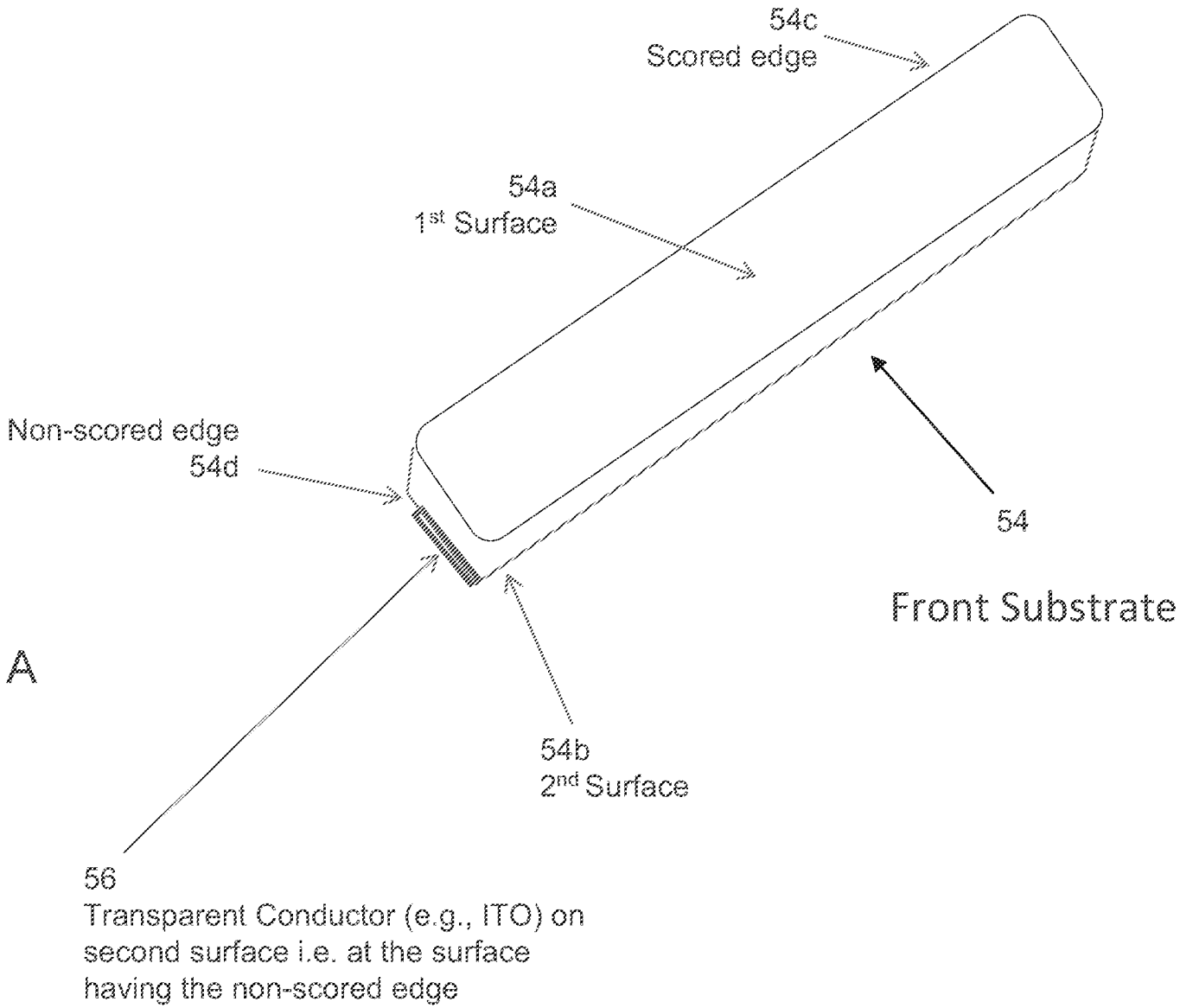


FIG. 71A

Inventors: John T. Uken et al.
Title: EXTERIOR REARVIEW MIRROR ASSEMBLY
Docket No.: DON01 P-2803
Sheet No.: 68/74

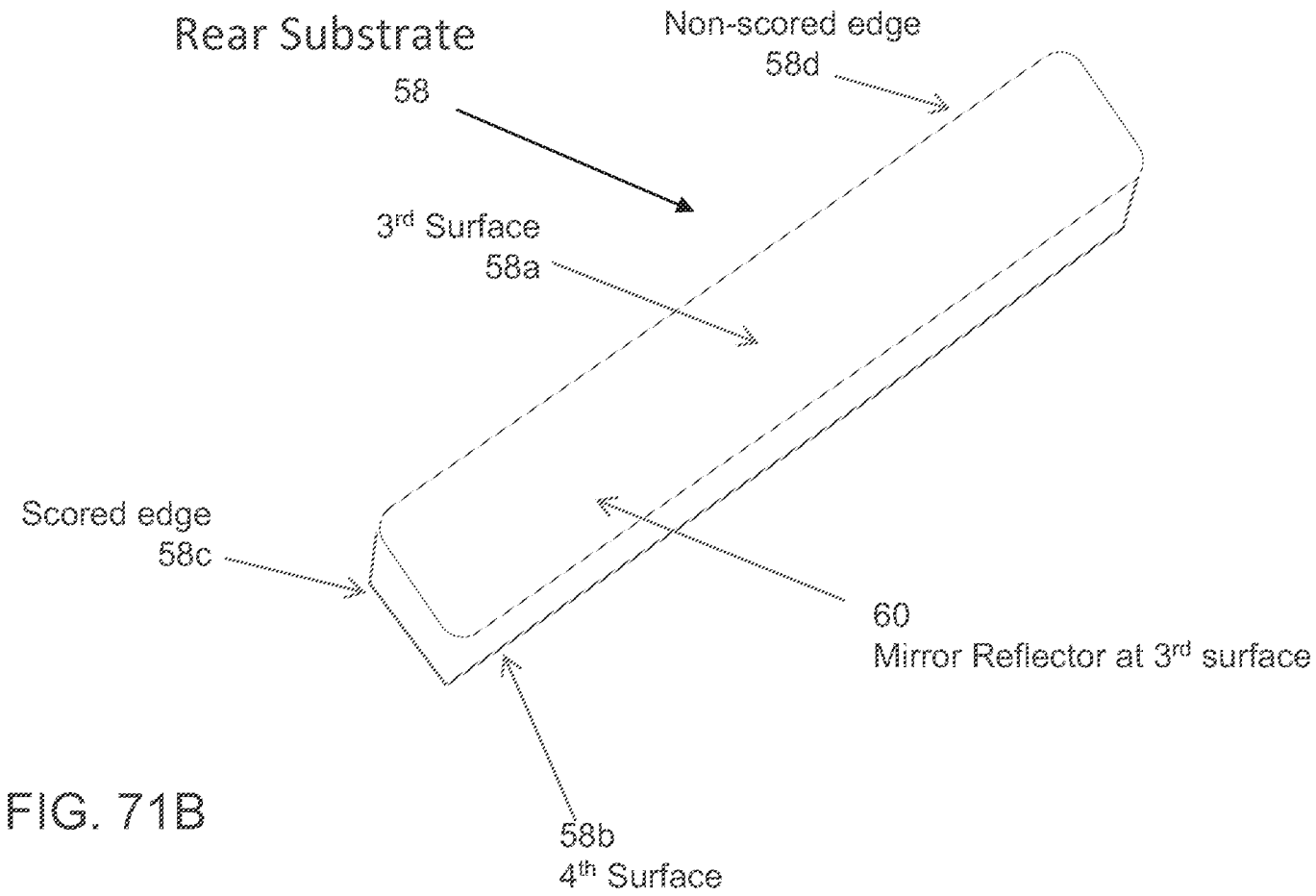


FIG. 71B

Inventors: John T. Uken et al.
Title: EXTERIOR REARVIEW MIRROR ASSEMBLY
Docket No.: DON01 P-2803
Sheet No.: 69/74

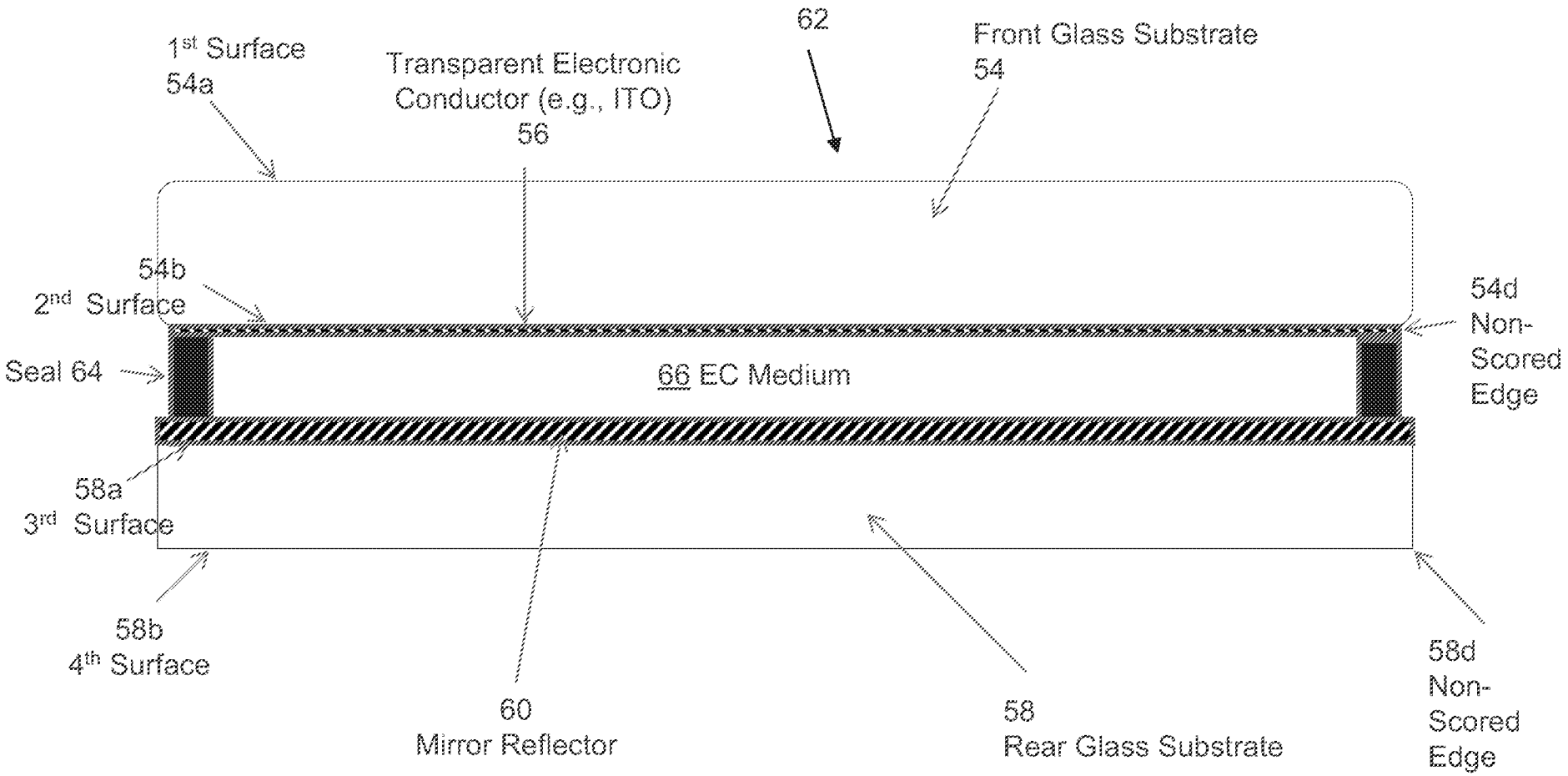


FIG. 72

Inventors: John T. Uken et al.
Title: EXTERIOR REARVIEW MIRROR ASSEMBLY
Docket No.: DON01 P-2803
Sheet No.: 70/74

Test Setup:

•Instron Tensile Tester
•2 glass supports spaced as shown
•Force applied at midpoint at 30mm/min speed until glass breaks
•Peak force (N) recorded

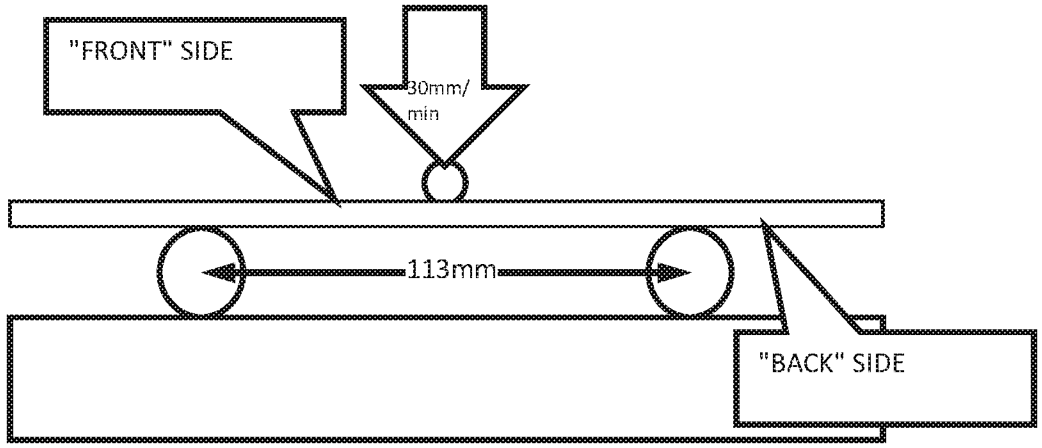
	Scribe position	
Ground / Raw	Front (3rd)	Back (4th)
Ground	158.3 N	97.9 N
Raw	283.8 N	82.2 N

Test Samples:

•Rear Glass Substrates
•Ground = fully hand seamed (using seaming belt) and ground button area
•Raw = no edge treatment, just cut glass.

Test Data:

Sample ID	Ground / Raw	Front (3rd)	Back (4th)
GF1	Ground	188.2	
GF2	Ground	151.0	
GF3	Ground	160.5	
GF4	Ground	148.1	
GF5	Ground	143.9	
GB6	Ground		110.9
GB7	Ground		97.1
GB8	Ground		95.3
GB9	Ground		91.3
GB10	Ground		94.9
RF1	Raw	226.6	
RF2	Raw	376.0	
RF3	Raw	287.7	
RF4	Raw	359.5	
RF5	Raw	169.1	
RB6	Raw		77.7
RB7	Raw		84.8
RB8	Raw		86.7
RB9	Raw		76.4
RB10	Raw		85.2



Conclusions:

1.Bend strength is much higher with Raw glass
2.Bend strength is much higher with scribe on Front (3rd surface) side.
3.Seaming increases the strength of the scribed side when on back (4th surface)

FIG. 73

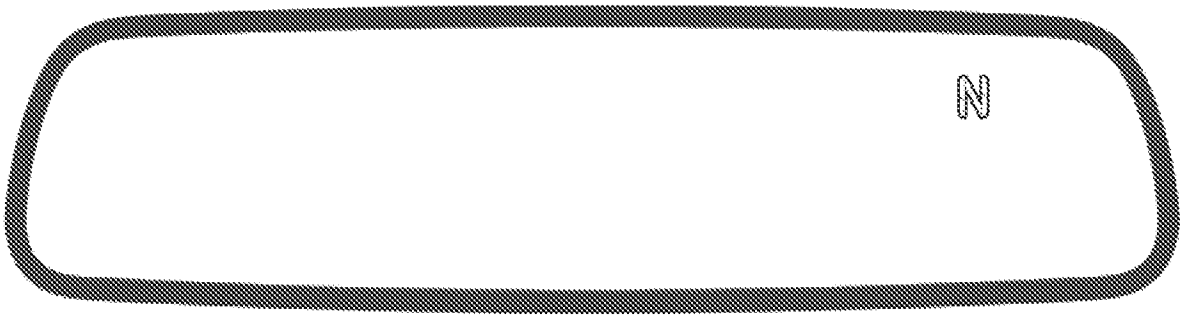


FIG. 74A

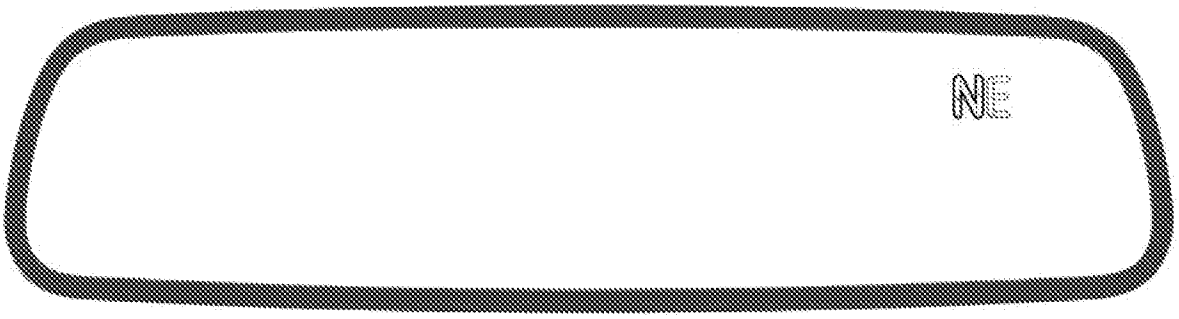


FIG. 74B

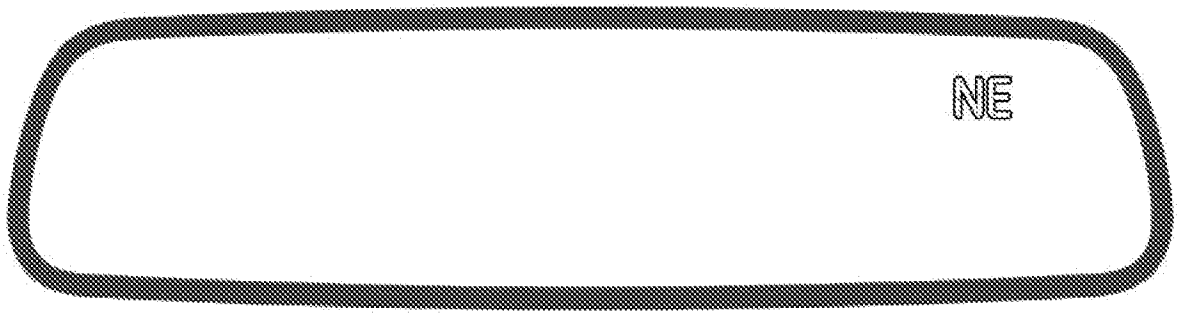


FIG. 74C

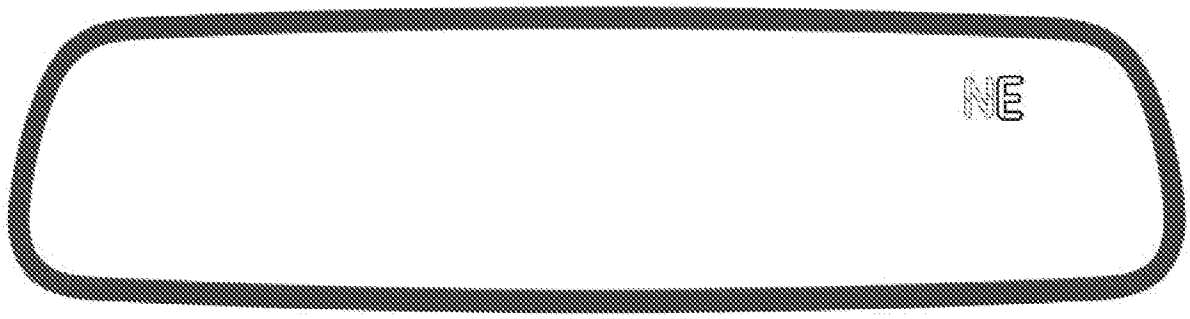


FIG. 74D

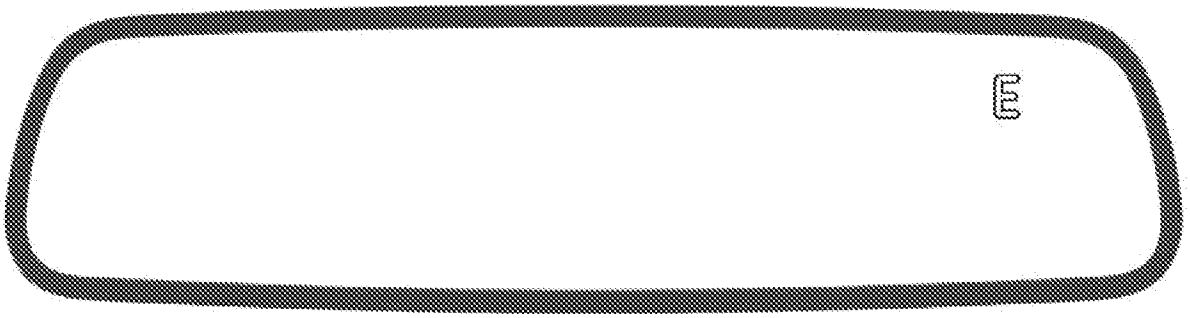


FIG. 74E

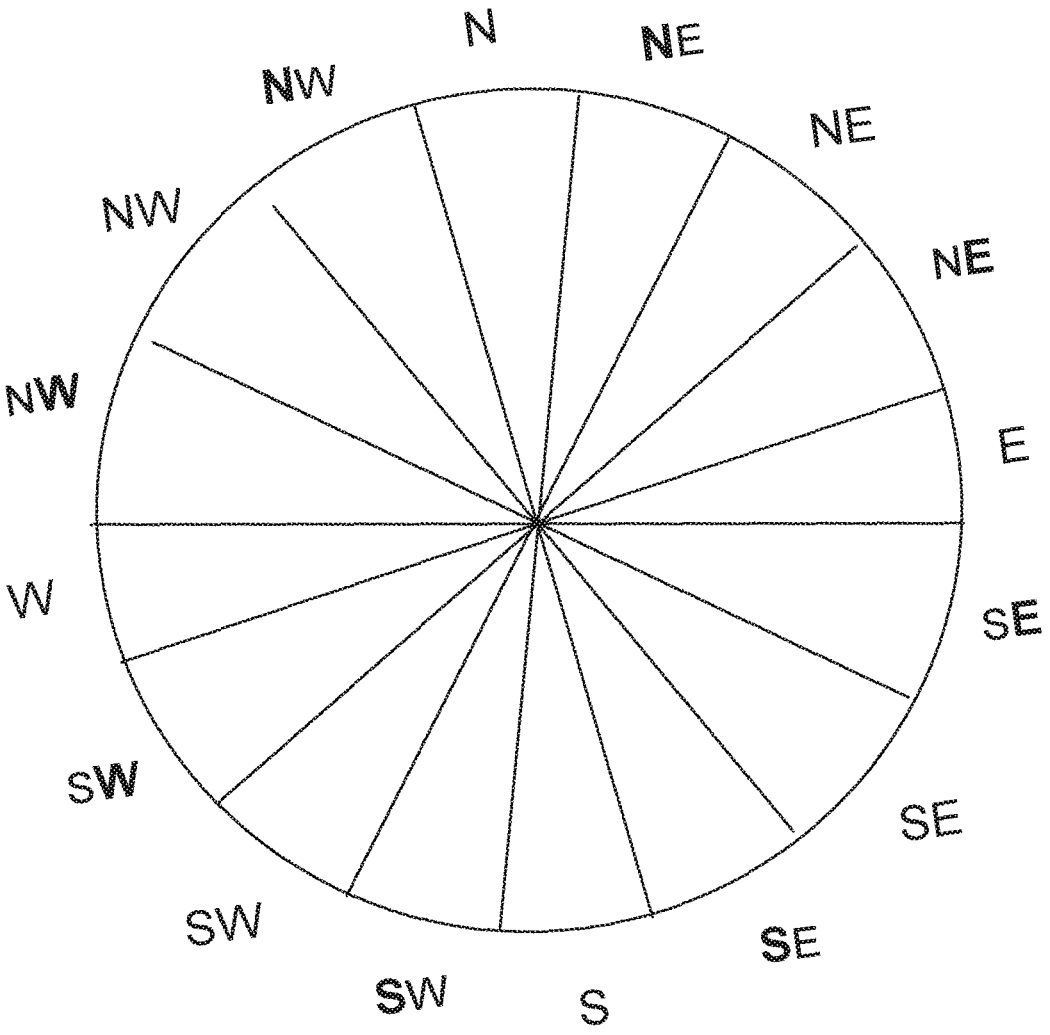


FIG. 74F

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventors : John T. Uken, Darryl P. De Wind, Keith D. Foote, Joseph M. Mambourg, Rodney K. Blank, Mark L. Larson and Niall R. Lynam

For : EXTERIOR REARVIEW MIRROR ASSEMBLY

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

INFORMATION DISCLOSURE STATEMENT

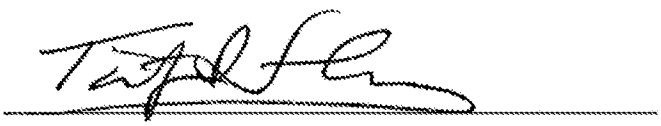
In accordance with 37 CFR 1.51, 1.56, 1.97 and 1.98, Applicants submit herewith patents, publications or other information listed on the attached forms for consideration by the Examiner in connection with examination of the present application. Copies of the cited non-U.S. patent/publication references are not provided herewith, since these references were previously made of record during prosecution of the parent application Serial No. 14/357,025. The Examiner is invited to contact the undersigned attorney if an additional copy of any of these references is desired.

This Information Disclosure Statement is not intended to constitute an admission that any patent, publication or other information referred to herein is "prior art" for this invention unless specifically designated as such.

Under 37 CFR 1.97, the filing of this Information Disclosure Statement shall not be construed to mean that a search has been made or that no other material information as defined in 37 CFR 1.56(a) exists.

An early and favorable action on the merits is respectfully requested.

Respectfully submitted,



Dated: May 23, 2016

Timothy A. Flory
Registration No. 42 540
Gardner, Linn, Burkhart & Flory, LLP
2851 Charlevoix Drive, S.E., Suite 207
Grand Rapids, Michigan 49546
(616) 975-5500

TAF:ars

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 15/161,708

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	280
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	600
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	720
TOTAL CLAIMS (37 CFR 1.16(i))	36 minus 20 =	* 16			OR	x 80 =	1280
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3 minus 3 =	*				x 420 =	0.00
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						400
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	3280

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)		RATE($)	ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
15/161,708	05/23/2016	2872	3280	DON01 P-2803	36	3

CONFIRMATION NO. 8364

15671
Gardner, Linn, Burkhart & Flory, LLP
2851 Charlevoix Dr., SE, Suite 207
Grand Rapids, MI 49546

FILING RECEIPT

OC000000083455847

Date Mailed: 06/08/2016

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

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Applicant(s)

MAGNA MIRRORS OF AMERICA, INC., Holland, MI;

Power of Attorney: The patent practitioners associated with Customer Number 15671

Domestic Priority data as claimed by applicant

This application is a CON of 14/357,025 05/08/2014 PAT 9346403
which is a 371 of PCT/US2012/064398 11/09/2012
which claims benefit of 61/705,876 09/26/2012
and claims benefit of 61/697,554 09/06/2012
and claims benefit of 61/665,509 06/28/2012
and claims benefit of 61/664,438 06/26/2012
and claims benefit of 61/647,179 05/15/2012
and claims benefit of 61/614,877 03/23/2012
and claims benefit of 61/601,756 02/22/2012
and claims benefit of 61/590,578 01/25/2012
and claims benefit of 61/565,541 12/01/2011
and claims benefit of 61/558,623 11/11/2011
and said 14/357,025 05/08/2014

is a CIP of 13/879,481 04/15/2013
which is a 371 of PCT/US11/56295 10/14/2011
which claims benefit of 61/490,375 05/26/2011
and claims benefit of 61/452,789 03/15/2011
and claims benefit of 61/449,364 03/04/2011
and claims benefit of 61/448,916 03/03/2011
and claims benefit of 61/409,346 11/02/2010
and claims benefit of 61/393,407 10/15/2010
and said 14/357,025 05/08/2014
is a CIP of 13/498,597 05/30/2012 PAT 8730553
which is a 371 of PCT/US10/51741 10/07/2010
which claims benefit of 61/261,839 11/17/2009
and claims benefit of 61/249,300 10/07/2009

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 06/06/2016

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/161,708**

Projected Publication Date: 09/15/2016

Non-Publication Request: No

Early Publication Request: No

Title

EXTERIOR REARVIEW MIRROR ASSEMBLY

Preliminary Class

359

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/161,708	05/23/2016	John T. Uken	DON01 P-2803

CONFIRMATION NO. 8364

15671
Gardner, Linn, Burkhart & Flory, LLP
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PUBLICATION NOTICE

Title:EXTERIOR REARVIEW MIRROR ASSEMBLY

Publication No.US-2016-0264054-A1
Publication Date:09/15/2016

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The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

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Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

PTO/SB/08a (03-15)
Approved for use through 07/31/2016. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15161708
Filing Date	2016-05-23
First Named Inventor	John T. Uken
Art Unit	2875
Examiner Name	Anabel Ton
Attorney Docket Number	DON01 P-2803

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	1949138		1934-02-27	Bell	
	2	5179471		1993-01-12	Caskey et al.	

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	1					

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	1	DE2362191	DE		1975-06-19	ZIPPERLE WOLFGANG		X

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15161708
	Filing Date	2016-05-23
	First Named Inventor	John T. Uken
	Art Unit	2875
	Examiner Name	Anabel Ton
	Attorney Docket Number	DON01 P-2803

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
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Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15161708
	Filing Date	2016-05-23
	First Named Inventor	John T. Uken
	Art Unit	2875
	Examiner Name	Anabel Ton
	Attorney Docket Number	DON01 P-2803

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Timothy A. Flory/	Date (YYYY-MM-DD)	2017-03-31
Name/Print	Timothy A. Flory	Registration Number	42540

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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Anlage D0

(51) Int. Cl. 2: B 60 R 1-06

(19) BUNDESREPUBLIK DEUTSCHLAND

DEUTSCHES PATENTAMT

DT 23 62 191 A1

(11) Offenlegungsschrift 23 62 191

(21) Aktenzeichen: P 23 62 191.2
(22) Anmeldetag: 14. 12. 73
(43) Offenlegungstag: 19. 6. 75

(30) Unionspriorität:
(32) (33) (31) —

(54) Bezeichnung: Außenspiegel für Kraftfahrzeuge

(71) Anmelder: Zipperle, Wolfgang, 7140 Ludwigsburg

(72) Erfinder: gleich Anmelder

DT 2362 191 A1

© 6.75 509 825/161 6/60

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außer samstags

.2362191

Reg.-Nr. 124 209

31.10.1973/3322elz

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Außenspiegel für Kraftfahrzeuge

509825/0161

Die Erfindung betrifft einen Außenspiegel für Kraftfahrzeuge, mit einer an ihrer Rückseite verspiegelten Glasscheibe, deren Rand zusammen mit einer an ihm anliegenden Dichtung zwischen einer umlaufenden Schulter eines Kunststoffgehäuses und einem mit diesem dicht verschweißten sowie die Glasscheibe seitlich abdeckenden Rahmen eingeklemmt ist.

Nicht nur bei den bekannten Außenspiegeln anderer Bauart, sondern auch bei dem Spiegel der eingangs genannten Art, kann eine im Laufe der Zeit einsetzende Korrosion der Spiegelfläche nicht verhindert werden, da das Eindringen von Feuchtigkeit nicht vollständig verhindert werden kann, und zwar auch dann nicht, wenn die Scheibe an den Rändern mit einem Wachs beschichtet wird oder wenn man das Gehäuse mit Ablaufkanälen für das eingedrungene Wasser versieht.

Der Erfindung liegt die Aufgabe zugrunde, einen Außenspiegel zu schaffen, der trotz eines einfachen Aufbaus eine Korrosion der Spiegelschicht verhindert. Diese Aufgabe ist erfindungsgemäß bei einem Außenspiegel der eingangs genannten Art dadurch gelöst, daß die Rückseite der Scheibe unmittelbar an der Schulter des Gehäuses anliegt und die Dichtung zwischen der Vorderseite der Scheibe und dem diese übergreifenden Flanschteil des Rahmens angeordnet ist.

Durch eine solche Anordnung der Dichtung in Verbindung mit der unmittelbaren Anlage der Scheibe an der Schulter des Gehäuses läßt sich ein ausreichend hoher Anpreßdruck im Bereich der Anlage der Dichtung an der Scheibe und am Rahmen erzielen, daß Feuchtigkeit nicht zwischen der Scheibe und dem Flanschteil des Rahmens hindurch dringen und zu der Spiegelschicht gelangen kann. Dies ist insofern von entscheidender Bedeutung, als die Korrosion der Spiegelschicht auch dann nicht verhindert werden kann, wenn eine Dichtung an die Spiegelschicht angepreßt wird, da die Korrosion unter der Dichtung hindurch erfolgen kann.

Um sicherzustellen, daß die Dichtung an der gewünschten Stelle liegt und die Montage durch das Einlegen der Dichtung nicht schwierig wird, ist der Flanschteil zweckmäßigerweise mit einer umlaufenden, die Dichtung in der gewünschten Lage haltenden Nut versehen. Die Dichtung braucht dann nur vor dem Aufsetzen des Rahmens auf das Gehäuse in diese Nut eingelegt zu werden.

Bei einer bevorzugten Ausführungsform ist der das Gehäuse mit der Karosserie des Kraftfahrzeuges verbindende Fuß hohl ausgebildet sowie auf einer Seite mit einer Zugangsöffnung versehen, die von einem abnehmbaren Deckel verschlossen wird. Im Fuß können dann, durch die Zugangsöffnung hindurch zugänglich, die Köpfe der für die Verbindung des Fußes mit der Karosserie vorgesehenen Schraube oder Schrauben sowie des der Einstellung der Reibung in dem den Fuß mit dem Gehäuse verbindenden Gelenk dienenden Spannelementes angeordnet sein. Sowohl das Auswechseln eines Spiegels als auch die Nachstellung der Reibung im Gelenk ist hierdurch in äußerst einfacher Weise möglich.

Besonders vorteilhaft ist es ferner, wenn das den Fuß mit dem Gehäuse verbindende Gelenk aus einer einen zylindrischen Ansatz, der eine Öffnung des Gehäuses abdichtend durchdringt, aufweisenden Kalotte, einer im Fuß vorgesehenen Lagerschale, einem durch den zylindrischen Ansatz hindurch eingeführten und an der der Lagerschale abgekehrten Fläche der Kalotte anliegenden Druckkörper sowie einer den Druckkörper, die Kalotte und den Fuß durchdringenden, gegen Drehen gesicherten Spannschraube besteht, auf deren in das Innere des Fußes ragendem Ende mindestens eine Mutter als Spannelement sitzt. Ein solches Gelenk ist einfach im Aufbau und einfach zu montieren, dennoch aber unempfindlich gegen äußere Einflüsse. Um Schwierigkeiten bei der Einstellung der Spannkraft der Schraube auszuschließen, ist es dabei zweckmäßig, zwischen dem Kopf der Spannschraube und dem Druckkörper eine Feder anzuordnen.

4.

Sowohl zum Schutze gegen Feuchtigkeit als auch zum Schutze vor einem Verlust von Teilen des Gelenkes bei Spiegeln, welche als Ersatzteil ohne Fuß in den Handel gelangen, ist es vorteilhaft, wenn in den zylindrischen Ansatz ein dicht an ihm anliegender, vorzugsweise aus einem Kunststoff bestehender Stopfen eingesteckt ist, da dieser das Eindringen von Feuchtigkeit verhindert und auch die Spannschraube und den Druckkörper unverlierbar mit dem Gelenk verbindet.

Im folgenden ist die Erfindung anhand eines in der Zeichnung dargestellten Ausführungsbeispiels im einzelnen erläutert. Es zeigen:

Fig. 1 eine Ansicht des Ausführungsbeispiels;

Fig. 2 einen Schnitt nach der Linie II - II der Fig. 1;

Fig. 3 einen Schnitt nach der Linie III - III der Fig. 2.

Ein Außenspiegel für ein Kraftfahrzeug weist ein aus Kunststoff bestehendes Gehäuse 1 auf, dessen Rand eine umlaufende Schulter 2 mit einer in einer Ebene liegenden Stirnfläche bildet. Diese Schulter ist mit einer umlaufenden, zur Stirnfläche hin offenen Nut 3 versehen, in welche ein umlaufender, in seinem Querschnittsprofil an dasjenige der Nut 3 angepaßter Vorsprung 4 eines Rahmens 5 eingreift, der ebenfalls aus Kunststoff besteht und dicht mit dem Gehäuse 1 verschweißt ist.

Der Rahmen 5 hat ein Winkelprofil, wobei der eine Schenkel an einer Stirnfläche der Schulter 2 im Bereich zwischen der Nut 3 und dem äußeren Rand anliegt. Das von diesem Schenkel begrenzte Fenster ist an die Kontur einer auf ihrer Rückseite mit einer Spiegelschicht versehenen Glasscheibe 6 angepaßt, welche auf dem zwischen der Nut 3 und dem inneren Rand der Schulter 2 liegenden Bereich unmittelbar auf der Schulter aufliegt und durch den den

Vorsprung 4 tragenden Schenkel des Rahmens 5 gegen eine Verschiebung in der Ebene der Auflagefläche gesichert ist.

Der zweite Schenkel des Rahmens 5 übergreift die Randzone der nach außen weisenden Vorderseite der Glasscheibe 6. Ferner ist, wie Fig. 2 zeigt, dieser Schenkel mit einer umlaufenden Nut versehen, in die eine endlos ausgebildete Dichtung 7 eingelegt ist, bei der es sich im Ausführungsbeispiel um einen Gummistrang handelt, der im unbelasteten Zustand einen kreisförmigen Querschnitt hat. Die Tiefe der Nut ist kleiner als die Stärke der Dichtung 7 im unbelasteten Zustand, damit die Dichtung mit ausreichendem Druck an der Glasscheibe 6 und dem Rahmen 5 anliegt, wenn dieser auf der Schulter 2 aufliegt. Damit ist sichergestellt, daß keine Feuchtigkeit zwischen der Dichtung 7 und der Glasscheibe 6 oder der Dichtung 7 und dem Rahmen 5 hindurch bis zu der verspiegelten Rückseite der Glasscheibe 6 gelangen kann.

Auch sonst kann in das Gehäuseinnere keine Feuchtigkeit eindringen, da der Rahmen 5 dicht mit dem einstückig ausgebildeten Gehäuse 1 verschweißt ist und auch die Verbindung eines als Ganzes mit 8 bezeichneten Gelenkes mit dem Gehäuse 1 dicht ausgebildet ist.

Das Gelenk 8, das das Gehäuse 1 mit einem Fuß 9 verbindet, weist eine außerhalb des Gehäuses 1 liegende Kugelkalotte 10 auf, an die sich ein Ringbund 11 und ein hohlzylindrischer Teil 12 anschließen. Letzterer ist mit einem Außengewinde versehen, und sein Innendurchmesser ist an den maximalen Innendurchmesser der Kugelkalotte 10 angepaßt. Der Teil 12 durchdringt eine Öffnung des Gehäuses 1, und eine auf ihn aufgeschraubte Mutter 13 zieht den Ringbund 11 gegen das Gehäuse 1. Gleichzeitig drückt sie dabei eine zwischen ihr und der Gehäusewand liegende Unterlagsscheibe 14 an die Gehäusewand an.

Im Inneren der Kugelkalotte liegt ein an deren Krümmung angepaßtes Druckstück 15, auf dessen der Kugelkalotte abgekehrte

Seite ein Federpaket 16 aufgelegt ist. Eine Spannschraube 17 durchdringt das Federpaket 16, das Druckstück 15 sowie die Kugelkalotte 10, die in ihrem Zentrum eine hinsichtlich der Größe an den gewünschten Schwenkbereich des Gehäuses 1 angepaßte Bohrung 20 hat.

Der Fuß 9 ist, wie Fig. 2 zeigt, hohl ausgebildet und auf der im Ausführungsbeispiel größten Seite zur Bildung einer Zugangsöffnung offen. Normalerweise ist der Innenraum 9' des Fußes 9 mittels eines Deckels 23 verschlossen, der im Ausführungsbeispiel aus Kunststoff besteht und in den Fuß einrastet.

Die dem Gehäuse 1 zugekehrte Seite des Fußes 9 ist mit einer eine Lagerschale für die Kugelkalotte 10 bildenden Vertiefung sowie einer im Zentrum der Vertiefung angeordneten Durchgangsbohrung für die Spannschraube 17 versehen. Wie Fig. 3 zeigt, ist sowohl die Durchgangsbohrung als auch die Spannschraube 17 in dem in ihr liegenden Abschnitt abgeflacht ausgebildet, damit die Spannschraube sich nicht in der Bohrung drehen kann. Mit Hilfe von zwei Muttern auf dem in den Innenraum ragenden Ende der Spannschraube 17 werden das Druckstück 15 gegen die Innenseite der Kugelkalotte 10 und deren Außenseite gegen die Lagerschale im Fuß 9 mit der erforderlichen Kraft gedrückt. Diese Kraft läßt sich jederzeit durch Drehen der Muttern 21 ändern. Hierzu braucht nur vorübergehend der Deckel 23 abgenommen zu werden, wozu eine Einstecköffnung 22 für einen Schraubenzieher od.dgl. vorgesehen ist.

In derjenigen Wand des Fußes 7, welche der die Lagerschale aufweisenden Wand gegenüber liegt, sind zwei Bohrungen 24 vorgesehen, durch die hindurch nicht dargestellte Befestigungsschrauben gesteckt werden, mittels deren der Fuß 9 an der Karosserie eines Fahrzeuges befestigt wird.

In den Teil 12 wird nach dem Einbringen des Druckstückes 15, des Federpaketes 16 und der Spannschraube 17 ein elastischer, im Ausführungsbeispiel aus Kunststoff bestehender Stopfen 25 eingesteckt. Dieser verhindert das Eindringen von Feuchtigkeit und sichert das Druckstück, das Federpaket und die Spannschraube gegen ein Verlieren, wenn das Gehäuse 1 und das Gelenk 8 ohne den Fuß 9 in den Handel gelangen, wie dies beispielsweise der Fall sein kann, wenn das Gehäuse 1 oder die Glasscheibe 6, nicht aber der Fuß, beschädigt worden sind und daher ersetzt werden müssen.

Patentansprüche

1. Außenspiegel für Kraftfahrzeuge, mit einer an ihrer Rückseite verspiegelten Glasscheibe, deren Rand zusammen mit einer an ihm anliegenden Dichtung zwischen einer umlaufenden Schulter eines Kunststoffgehäuses und einem mit diesem dicht verschweißten sowie die Glasscheibe seitlich abdeckenden Rahmen eingeklemmt ist, dadurch gekennzeichnet, daß die Rückseite der Glasscheibe (6) unmittelbar an der Schulter (2) des Gehäuses (1) anliegt und die Dichtung (7) zwischen der Vorderseite der Scheibe und dem diese übergreifenden Flanschteil des Rahmens (5) angeordnet ist.

2. Spiegel nach Anspruch 1, dadurch gekennzeichnet, daß der Flanschteil mit einer umlaufenden, die Dichtung (7) in der gewünschten Lage haltenden Nut versehen ist.

3. Spiegel nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß der das Gehäuse (1) mit der Karosserie eines Kraftfahrzeuges verbindende Fuß (9) hohl ausgebildet sowie auf einer Seite mit einer Zugangsöffnung versehen ist, die von einem abnehmbaren Deckel (23) verschlossen ist, und daß im Inneren des Fußes, durch die Durchgangsöffnung hindurch zugänglich, die Köpfe der für die Verbindung des Fußes mit der Karosserie vorgesehenen Schraube oder Schrauben sowie des der Einstellung der Reibung in dem den Fuß mit dem Gehäuse verbindenden Gelenk (8) dienenden Spannelements (17,21) angeordnet sind.

4. Spiegel nach einem der Ansprüche 1 bis 3, dadurch gekennzeichnet, daß das den Fuß (9) mit dem Gehäuse (1) verbindende Gelenk (8) aus einer einen zylindrischen Ansatz (12), der eine Öffnung des Gehäuses (1) abgedichtet durchgreift, aufweisenden Kalotte (10), einer im Fuß vorgesehenen Lagerschale, einem durch den zylindrischen Ansatz hindurch einge-

führten und an der der Lagerschale abgekehrten Fläche der Kalotte anliegenden Druckstück (15) sowie einer das Druckstück, die Kalotte und den Fuß durchdringenden, gegen Verdrehen gesicherten Spannschraube (17) besteht, auf deren in das Innere des Fußes ragendem Ende mindestens eine Mutter (21) als Spannelement sitzt.

5. Spiegel nach Anspruch 4, dadurch gekennzeichnet, daß zwischen dem Kopf der Spannschraube (17) und dem Druckstück (15) eine Feder (16) angeordnet ist.

6. Spiegel nach Anspruch 4 oder 5, dadurch gekennzeichnet, daß in den zylindrischen Ansatz (12) ein dicht an ihm anliegender, vorzugsweise aus Kunststoff bestehender Stopfen (25) eingesteckt ist.

- . -

10

Leerseite

11

Fig.1.

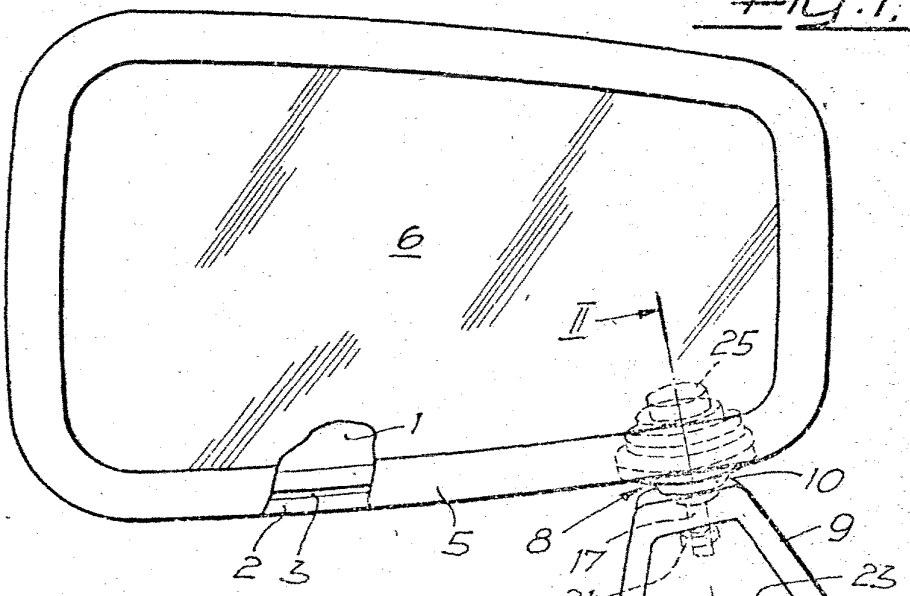


Fig.2.

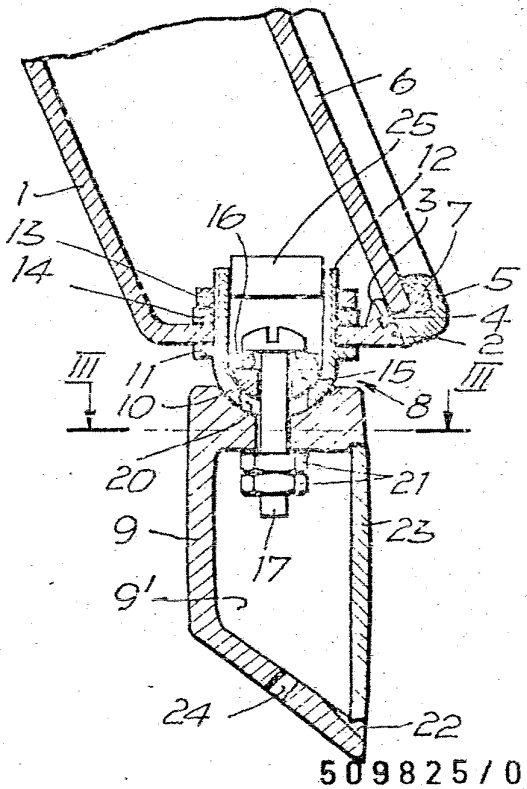
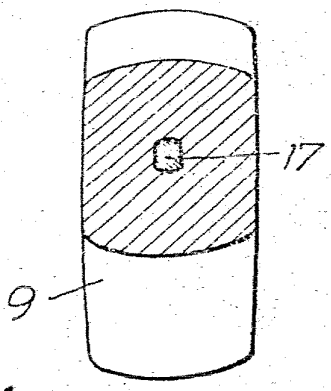


Fig.3.



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Wolfgang Zipperle.

B60R 1-06 AT:14.12.1973 OT:19.06.1975

Reg.-Nr. 124 209

Notice

DESCRIPTION DE2362191

[0001]

PATENT PANELS

[0002]

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Deutsche Bank AG, 14/286 30 ◙ BLZ600 7Ö0 70

[0013]

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[0014]

der Karosserie des Kraftfahrzeuges verbindende Fuß hohl ausge-. bildet sowie .auf einer Seite mit einer. Zugangsöffnung versehen, die von einem abnehmbaren Deckel verschlossen wird. Im Fuß .können dann, durch die Zugangsöffnung hindurch -zugänglich", die Köpfe der-für die Verbindung des Fußes mit der Karosserie vorgesehenen Schraube oder Schrauben sowie des der Einstellung der Reibung in dem den Fuß mit dem Gehäuse verbindenden Gelenk dienenden. Spannelementes angeordnet sein. Sowohl das Auswechseln eines Spiegels als auch die Nachstellung der Reibung im Gelenk; ist hierdurch in äußerst einfacher Weise möglich.

3l.IO.1973 / 3322elz

[0015]

Wolfgang Zipperle, 7140 Ludwigsburg, Germany. (Baden-Württ.) Exterior mirrors for mo

[0017]

Telephone information and orders are only binding upon written confirmation

[0018]

-JL-

[0019]

BACKGROUND OF THE INVENTION 1. Field of the Invention The invention relates to an exterior mirror for motor vehicles, having a glass pane, which is mirror-coated on its rear side, the edge of which is clamped between a surrounding shoulder of a plastic housing and a frame.

[0020]

Not only in the known exterior mirrors of a different type, but also in the mirror of the type mentioned at the outset, corrosion of the mirror surface occurring over time can not be prevented, since the penetration of moisture can not be completely prevented, When the disc is coated with a wax at the edges, or if the housing is provided with drainage channels for the penetrated water.

[0021]

SUMMARY OF THE INVENTION The object of the invention is to provide an exterior mirror which prevents corrosion of the mirror layer despite a simple up-stream. This object is achieved according to the invention in an exterior mirror of the type mentioned at the outset by the fact that the rear side of the pane rests directly against the shoulder of the housing and the seal is arranged between the front side of the pane and the flange part of the frame,

[0022]

By means of such an arrangement of the seal in conjunction with the direct contact of the disc on the shoulder of the housing, a sufficiently high contact pressure can be achieved in the chamber of the bearing of the seal on the disc and on the frame in such a way that moisture is not present between the disc and the flange part of the frame And can reach the mirror layer. This is of decisive importance insofar as the corrosion of the mirror layer can not be prevented even if a seal is pressed against the mirror layer since. The corrosion can occur under the seal.

[0024]

In order to ensure that the gasket is in the desired location and the assembly is not difficult by the insertion of the gasket, the flange part is suitably connected to one; Surrounding the seal in the desired position.

The seal then only needs to be inserted into the groove before the frame is placed on the housing. :

[0025]

In a preferred embodiment, the foot connecting the housing to the body of the motor vehicle is hollow. On one side with. Access opening, which is closed by a removable cover. In the foot, then, the heads of the screw or screws provided for the connection of the foot to the body, as well as that of the adjustment of the friction in the joint connecting the foot to the housing, can then be made accessible through the access opening. Tensioning element. Both the replacement of a mirror and the adjustment of the friction in the joint; is thereby possible in an extremely simple manner.

[0026]

It is also particularly advantageous if the joint connecting the foot with: the housing is composed of a joint which is cylindrical. Neck which penetrates an opening of the housing in a sealing manner; The calotte, a bearing shell provided in the foot, a passage inserted through the cylindrical shoulder and remote from the bearing shell. And the pressure body. The calotte and the foot, which is secured against rotation. Whose protuberances project into the interior of the foot. End at least one nut as a tension member. Such an articulation is simple in construction and simple to assemble, but nevertheless insensitive to external influences. In order to rule out difficulties in adjusting the clamping force of the screw, it is advantageous to arrange a spring between the head of the clamping screw and the pressure body. . .

[0027]

5? 9 8 2? / 01

[0028]

Both for the protection against moisture and for the protection against a loss of parts of the joint in mirrors which come into the trade as a spare part without a foot, it is advantageous if a sealing element, preferably made of a plastic material, is provided in the cylindrical projection Plug, since this prevents the penetration of moisture, and also connects the tensioning screw and the pressure member captively to the joint.

[0029]

In the following, the invention is explained in detail with reference to an exemplary embodiment shown in the drawing. Show it:

[0030]

FIG. 1 is a view of the embodiment; FIG.

[0031]

FIG. 2 is a sectional view taken along the line II - II of FIG. 1;

[0032]

FIG. 3 is a section along the line III - III of FIG. 2.

[0033]

An exterior mirror for a motor vehicle has a housing 1 made of plastic, the edge of which forms a circumferential shoulder 2 with an end face lying in one plane. This shoulder is provided with a circumferential groove 3, which is open toward the end face, into which a circumferential projection 4 of a frame 5, which is also made of plastic and is welded tightly to the housing 1, engages in its peripheral cross-section .

[0034]

The frame 5 has an angle profile, the one limb abutting against an end face of the shoulder 2 in the region between the groove 3 and the outer edge. The window, which is delimited by this limb, is adapted to the contour of a pane of glass 6 which is provided on its rear side with a mirror layer and rests directly on the shoulder between the groove 3 and the inner edge of the shoulder 2,

[0036]

Projection 4 of the frame 5 is secured against displacement in the plane of the support surface.

[0037]

The second leg of the frame 5 overlaps the edge zone of the outwardly facing front face of the glass pane 6. 2, this limb is provided with a circumferential groove into which an endlessly formed seal 7 is inserted; Which in the exemplary embodiment is a rubber strand which has a circular cross-section in the unstressed state. The depth of the groove is smaller than the thickness of the groove. Seal 7 in the unstressed state so that the seal rests with sufficient pressure against the glass pane 6 and the frame 5 when the latter rests on the shoulder 2. This is how it is created. So that no moisture can pass between the seal 7 and the glass pane 6 or the seal 7 and the frame 5 up to the mirrored rear side of the glass pane 6.

[0038]

In addition, no moisture can penetrate into the housing.innere because the frame 5 is welded tightly to the housing 1, which is embodied in one piece, and also the connection of a joint, which is designated as a whole by 8, is tightly formed with the housing 1.

[0039]

The joint 8, which connects the housing 1 to a foot 9, has a ball dome 10 lying outside the housing 1, to which a ring collar 11 and a hollow-cylindrical part adjoin. The latter is provided with an external thread, and its internal diameter is adapted to the maximum internal diameter of the spherical cap 10. The part 12 penetrates an opening of the housing 1, and a nut 13 screwed onto it pulls the ring collar 11 against the housing 1. At the same time, it presses a bearing washer 14 between the housing wall and the housing wall against the housing wall.

[0040]

In the interior of the spherical cap there is a pressure piece 15 adapted to its curvature and on which the spherical cap is

directed

[0042]

BAD ORIGINAL ^

[0043]

A spring pack 16 is placed.

A tensioning screw 17 penetrates the spring pack 16, the pressure piece 15 as well as the spherical cup 10, which has a bore 20 adapted in its center to the desired pivoting range of the housing 1.

[0044]

The foot 9, as shown in FIG. 2, is hollow and open on the largest side in the embodiment for forming an access opening. Normally, the interior 9 'of the foot 9 is closed by means of a cover 23, which in the exemplary embodiment consists of plastic and engages in the foot.

[0045]

The side of the foot 9 facing the housing 1 is provided with a recess forming a bearing shell for the spherical dome 10 as well as a through-bore for the clamping screw 17 arranged in the center of the recess. As shown in FIG. 3, both the through-hole and the tensioning screw are designed to be flattened in the section located therein. So that the clamping screw can not rotate in the bore. With the aid of two nuts on the end of the clamping screw 17 projecting into the interior, the pressure piece 15 is pressed against the inner side of the spherical cap 10 and its outer side against the bearing shell in the foot 9 with the required force. This force can be changed at any time by turning the nuts 21. For this purpose, the cover 2 3 only needs to be removed temporarily, for which purpose an insertion opening 22 for a screwdriver or the like, is provided.

[0046]

Two bores 24 are provided in the wall of the foot 7, which is opposite the wall having the bearing shell, by means of which fastening screws (not shown) are fastened by means of which the foot 9 is fastened to the bodywork of a vehicle.

[0048]

BAD ORIGINAL.

[0049]

After the introduction of the pressure piece 15, of the spring package 16 and the tensioning screw 17, a more elastic stopper 25 made of plastic is inserted into the part 12 in the exemplary embodiment.

This prevents the penetration of moisture and protects the thrust piece, the spring pack and the tensioning screw from losing when the housing 1 and the joint 8 come into the market without the foot 9, as may be the case, for example, Or the glass pane "6, but not the foot, have been damaged and must therefore be replaced. <:> ", ▪▪ '" -. ; ; - ':

[0050]

5 098 2 5/0161 BAD ORIGINAt,

CLAIMS DE2362191

Claims

1.

An exterior mirror for motor vehicles, comprising a glass pane, mirrored on its rear side, the edge of which is clamped between a surrounding shoulder of a plastic housing and a frame which is tightly welded thereto and covers the glass pane laterally, characterized in that the rear side Of the glass pane (6) rests directly against the shoulder (2) of the housing (1), and the seal (7) between the front face of the pane and the flange over which it engages. Part "of the frame (5).

2.

A mirror according to claim 1, characterized in that the flange part is provided with a circumferential groove holding the seal (7) in the desired position.

3.

Mirror according to claim 1 or 2, characterized in that the foot (9) connecting the housing (1) to the body of a motor vehicle is hollow and is provided on one side with an access opening which is closed by a removable cover (2 3) , And in the interior of the foot, accessible through the passage opening, the heads of the screw or screws provided for the connection of the foot to the body, and that of the adjustment of the friction in the joint connecting the foot to the housing

(6)

(17, 21) are arranged.

Spiegel nach einem der Ansprüche 1 bis 3, dadurch gekennzeichnet, daß das den Fuß (9) mit dem Gehäuse (1) verbindende Gelenk (8) aus einer einen zylindrischen Ansatz (12), der eine öffnung des Gehäuses (1) abgedichtet durchgreift, aufweisenden Kalotte (10), einer im Fuß vorgesehenen Lagerschale, einem durch den zylindrischen Ansatz hindurch einge-

4.

A mirror according to one of Claims 1 to 3, characterized in that the joint (8) connecting the foot (9) to the housing (1) comprises a cylindrical projection (12) sealingly penetrating an opening of the housing (1) (10), a bearing shell provided in the foot,

(15) resting against the bearing shell, and a clamping screw (17) penetrating the pressure piece, the calotte and the foot and being secured against rotation, on the end of which protrudes into the interior of the foot, at least one nut (21) As a tensioning element.

5.

Mirror according to claim 4, characterized in that a spring (16) is arranged between the head of the tensioning screw (17) and the pressure piece (15).

6.

A mirror according to claim 4 or 5, characterized in that a plug, which is preferably made of plastic, adjoins the cylindrical extension (12)

(25)

Is inserted.

Leerseite

Electronic Acknowledgement Receipt

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First Named Inventor/Applicant Name:	John T. Uken
Customer Number:	15671
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First Named Inventor	John T. Uken
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Art Unit	2875
Examiner Name	TON, ANABEL
Attorney Docket Number	DON01-P2803/425065

SIGNATURE of Applicant or Patent Practitioner

Signature	/Timothy A. Flory/	Date (Optional)	2018-02-19
Name	TIMOTHY A. FLORY	Registration Number	42540
Title (if Applicant is a juristic entity)	Patent Practitioner		
Applicant Name (if Applicant is a juristic entity)	MAGNA MIRRORS OF AMERICA, INC.		

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ *Total of _____ forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82B (07-13)
Approved for use through 01/31/2018. OMB 0651-0035
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number

POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

☑ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 153508

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

☑ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number:

OR

☐ Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

Magna Mirrors of America, Inc.

☐ Inventor or Joint Inventor (title not required below)

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

☑ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature	Niall Lynam	Date (Optional)	Feb 2 2018
Name	Niall Lynam		
Title	Senior Vice President and Chief Technical Officer		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ Total of forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Acknowledgement Receipt

EFS ID:	31822782
Application Number:	15161708
International Application Number:	
Confirmation Number:	8364
Title of Invention:	EXTERIOR REARVIEW MIRROR ASSEMBLY
First Named Inventor/Applicant Name:	John T. Uken
Customer Number:	15671
Filer:	Timothy A. Flory/Cindy Cory
Filer Authorized By:	Timothy A. Flory
Attorney Docket Number:	DON01 P-2803
Receipt Date:	19-FEB-2018
Filing Date:	23-MAY-2016
Time Stamp:	16:36:35
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	DON01-P2803_POA.pdf	117362 45af77d7630160d4faf3e5e71cf05b4c6e16a4ed	no	2

Warnings:

Information:	
Total Files Size (in bytes):	117362

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/161,708	05/23/2016	John T. Uken	DON01 P-2803

CONFIRMATION NO. 8364

POWER OF ATTORNEY NOTICE

15671
Gardner, Linn, Burkhart & Ondersma LLP
2851 Charlevoix Dr., SE, Suite 207
Grand Rapids, MI 49546

OC000000097548584

Date Mailed: 02/22/2018

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 02/19/2018.

- The Power of Attorney to you in this application has been revoked by the applicant. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/tgebre/

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/161,708	05/23/2016	John T. Uken	DON01 P-2803/425065

CONFIRMATION NO. 8364

POA ACCEPTANCE LETTER

153508
Jonathan P. O'Brien, Ph.D.
Honigman Miller Schwartz and Cohn LLP/Magna
350 East Michigan Avenue
Suite 300
KALAMAZOO, MI 49007

OC000000097548609

Date Mailed: 02/22/2018

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 02/19/2018.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/tgebre/

UNITED STATES PATENT AND TRADEMARK OFFICE

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United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/161,708	05/23/2016	John T. Uken	DON01 P-2803/425065	8364

153508 7590 10/01/2018

Honigman Miller Schwartz and Cohn LLP/Magna
650 Trade Centre Way
Suite 200
KALAMAZOO, MI 49002-0402
UNITED STATES OF AMERICA

EXAMINER
TON, ANABEL

ART UNIT	PAPER NUMBER
2875	

NOTIFICATION DATE	DELIVERY MODE
10/01/2018	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patent@honigman.com
tflory@honigman.com
asytsma@honigman.com

Office Action Summary	Application No. 15/161,708	Applicant(s) UKEN ET AL.	
	Examiner ANABEL TON	Art Unit 2875	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *5/2323/16*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *1-36* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☒ Claim(s) *15-36* is/are allowed.

7)☒ Claim(s) *1-3,5-8 and 10-13* is/are rejected.

8)☒ Claim(s) *4,9 and 14* is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date *5/23/16; 3/31/17*.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

The present application is being examined under the pre-AIA first to invent provisions.

DETAILED ACTION

Double Patenting

1. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on nonstatutory double patenting provided the reference application or patent either is shown to be commonly owned with the examined application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. See MPEP § 717.02 for applications subject to examination under the first inventor to file provisions of the AIA as explained in MPEP § 2159. See MPEP §§ 706.02(l)(1) -

706.02(l)(3) for applications not subject to examination under the first inventor to file provisions of the AIA. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

The USPTO Internet website contains terminal disclaimer forms which may be used. Please visit www.uspto.gov/patent/patents-forms. The filing date of the application in which the form is filed determines what form (e.g., PTO/SB/25, PTO/SB/26, PTO/AIA/25, or PTO/AIA/26) should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp.

2. Claims 1-3, 5-8, 10-13 rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1-4 of U.S. Patent No. 9,827,913. Although the claims at issue are not identical, they are not patentably distinct from each other because of the following reasons:

3. The limitations of claims 1-3, 5-8 and 12 are contained within claim 1 of the ‘913 reference.

4. The limitations of claim 10 are contained within claim 3 of the ‘913 reference.

5. The limitations of claim 11 are contained within claim 4 of the '913 reference

6. The limitations of claim 13 are contained within claim 2 of the '913 reference.

Allowable Subject Matter

7. Claim 4, 9 and 14 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

8. Claims 15-36 are allowed.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANABEL TON whose telephone number is (571)272-2382. The examiner can normally be reached on 09:00-17:30.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diane Lee can be reached on (571) 272-2399. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free)? If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Anabel M Ton
Primary Examiner
Art Unit 2875

/ANABEL TON/
Primary Examiner, Art Unit 2875

Notice of References Cited	Application/Control No. 15/161,708	Applicant(s)/Patent Under Reexamination UKEN ET AL.	
	Examiner ANABEL TON	Art Unit 2875	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-5,582,383 A	12-1996	Mertens; Jens	B60R1/086	248/484
*	B	US-7,922,199 B2	04-2011	Webber; James L.	B60R21/233	280/743.2
*	C	US-2017/0355312 A1	12-2017	Habibi; Hamid	B60R1/12	1/1
*	D	US-2015/0085337 A1	03-2015	Lee; Ethan J.	G02B27/0149	359/267
*	E	US-2012/0236388 A1	09-2012	De Wind; Darryl P.	B60R1/04	359/267
*	F	US-5,455,716 A	10-1995	Suman; Michael J.	B60R1/04	248/479
*	G	US-2014/0133044 A1	05-2014	Mambourg; Joseph R.	B60R1/072	359/877
*	H	US-2018/0257571 A1	09-2018	De Wind; Darryl P.	B60R1/062	1/1
*	I	US-2010/0177413 A1	07-2010	Lee; Jin-Woo	B60R1/025	359/843
*	J	US-9,827,913 B2	11-2017	De Wind; Darryl P.	B60R1/062	1/1
	K	US-				
	L	US-				
	M	US-				

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (03-15)
Approved for use through 07/31/2016. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15161708
Filing Date	2016-05-23
First Named Inventor	John T. Uken
Art Unit	2875
Examiner Name	Anabel Ton
Attorney Docket Number	DON01 P-2803

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	1949138		1934-02-27	Bell	
	2	5179471		1993-01-12	Caskey et al.	

If you wish to add additional U.S. Patent citation information please click the Add button. Add

U.S.PATENT APPLICATION PUBLICATIONS Remove

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

If you wish to add additional U.S. Published Application citation information please click the Add button. Add

FOREIGN PATENT DOCUMENTS Remove

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	DE2362191	DE		1975-06-19	ZIPPERLE WOLFGANG		X

If you wish to add additional Foreign Patent Document citation information please click the Add button Add

NON-PATENT LITERATURE DOCUMENTS Remove

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.T/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15161708
Filing Date	2016-05-23
First Named Inventor	John T. Uken
Art Unit	2875
Examiner Name	Anabel Ton
Attorney Docket Number	DON01 P-2803

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1		

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature	/ANABEL TON/	Date Considered	09/25/2018

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.T/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15161708
Filing Date	2016-05-23
First Named Inventor	John T. Uken
Art Unit	2875
Examiner Name	Anabel Ton
Attorney Docket Number	DON01 P-2803

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Timothy A. Flory/	Date (YYYY-MM-DD)	2017-03-31
Name/Print	Timothy A. Flory	Registration Number	42540

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.T/

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

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2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.T/

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	651535	g08l3/044.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/19 13:02
S2	53510	g08l3/04883.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/19 13:03
S3	3586	g08l3/047.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/19 13:03
S4	2705	b60r11/072.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/19 13:04
S5	3355	b60r11/069.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/19 13:04
S6	1086	b60r25/252.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/19 13:04
S7	2582	g02b7/182.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/19 13:27
S8	0	g08l3/04.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/19 13:27
S9	4371	b60r11/06.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/19 13:27
S10	318	b60r11/06.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/19 13:27
S11	649	b60r11/068.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/19 13:27
S12	5235	b60r1/12.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/19 13:27
S13	651535	g08l3/044.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/19 16:13
S14	317	Actuat$3 and mirror$1 and adjust$3 and attach$4 and electrochromic$4 and S13	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/19 16:16
S15	31	Actuat$3 and mirror$1 and adjust$3 and attach$4 and rearview and yaw and S13	US-PGPUB; USPAT; USOCR; FPRS; EPO;	ADJ	ON	2018/09/19 16:17

			US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ		ON		
S16	63610	go0813/04883.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ		ON	2018/09/19 16:17	
S17	31	Actuat$3 and mirror$1 and adjust$3 and attach$4 and rearview and yaw and S16	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ		ON	2018/09/19 16:17	
S18	31	Actuat$3 and mirror$1 and adjust$3 and attach$4 and rearview and yaw and S15	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ		ON	2018/09/19 16:17	
S19	31	Actuat$3 and mirror$1 and adjust$3 and attach$4 and rearview and yaw and S18	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ		ON	2018/09/19 16:17	
S20	32	Actuat$3 and mirror$1 and adjust$3 and attach$4 and rearview and S18	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ		ON	2018/09/19 16:17	
S21	31	Actuat$3 and mirror$1 and adjust$3 and attach$4 and rearview and S15	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ		ON	2018/09/19 16:18	
S22	25492	g02e7/182.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ		ON	2018/09/19 16:24	
S23	343	Actuat$3 and mirror$1 and adjust$3 and rearview and S22	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ		ON	2018/09/19 16:24	
S24	11086	b60r25/252.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ		ON	2018/09/19 16:24	
S25	26	Actuat$3 and mirror$1 and adjust$3 and rearview and S24	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ		ON	2018/09/19 16:24	
S26	33055	b60r1/088.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ		ON	2018/09/19 16:24	
S27	4558	Actuat$3 and mirror$1 and adjust$3 and rearview and S26	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ		ON	2018/09/19 16:24	
S28	32705	b60r1/072.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ		ON	2018/09/19 16:24	
S29	169	Actuat$3 and mirror$1 and adjust$3 and rearview and S28	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ		ON	2018/09/19 16:24	
S30	28586	go0813/047.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ		ON	2018/09/19 16:24	
S31	31	Actuat$3 and mirror$1 and adjust$3 and rearview and S30	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ		ON	2018/09/19 16:24	
S32	32	Actuat$3 and mirror$1 and adjust$3 and rearview and S16	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ		ON	2018/09/19 16:24	
S33	312	Actuat$3 and mirror$1 and adjust$3 and rearview and S13	US-PGPUB; USPAT;	ADJ		ON	2018/09/19 16:25	

			USOCR, FPRS, EPO, JPO			
S34	74	Actual$3 and mirror$1 and adjust$3 and (side view) and S22	US-PGPUB, USPAT, USOCR, FPRS, EPO, JPO	ADJ	ON	2018/09/19 16:55
S35	73	Actual$3 and mirror$1 and adjust$3 and (side view) and S13	US-PGPUB, USPAT, USOCR, FPRS, EPO, JPO	ADJ	ON	2018/09/19 16:55
S36	105	Actual$3 and mirror$1 and adjust$3 and (side view) and S16	US-PGPUB, USPAT, USOCR, FPRS, EPO, JPO	ADJ	ON	2018/09/19 16:55
S37	39	Actual$3 and mirror$1 and adjust$3 and (side view) and S24	US-PGPUB, USPAT, USOCR, FPRS, EPO, JPO	ADJ	ON	2018/09/19 16:55
S38	251	Actual$3 and mirror$1 and adjust$3 and (side view) and S26	US-PGPUB, USPAT, USOCR, FPRS, EPO, JPO	ADJ	ON	2018/09/19 16:56
S39	124	Actual$3 and mirror$1 and adjust$3 and (side view) and S28	US-PGPUB, USPAT, USOCR, FPRS, EPO, JPO	ADJ	ON	2018/09/19 16:56
S40	31	Actual$3 and mirror$1 and adjust$3 and (side view) and S30	US-PGPUB, USPAT, USOCR, FPRS, EPO, JPO	ADJ	ON	2018/09/19 16:56
S41	31	"20180257568"	US-PGPUB, USPAT, USOCR, FPRS, EPO, JPO	ADJ	ON	2018/09/21 13:26
S42	3	("20180257568") or ("20140133044").PN.	US-PGPUB, USPAT, USOCR, FPRS, EPO, JPO	OR	OFF	2018/09/21 13:27
S43	16	("20170365312") or ("20150086337") or ("20120236388") or ("5455716").PN.	US-PGPUB, USPAT, USOCR, FPRS, EPO, JPO	OR	OFF	2018/09/21 13:27
S44	2	("19491136" | "5179471").PN.	US-PGPUB, USPAT	ADJ	ON	2018/09/21 13:28
S45	55	("3340403") or ("8976439 ") or ("8922967 ") or ("6736553") or ("8508631") or ("8485161") or ("8339526 ") or ("8287184 ") or ("8277059") or ("8237809 ") or ("8194133 ") or ("8179586 ") or ("8169684 ") or ("8154418 ") or ("8050551") or (" 8049640") or (" 8048085") or (" 8047667") or (" 8018440") or (" 8004741") or " 7980711 ") or ("7979094") or (" 7944371") or (" 7926960") or (" 7864398") or (" 7855755 ") or ("7826123 ") or ("7821697 ") or ("7817020") or (" 7748956 ") or ("7722198") or (" 7720580 ") or ("7719750")).PN.	US-PGPUB, USPAT, USOCR, FPRS, EPO, JPO	OR	OFF	2018/09/21 15:15
S46	2	("7599108") or ("7581859") or " 7570413 7542193 7532149 7526367 7510311 7492281 7420756 7372611 7370893 7360932 7338177 7334922 7324261 7314295 7289037 7287868 7274501 7267449 7255451 7253723 7249880 7224324 7195381 7184190 7159992 7126456 7110156 7104663 7093985 7093946 7080914 7073914")).PN.	US-PGPUB, USPAT, USOCR, FPRS, EPO, JPO	OR	OFF	2018/09/21 16:09
S47	48	("7599108") or ("7581859") or (" 7570413 ") or ("7542193") or (" 7532149") or (" 7526367") or (" 7510311") or (" 7492281") or (" 7420756") or (" 7372611 ") or ("7370893") or (" 7360932 ") or ("7338177 ") or ("7334922") or (" 7324261 ") or ("7314295") or (" 7289037 ") or ("7287868 ") or ("7274501") or (" 7267449") or (" 7255451") or (" 7253723") or (" 7249880") or (" 7224324 ") or ("7195381 ") or ("7184190") or (" 7159992") or (" 7126456") or (" 7110156") or (" 7104663") or (" 7093985") or (" 7093946") or (" 7080914 ") or ("7073914")).PN.	US-PGPUB, USPAT, USOCR, FPRS, EPO, JPO	OR	OFF	2018/09/21 16:10
S51	61	("5877897") or ("5863116") or ("5825627") or ("5823654") or ("5820097") or ("5818825") or ("5808778") or ("5798575") or ("5796176") or ("5796094") or ("5790256") or ("5789357") or ("5786772") or ("5724187") or ("5703731") or ("5680263") or ("5671996") or ("5669705") or ("5668704") or ("5663639") or "5663639") or ("5658683") or ("5659423") or ("5649756") or ("5632551") or ("5624176") or ("5613575") or ("5613574") or ("5610756") or ("5587699") or ("5582383")).PN.	US-PGPUB, USPAT, USOCR, FPRS, EPO, JPO	OR	OFF	2018/09/21 16:33
S52	20	"7038677701 2729 7004593 6916100 6882287 6877708 6870656 6828948 6781736 6774810 6755544 6717712 6717109 6696905 6690268 6685804 6657767 6650457 6619955 6614579 6606183 6598980 6593565 6582109 6565221 6540193 6535126 6522451 6502970 6439850 6403438 6476358 6467920 6452479".PN.	US-PGPUB, USPAT, USOCR, FPRS, EPO, JPO	OR	OFF	2018/09/21 16:41
S53	54	("7038677") or ("7012729") or (" 7004593") or (" 6916100 ") or ("6882287") or (" 6877708") or (" 6870656") or (" 6828948") or (" 6781736 ") or ("6774810") or (" 6755544 ") or ("6717712") or (" 6717109") or (" 6696905") or (" 6690268 ") or ("6685804 ") or ("6657767 ") or ("6650457") or (" 6619955") or (" 6614579 ") or ("6606183 ") or ("6598980") or (" 6593565") or (" 6582109") or (" 6565221") or (" 6540193") or (" 6535126") or (" 6522451") or (" 6502970") or (" 6439850 ") or ("6403438 ") or ("6476358 ") or ("6467920") or (" 6452479")).PN.	US-PGPUB, USPAT, USOCR, FPRS, EPO, JPO	OR	OFF	2018/09/21 16:43
S54	10	("20170365312") or ("20150086337") or ("20120236388") or ("5455716") or ("5582383") or ("7122199")).PN.	US-PGPUB, USPAT, USOCR,	OR	OFF	2018/09/24 12:56

			FPRS; EPO; JPO				
S66	311	("20170366312") or ("20150098337") or ("20120236388") or ("5455716") or ("5582383") or ("7722199")).PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/09/24 12:59
S68	310	("20170366312") or ("20150098337") or ("20120236388") or ("5455716") or ("5582383") or ("7722199")).PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2018/09/24 13:00
S67	2582	g02b7/182.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24 13:02
S69	367	Actual$3 and mirror$1 and adjust$3 and (exterior) and S67	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24 13:02
S60	3573	g08l3/047.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24 13:02
S60	31	Actual$3 and mirror$1 and adjust$3 and (exterior) and S59	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24 13:02
S61	2707	b60r1/072.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24 13:03
S62	189	Actual$3 and mirror$1 and adjust$3 and (exterior) and S61	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24 13:03
S63	1086	b60r25/252.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24 13:03
S64	344	Actual$3 and mirror$1 and adjust$3 and (exterior) and S63	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24 13:03
S65	344	Actual$3 and mirror$1 and adjust$3 and (exterior) and S63	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24 13:04
S66	53532	g08l3/04883.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24 13:04
S67	367	Actual$3 and mirror$1 and adjust$3 and (exterior) and S66	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24 13:04
S68	3207	rotating and exterior and vehicle and mirror and housing and head$1 and vehicle$1	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24 13:22
S69	1480	actuator$1 and S68	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24 13:22
S70	1235	S68 and multi$4 and axi$1	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24 13:23
S71	990	exterior$2 and (side view) and S70	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24 13:24
S72	311	("20170366312") or ("20150098337") or ("20120236388") or ("5455716") or ("5582383") or ("20100177413") or ("7722199")).PN.	US-	OR	OFF	2018/09/24

			US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO				16:38
S73	33	reflector$1 and S72	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24	17:38
S74	851606	g0813/044.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24	17:39
S75	18	Actual$3 and mirror$1 and adjust$3 and (exterior) and reflector and S74	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24	17:39
S76	836532	g0813/04883.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24	17:39
S77	48	Actual$3 and mirror$1 and adjust$3 and (exterior) and reflector and S76	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24	17:39
S78	48	Actual$3 and mirror$1 and adjust$3 and (exterior) and reflector and S76	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24	17:39
S79	3673	g0813/047.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24	17:39
S80	31	Actual$3 and mirror$1 and adjust$3 and (exterior) and reflector and S79	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24	17:39
S81	3055	b60r1/088.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24	17:40
S82	403	Actual$3 and mirror$1 and adjust$3 and (exterior) and reflector and S81	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24	17:40
S83	2707	b60r1/072.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24	17:40
S84	278	Actual$3 and mirror$1 and adjust$3 and (exterior) and reflector and S83	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24	17:40
S85	2592	g02b7/182.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24	17:40
S86	42	Actual$3 and mirror$1 and adjust$3 and (exterior) and reflector and S85	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24	17:40
S87	1088	b60r25/252.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24	17:40
S88	28	Actual$3 and mirror$1 and adjust$3 and (exterior) and reflector and S87	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24	17:40
S89	4372	b60r1/06.cpc.	US-PGPUB; USPAT; USOCR; FPRS;	ADJ	ON	2018/09/24	17:41

			EPO; JPO			
S90	3103	Actuat$3 and mirror$1 and adjust$3 and (exterior) and reflector and S89	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24 17:41
S91	3918	b60r1/08.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24 17:41
S92	1118	Actuat$3 and mirror$1 and adjust$3 and (exterior) and reflector and S91	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24 17:41
S93	3949	b60r1/088.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24 17:41
S94	49	Actuat$3 and mirror$1 and adjust$3 and (exterior) and reflector and S93	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24 17:41
S95	5536	b60r1/12.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24 17:41
S96	575	Actuat$3 and mirror$1 and adjust$3 and (exterior) and reflector and S95	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	ADJ	ON	2018/09/24 17:41

EAST Search History (Interference)

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9/25/2018 7:24:31 PM
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PTO/SB/08A (07-05)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

	Complete if Known
Application Number	
Filing Date	May 23, 2016
First Named Inventor	John T. Uken
Art Unit	
Examiner Name	
Attorney Docket Number	DON01 P-2803

Sheet 1 of 12

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		9346403	05-24-2016	Uken et al.	
		8976439	03-10-2015	De Wind	
		8922867	12-30-2014	De Wind et al.	
		8730553	05-20-2014	De Wind et al.	
		8508831	08-13-2013	De Wind et al.	
		8465161	06-18-2013	De Wind et al.	
		8339526	12-25-2012	Minikey, Jr. et al.	
		8287164	10-16-2012	Fehn et al.	
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		7710631	05-04-2010	McCabe et al.	
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First Named Inventor	John T. Uken
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Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
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		7599108	10-06-2009	Lawlor et al.	
		7581859	09-01-2009	Lynam	
		7570413	08-04-2009	Tonar et al.	
		7542193	06-02-2009	McCabe et al.	
		7532149	05-12-2009	Banko et al.	
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		7510311	03-31-2009	Romas et al.	
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		7080914	07-25-2006	Boddy	
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		7004593	02-28-2006	Weller et al.	
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		6882287	04-19-2005	Schofield	
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		6832848	12-21-2004	Pastrick	
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		5798575	08-25-1998	O'Farrell et al.	
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		5788357	08-04-1998	Muth et al.	
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		5513048	04-30-1996	Chen	
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		5489080	02-06-1996	Allen	
		5481409	01-02-1996	Roberts	
		5448397	09-05-1995	Tonar	
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		5379146	01-03-1995	Defendini	
		5371659	12-06-1994	Pastrick et al.	
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		5327288	07-05-1994	Wellington et al.	
		5313335	05-17-1994	Gray et al.	
		5253109	10-12-1993	O'Farrell et al.	
		5210651	05-11-1993	Shibuya et al.	
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		5115346	05-19-1992	Lynam	
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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	Complete if Known
Application Number	
Filing Date	May 23, 2016
First Named Inventor	John T. Uken
Art Unit	
Examiner Name	
Attorney Docket Number	DON01 P-2803

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U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		5017903	05-21-1991	Krippelz, Sr.	
		5016996	05-21-1991	Ueno	
		5014167	05-07-1991	Roberts	
		5005797	04-09-1991	Maekawa et al.	
		4948242	08-14-1990	Desmond et al.	
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		1563258	11-24-1925	Cunningham	
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		D661234	06-05-2012	De Wind	
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		D493394	07-27-2004	Lawlor et al.	
		D493131	07-20-2004	Lawlor et al.	

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		D430088	08-29-2000	Todd et al.	
		D429202	08-08-2000	Todd et al.	
		D428842	08-01-2000	Todd et al.	
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		2008/0042938	02-21-2008	Cok	
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U. S. PATENT DOCUMENTS					
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		2010/0290141	11-18-2010	Huang	
		2010/0321758	12-23-2010	Bugno et al.	
		2011/0096427	04-28-2011	Uken et al.	
		2011/0176323	07-21-2011	Skiver et al.	
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		2012/0026571	02-02-2012	Uken et al.	
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		2014/0022390	01-23-2014	Blank et al.	
		2015/0097955	04-09-2015	De Wind et al.	

Examiner Signature	/ANABEL TON/	Date Considered	09/25/2018

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FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] Number[4]-Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
		CA2028461	11-08-1994	K.W. Muth Co., Inc.		
		DE2254511	05-09-1971	Reitter & Schefenacker KG		X
		DE3049169	07-15-1982	Zipperle		X
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		EP1103420	06-21-2006	Donnelly Corp.		
		EP1345071	09-17-2003	National Inst. Of Advanced Industrial Science and Technology		X
		EP2106970	10-07-2009	SMR Patents S.a.r.l		
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		JP 6-81836	03-04-1997			X
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		WO2008013499	01-31-2008	Chromogenics Sweden AB		

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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				Application Number	
				Filing Date	May 23, 2016
				First Named Inventor	John T. Uken
				Art Unit	
				Examiner Name	
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NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		International Search Report and Written Opinion dated March 19, 2013 for corresponding PCT Application No. PCT/US2012/064398.	

Examiner Signature	/ANABEL TON/	Date Considered	09/25/2018

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15161708	UKEN ET AL.
	Examiner	Art Unit
	ANABEL TON	2875

CPC- SEARCHED		
Symbol	Date	Examiner
G06F3/047,044,04883; B60R1/04,06,08,086,12,072,088; B06R25/252; G02B7/182	9/17/2018	AT

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner

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SEARCH NOTES		
Search Notes	Date	Examiner
EUNCHA CHERRY, SEARCH CLASS 359	9/17/2018	AT

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15161708	UKEN ET AL.
	Examiner	**Art Unit**
	ANABEL TON	2875

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	09/25/2018								
	1	✓								
	2	✓								
	3	✓								
	4	O								
	5	✓								
	6	✓								
	7	✓								
	8	✓								
	9	O								
	10	✓								
	11	✓								
	12	✓								
	13	✓								
	14	O								
	15	=								
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TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING REJECTION OVER A "PRIOR" PATENT

Docket Number (Optional)
225894-425065/DON01 P2803

In re Application of: John T. Uken et al.

Application No.: 15/161,708

Filed: May 23, 2016

For: EXTERIOR REARVIEW MIRROR ASSEMBLY

The applicant, MAGNA MIRRORS OF AMERICA, INC., owner of 100 percent interest in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of **prior patent** No. 9,827,913 as the term of said **prior patent** is presently shortened by any terminal disclaimer. The applicant hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the **prior patent** are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the applicant does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term of the **prior patent**, "as the term of said **prior patent** is presently shortened by any terminal disclaimer," in the event that said **prior patent** later:

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2. ☑ The undersigned is an attorney or agent of record. Reg. No. 42540

/Timothy A. Flory/ — Signature
December 11, 2018 — Date

Timothy A. Flory — Typed or printed name

Attorney of Record — Title
616-649-1924 — Telephone Number

☑ Terminal disclaimer fee under 37 CFR 1.20(d) included.

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15161708
Filing Date	2016-05-23
First Named Inventor	John T. Uken
Art Unit	2875
Examiner Name	A. Ton
Attorney Docket Number	225894-425065

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	3459470		1969-08-05	Hahn	
	2	2307568		1943-01-05	Colbert	
	3	2552074		1951-05-08	Thompson	
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	5	2969715		1961-01-31	Mosby	
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	7	3711179		1973-01-16	Takeda	
	8	4470323		1984-09-11	Manzoni	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
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	Filing Date	2016-05-23
	First Named Inventor	John T. Uken
	Art Unit	2875
	Examiner Name	A. Ton
	Attorney Docket Number	225894-425065

	9	4477149		1984-10-16	Crespy	
	10	4512633		1985-04-23	Manzoni	
	11	4558930		1985-12-17	Deedreek	
	12	4936670		1990-06-26	Yoo	
	13	5473476		1995-12-05	Fujita	
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	15	6170957		2001-01-09	Kaspar	
	16	6481878		2002-11-19	Thau	
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	20	6932497		2005-08-23	Huang	
	21	7035678		2006-04-25	Lynam et al.	
	22	7178925		2007-02-20	Tidwell	
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	24	7322710		2008-01-29	Foote et al.	
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	26	7777611		2010-08-17	Desai	
	27	8262240		2012-09-11	Negel	
	28	8764256		2014-07-01	Foote et al.	
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	Examiner Name	A. Ton
	Attorney Docket Number	225894-425065

	31	9174578		2015-11-03	Uken et al.	
	32	10099618		2018-10-16	Foote et al.	

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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20090161379	A1	2009-06-25	Liesener	
	2	20010015862	A1	2001-08-23	Lynam et al.	
	3	20020063978	A1	2002-05-30	Guttenberger et al.	
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	8	20100321758	A1	2010-12-23	Bugno et al.		
	9	20120038964	A1	2012-02-16	De Wind et al.		
	10	20120236388	A1	2012-09-20	De Wind et al.		
	11	20140285666	A1	2014-09-25	O'Connell et al.		
	12	20150224930	A1	2015-08-13	Foote et al.		

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Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	102009031809	DE	A1	2011-01-13	Volkswagen AG		☒
	2	1530861	DE	A1	1969-06-12	Maier,imanuel		☒
	3	202010005203	DE	U1	2010-09-16	Liu, Tzu-chuan		☒
	4	0780266	EP	A2	1997-06-25	Kuramoto, Atsushi		☒

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	Examiner Name	A. Ton
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	5	2112022	EP	A1	2009-10-28	Smr Patents Sarl		☒
	6	2492144	EP	A1	2012-08-29	Smr Patents Sarl		☒
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	Application Number	15161708
	Filing Date	2016-05-23
	First Named Inventor	John T. Uken
	Art Unit	2875
	Examiner Name	A. Ton
	Attorney Docket Number	225894-425065

	16	0064421	EP	A1	1982-11-10	Manzoni, Stephane		☒
	17	0314839	EP	A1	1989-05-10	Haan Mechatronics		☒
	18	1000807	EP	A2	2000-05-17	Ichikoh Industries Ltd		☒
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(19) Deutsches Patent- und Markenamt

(10) **DE 10 2009 031 809 A1** 2011.01.13

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(56) Für die Beurteilung der Patentfähigkeit in Betracht zu ziehende Druckschriften:

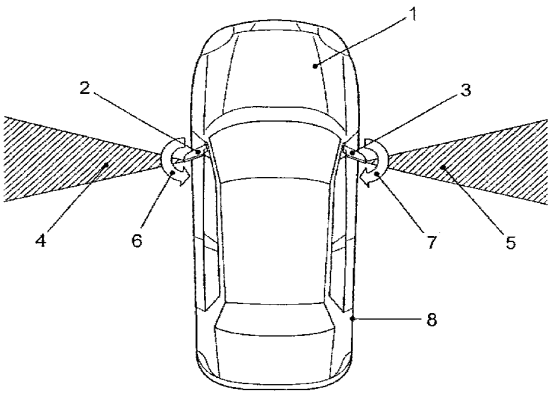
DE	60 2004 000387	T2
DE	603 07 451	T2
US	54 73 364	A
EP	13 21 334	A2

Die folgenden Angaben sind den vom Anmelder eingereichten Unterlagen entnommen

Rechercheantrag gemäß § 43 Abs. 1 Satz 1 PatG ist gestellt.

(54) Bezeichnung: **Verfahren und Vorrichtung zur Vermessung des Umfeldes eines Kraftfahrzeugs**

(57) Zusammenfassung: Bei einem Verfahren zur Bestimmung von Umfelddaten eines Kraftfahrzeugs mit mindestens einer Kamera und zur Generierung von 3-D-Daten des Umfeldes, führt im Stillstand des Kraftfahrzeugs die mindestens eine Kamera eine vorgegebene Bewegung aus, wobei unter Verwendung der Bewegung der Kamera aus den Umfelddaten die 3-D-Daten generiert werden. Eine entsprechende Vorrichtung weist einen Weggeber auf, um den Weg einer in einem Außenspiegel angeordneten Kamera während einer Spiegelbewegung festzustellen.



Beschreibung

[0001] Die Erfindung betrifft ein Verfahren zum Vermessen und Generieren von 3D-Daten des Umfeldes eines Kraftfahrzeuges gemäß dem Oberbegriff des Anspruchs 1 sowie eine entsprechende Vorrichtung gemäß dem Oberbegriff des Anspruchs 9 bzw. des Anspruchs 10.

[0002] Systeme, die den Fahrer eines Kraftfahrzeuges beim Einparken unterstützen, also Einparksysteme oder Parkhilfesysteme, gehören zur Gruppe der Fahrerassistenzsysteme, die zunehmend in Fahrzeugen zur Erhöhung des Komforts, zur Unterstützung des Fahrers und/oder zur Erhöhung der Sicherheit eingesetzt werden. All diesen derzeitigen Systemen ist gemeinsam, dass sie mit einer geeigneten Messvorrichtung die Umgebung des eigenen Fahrzeugs vermessen und unter zur Hilfenahme diverser Algorithmen Parklücken mehr oder weniger gut erkennen und vermessen können.

[0003] Insbesondere ist die Suche nach ausreichend großen Längsparklücken, gefolgt von seitlichen Einparkmanövern, eine alltägliche Herausforderung von Fahrern von Kraftfahrzeugen. Gleichzeitig hat die Entwicklung des Fahrzeugdesigns sowohl aus optischen als auch aus sicherheitstechnischen Gründen stetig den einsehbaren Bereich um das Fahrzeug reduziert und so die Einparkaufgabe zusätzlich erschwert. Um den Fahrer daher zu entlasten und Souveränität zurück zu geben, sind diverse Parkassistenzsysteme entwickelt worden, die den Fahrer eines Kraftfahrzeuges beim Einparken unterstützen oder in der Endausbaustufe das Einparken selbsttätig durchführen sollen.

[0004] In seiner einfachsten Form ist ein derartiger Einparkassistent eine Einparkhilfe, bei der die Abstände des Fahrzeugs nach vorne und/oder hinten zu anderen Fahrzeugen unter Hindernissen gemessen und auf einem Display im Cockpit angezeigt werden. Im Fall des Unterschreitens vorgegebener Sicherheitsabstände wird eine optische, akustische und/oder haptische Warnung an den Fahrer ausgegeben, so dass dieser seinen Einparkvorgang entsprechend steuern kann. Derartige Einparkhilfen gehören mittlerweile zu den Sonderausstattungen von Fahrzeugen der Mittelklasse.

[0005] In einer weiteren Ausführungsform, wie dies beispielsweise in der DE 10 2005 017 360 A1 geschildert ist, umfasst ein Einparkassistent für das Einparken eines Kraftfahrzeuges mindestens eine Anzeigevorrichtung, eine Vorrichtung zum Vermessen von Parklücken und/oder Parktaschen, ein Steuergerät und einen Lenkaktuator, wobei die Vorrichtung eine Anzeigeeinrichtung mit einer Vielzahl von Anzeigezuständen aufweist, die den Fahrer über Parklücken oder Parktaschen betreffende Parameter und über Systemzustände des Einparkassistenten informiert. In der weiteren Ausbaustufe wird ein automatischer Parkvorgang nach vorheriger Vermessung der Parklücke durchgeführt, wie dies beispielsweise in der DE 3813083 A1 beschrieben ist. Die bekannte Vorrichtung umfasst vier Schalter bezüglich der Wahl der Betriebsart, über die der Fahrer den Ort und die Art der Parklücke angeben kann. Somit kann der Fahrer selektieren zwischen linke Parklücke, linke Parktasche, rechte Parklücke oder rechte Parktasche.

[0006] Ferner ist aus der Druckschrift E. Wahl et al.: "Realisierung eines Parkassistenten basierend auf Motion-Stereo", 16. Aachener Kolloquium Fahrzeug- und Motorentechnik 2007, S. 871–879, ein Video-basiertes Verfahren zur Parklückenvermessung bekannt, das sich auf Motion-Stereo stützt. Dabei unterscheidet das Verfahren zwei Operationsmodi, nämlich einen ersten Modus zur Vermessung der Parklücke und Bestimmung ihrer Länge. Der zweite Modus dient der verfeinerten Rekonstruktion der Fahrumgebung beim Zurücksetzen in die Lücke. Auf diese Weise können Warnfunktionen bzw. autonome Fahrmanöver realisiert werden.

[0007] Nachteilig bei einem Motion-Stereo-Verfahren zur Bestimmung von 3D-Daten des Umfeldes eines Kraftfahrzeugs mittels einer Monokamera ist, dass das Verfahren eine Bewegung des Kraftfahrzeugs zwingend bedingt, um aus der Fahrzeugbewegung und den korrespondierenden Kameradaten 3D-Daten des Umfeldes des Fahrzeuges ermitteln zu können. Bei stehendem Fahrzeug können mittels Motion-Stereo mangels Eigenbewegung des Fahrzeugs keine 3D-Daten bestimmt werden und das Fahrzeug bzw. das entsprechende Fahrerassistenzsystem ist sozusagen "blind". Dies ist beispielsweise bei einem automatischen Ausfahren aus einer Parklücke mittels einem Parkassistenten nachteilig. Kurz vor dem Anfahren des Fahrzeugs haben auf Grund des Stillstandes desselben die auf Motion-Stereo basierenden Assistenzsysteme keine Informationen über das aktuelle Umfeld des Fahrzeugs. Auch wird die Umfeldinformation erst langsam auf den ersten Metern der Fahrzeugbewegung aufgebaut, so dass die Systeme auf vergangene, während der Einparkphase ermittelten Informationen zurückgreifen müssen, die aufgrund des verstrichenen Zeitintervalls oftmals nicht mehr aktuell sind.

[0008] Der Erfindung liegt daher die Aufgabe zugrunde, das Verfahren zur Erkennung des Umfelds eines Kraftfahrzeugs mittel Motion-Stereo zu verbessern und insbesondere ein solches Verfahren auch für stehende Fahrzeuge durchführen zu können.

[0009] Diese Aufgabe wird durch ein Verfahren zur Umfelderkennung mittels Motion-Stereo mit den Merkmalen des Anspruchs 1 und durch eine entspre-

chende Vorrichtung mit den Merkmalen des Anspruchs 9 bzw. des Anspruchs 10 gelöst. Bevorzugte Ausführungsformen der Erfindung sind Gegenstand der Unteransprüche.

[0010] Bei dem erfindungsgemäßen Verfahren zur Bestimmung von Umfelddaten eines Kraftfahrzeugs mit mindestens einer Kamera und zur Generierung von 3D-Daten des Umfeldes mittels Motion-Stereo, führt im Stillstand des Kraftfahrzeugs die mindestens eine Kamera eine vorgegebene Bewegung aus und es werden unter Zugrundelegung des zurückgelegten Bewegungswegs der Kamera und deren Umfelddaten mittels Motion-Stereo die 3D-Daten des Umfelds des Kraftfahrzeugs generiert. Damit ist es auch bei stehendem Kraftfahrzeug möglich neue 3D-Daten mittels der Kamerabewegung zu erzeugen, so dass beispielsweise bei einem automatischen Ausparken des Kraftfahrzeugs der Ausparkfunktion aktuelle Umfelddaten zur Verfügung stehen und nicht auf veraltete Daten oder auf Daten anderer Sensoren, wie beispielsweise Ultraschalldaten mit schlechter Auslösung, zurückgegriffen werden muss.

[0011] Vorzugsweise wird die Kamerabewegung durch einen Kameraschwenk gebildet. Dabei ist unter einem Kameraschwenk eine Drehbewegung der Kamera zu verstehen, wobei der Drehpunkt des Kameraschwenks einen vorgegebenen Abstand zur Kamera bzw. zur Bildebene der Kamera aufweist, so dass die Kamera bzw. deren Bildebene eine Wegstrecke im Raum im Sinne einer translatorischen Bewegung während des Kameraschwenks zurücklegt. Dies ist notwendig da das Motion-Stereo-Verfahren eine zurückgelegte Wegstrecke der Kamera zur Voraussetzung hat. Ferner kann die Kamerabewegung durch eine Längsbewegung der Kamera gebildet werden. Als Kamera kommt weiter bevorzugt eine Monokamera zum Einsatz.

[0012] Der genannte Kameraschwenk wird bevorzugt durch eine elektromotorische Drehbewegung bewirkt. Insbesondere kann die Kamera weiter bevorzugt in einem Außenspiegel des Kraftfahrzeugs angeordnet sein und der Kameraschwenk kann in diesem Fall durch eine Bewegung des Außenspiegels erzeugt werden.

[0013] Eine derartige Bewegung des Außenspiegels kann durch ein Ein- oder Ausklappen des Außenspiegels erzeugt werden. Ein Ein- und Ausklappen der Außenspiegel wird in heutigen Kraftfahrzeugen oftmals eingesetzt, um die Außenspiegel mit ihren oftmals großen Ausmaßen an das Fahrzeug zu klappen, wenn das Fahrzeug abgestellt wird. In diesem Fall ragen die Außenspiegel nicht mehr aus der Kontur des Fahrzeugs heraus und die Gefahr einer Beschädigung der Außenspiegel wird so verringert. Um das Klappen der Spiegel ausführen zu können, ist im Spiegelfuß ein elektromotorischer Antrieb vorgesehen. Derartige Außenspiegel mit elektromotorischem Antrieb können daher vorteilhafterweise verwendet werden, um eine Schwenkbewegung einer im Außenspiegel angeordneten Kamera zu bewirken.

[0014] Falls kein Ein- und Ausklappen des Außenspiegels bei einem Kraftfahrzeug vorgesehen ist, kann in weiter bevorzugter Weise die Schwenkbewegung des Außenspiegels mit der Kamera durch eine Türbewegung erzeugt werden, falls der Außenspiegel an der Fahrer- oder Beifahrertür angeordnet ist.

[0015] Es ist natürlich auch möglich, die Kamera ohne Verwendung eines Außenspiegel an einer Fahrer- oder Beifahrertür anzuordnen. Dann kann die Schwenkbewegung der Kamera durch die Türbewegung beim Türöffnen oder Türschließen erzeugt werden.

[0016] Ferner ist es möglich, die Längsbewegung der Kamera durch einen elektromotorischen Längsaktuator zu erzeugen.

[0017] Sollte das Kraftfahrzeug mit einer Schiebetür ausgestattet sein, wie dies bei einigen Vans der Fall ist, so kann die Kamera in der Schiebetür angeordnet werden. Die Bewegung der Schiebetür als rein translatorische Bewegung beim Öffnen oder Schließen der Tür kann ebenfalls als Basis für eine Auswertung der Kameradaten durch Motion-Stereo dienen, um 3D-Daten der Umgebung des Fahrzeugs bei dessen Stillstand zu bestimmen.

[0018] Eine erfindungsgemäße Vorrichtung zur Durchführung des im vorigen erläuterten Verfahrens umfasst eine Kamera zu Erfassung von Umfelddaten des Umfelds des Kraftfahrzeugs, einen klappbaren Außenspiegel, wobei die Kamera in dem Außenspiegel angeordnet ist, und eine Steuerungseinheit zur Bestimmung des Umfelds des Kraftfahrzeugs aus der Kamerabewegung und den Umfelddaten sowie zum Ansteuern der Klappbewegung des Außenspiegels, wobei der Außenspiegel einen Weggeber zur Bestimmung der Bewegung des Spiegels aufweist. Mittels des Weggebers kann eine genaue Bestimmung der Position des Spiegels und damit der im Spiegel angeordneten Kamera, um mittels des Motion-Stereo-Verfahrens dreidimensionale Punkte, also 3D-Daten, des Umfeldes des Kraftfahrzeugs bestimmen zu können.

[0019] Eine weitere erfindungsgemäße Vorrichtung zur Durchführung des im vorigen erläuterten Verfahrens umfasst eine Kamera zu Erfassung von Umfelddaten des Umfelds des Kraftfahrzeugs, wobei die Kamera in einer Schiebetür eines Kraftfahrzeugs angeordnet ist, und eine Steuerungseinheit zur Ermittlung des Umfelds des Kraftfahrzeugs (1) aus den Umfelddaten, wobei die Schiebetür einen Weggeber zur Bestimmung eines Kamerawegs während der Bewe-

gung der Schiebetür aufweist und die Steuerungseinheit aus den Umfelddaten und dem Kameraweg 3D-Daten des Umfelds des Kraftfahrzeugs bestimmt.

[0020] Vorzugsweise kommt als Kamera eine Monokamera zum Einsatz.

[0021] Eine bevorzugte Ausführungsform der Erfindung wird nachfolgend anhand der Zeichnung erläutert. Dabei zeigt

[0022] Fig. 1 ein Kraftfahrzeugs mit in den Außenspiegeln angeordneten Kameras in schematischer Darstellung.

[0023] Fig. 1 zeigt ein Kraftfahrzeug **1** in stehendem Zustand mit einem an der Fahrertür angeordneten linken Außenspiegel **2** und einem an der Baifahrertür angeordneten Außenspiegel **3**. In den beiden Außenspiegeln **2**, **3** ist jeweils eine nicht dargestellte Monokamera angeordnet, wobei die Kameras den seitlichen linken Bereich und rechten Bereich des Kraftfahrzeugs **1** überwacht.

[0024] Die linke und rechte Kamera der Außenspiegel **2**, **3** haben jeweils einen seitlichen Sichtbereich **4**, **5**, wie sie schematisch in der Fig. 1 dargestellt sind. Der Sichtbereich **4**, **5** hängt von der verwendeten Kamera ab und kann bei der Verwendung von Weitwinkelobjektiven einen Winkelbereich von 130° bis 160° betragen, wobei maximal 180° möglich sind. Aufgrund der Verzerrung sind bei extremen Weitwinkelobjektiven die rückgerechneten, entzerrten Randkoordinaten mit einem großen Fehler behaftet.

[0025] Hier dargestellt ist ein Sichtbereich von ca. 30°. Mittels des in den Außenspiegeln angeordneten Klappmechanismus können die Außenspiegel **2**, **3** die durch Drehpfeile angedeuteten Drehbewegungen **6**, **7** links und rechts ausführen. Während der dargestellten Drehbewegungen überstreichen der Sichtbereiche **4**, **5** der Kameras den seitlichen Fahrzeugbereich. Da die Position der Außenspiegel **2**, **3** und damit der Kameras während der Schwenk- oder Klappbewegung **6**, **7** beispielsweise über einen nicht dargestellten Weggeber ausreichend genau bekannt ist, kann durch die Zuordnung der Position des Außenspiegels und dem damit verbundenen Kamerabild über den Schwenk eine Motion-Stereo-Analyse durchgeführt werden und es ergeben sich auch bei stehendem Kraftfahrzeug **1** die 3D-Daten des seitlichen Umfeldes des Kraftfahrzeugs **1**.

[0026] Da der Abstand zwischen der Drehachse der Schwenkbewegung der Kameras und der Kamera relativ gering ist, ist die zur Berechnung von 3D-Daten mittels Motion-Stereo notwendige Basislinie relativ klein, so dass die Unsicherheit bzw. der Messfehler bei großen Hindernisentfernungen relativ groß. Jedoch ist die Genauigkeit für Abstände bis zu 2 m ausreichend groß, um ein automatisches Ein- oder Ausparken aus dem Stand zu ermöglichen, da die Ungenauigkeit für einen Abstand von 200 cm bei einer angenommenen Basislinie von 5 bzw. 10 cm ungefähr 4 cm bzw. 10 cm beträgt. Für Hindernisabstände kleiner als 200 cm wird die Ungenauigkeit exponentiell kleiner.

Bezugszeichenliste

1	Kraftfahrzeug
2	Außenspiegel links mit Kamera
3	Außenspiegel rechts mit Kamera
4	Sichtbereich Kamera links
5	Sichtbereich Kamera rechts
6	Drehbewegung Spiegel links
7	Drehbewegung Spiegel rechts
8	Kontur Kraftfahrzeug

ZITATE ENTHALTEN IN DER BESCHREIBUNG

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Zitierte Patentliteratur

- DE 102005017360 A1 **[0005]**
- DE 3813083 A1 **[0005]**

Zitierte Nicht-Patentliteratur

- E. Wahl et al.: "Realisierung eines Parkassistenten basierend auf Motion-Stereo", 16. Aachener Kolloquium Fahrzeug- und Motorentechnik 2007, S. 871–879 **[0006]**

Patentansprüche

1. Verfahren zur Bestimmung von Umfelddaten eines Kraftfahrzeugs (**1**) mit mindestens einer Kamera und zur Generierung von 3D-Daten des Umfeldes, **dadurch gekennzeichnet**, dass im Stillstand des Kraftfahrzeugs (**1**) die mindestens eine Kamera eine vorgegebene Bewegung ausführt, wobei unter Verwendung des durch die Bewegung zurückgelegten Wegs und den Umfelddaten die 3D-Daten generiert werden.

2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, dass die Bewegung durch einen Kameraschwenk oder eine Längsbewegung der Kamera gebildet wird.

3. Verfahren nach einem der vorangegangenen Ansprüche, dadurch gekennzeichnet, dass die mindestens eine Kamera eine Monokamera ist.

4. Verfahren nach Anspruch 2 oder 3, dadurch gekennzeichnet, dass der Kameraschwenk durch eine elektromotorische Drehbewegung erzeugt wird.

5. Verfahren nach einem der Ansprüche 2 bis 4, dadurch gekennzeichnet, dass die Kamera in einem Außenspiegel (**2**, **3**) angeordnet ist und der Kameraschwenk durch eine Bewegung des Außenspiegels (**2**, **3**) erzeugt wird.

6. Verfahren nach Anspruch 5, dadurch gekennzeichnet, dass die Bewegung des Außenspiegels (**2**, **3**) durch ein Einklappen oder Ausklappen des Spiegels erzeugt wird.

7. Verfahren nach Anspruch 5, dadurch gekennzeichnet, dass die Bewegung des Außenspiegels (**2**, **3**) durch eine Türbewegung erzeugt wird.

8. Verfahren nach Anspruch 2 oder 3, dadurch gekennzeichnet, dass die Längsbewegung durch einen elektromotorischen Längsaktuator erzeugt wird.

9. Verfahren nach Anspruch 2 oder 3, dadurch gekennzeichnet, dass die Längsbewegung durch das Öffnen oder Schließen einer Schiebetür des Kraftfahrzeugs (**1**) erzeugt wird.

10. Vorrichtung zur Durchführung des Verfahrens nach einem der vorangegangenen Ansprüche mit einer Kamera zu Erfassung von Umfelddaten des Umfelds des Kraftfahrzeugs (**1**), einem klappbaren Außenspiegel (**2**, **3**), wobei die Kamera in dem Außenspiegel (**2**, **3**) angeordnet ist, und einer Steuerungseinheit zur Ermittlung des Umfelds des Kraftfahrzeugs (**1**) aus den Umfelddaten sowie zum Ansteuern der Klappbewegung des Außenspiegels (**2**, **3**), dadurch gekennzeichnet, dass der Außenspiegel (**2**, **3**) einen Weggeber zur Bestimmung eines Kamerawegs während der Bewegung des Außenspiegels (**2**, **3**) aufweist und die Steuerungseinheit aus den Umfelddaten und dem Kameraweg 3D-Daten des Umfelds des Kraftfahrzeugs bestimmt.

11. Vorrichtung zur Durchführung des Verfahrens nach einem der vorangegangenen Ansprüche mit einer Kamera zu Erfassung von Umfelddaten des Umfelds des Kraftfahrzeugs (**1**), wobei die Kamera in einer Schiebetür eines Kraftfahrzeugs angeordnet ist, und einer Steuerungseinheit zur Ermittlung des Umfelds des Kraftfahrzeugs (**1**) aus den Umfelddaten, dadurch gekennzeichnet, dass die Schiebetür einen Weggeber zur Bestimmung eines Kamerawegs während der Bewegung der Schiebetür aufweist und die Steuerungseinheit aus den Umfelddaten und dem Kameraweg 3D-Daten des Umfelds des Kraftfahrzeugs (**1**) bestimmt.

12. Vorrichtung nach Anspruch 10 oder 11, dadurch gekennzeichnet, dass die Kamera eine Monokamera ist.

Es folgt ein Blatt Zeichnungen

Anhängende Zeichnungen

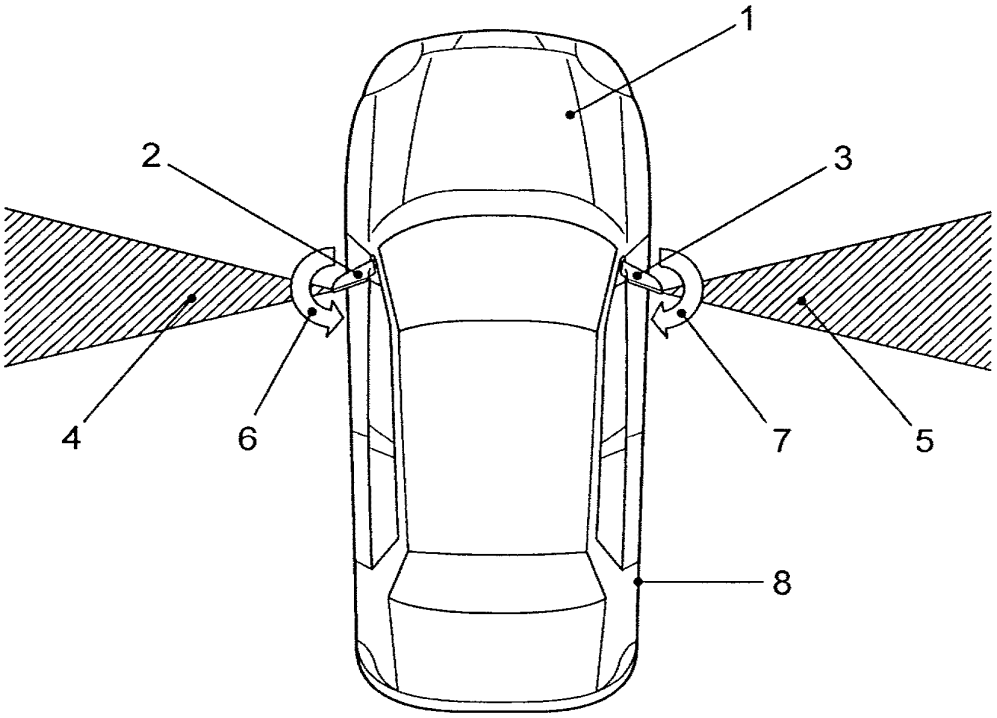

FIG. 1

Notice

DESCRIPTION DE102009031809

[0001]
The invention relates to a method for measuring and generating 3D data of the environment of a motor vehicle according to the preamble of claim 1 and to a corresponding device according to the preamble of claim 9 or of claim 10.

[0002]

Systems that assist the driver of a motor vehicle when parking, ie parking systems or parking assistance systems, belong to the group of driver assistance systems that are increasingly being used in vehicles to increase comfort, to assist the driver and / or to increase safety. All these current systems have in common that they measure with a suitable measuring device, the environment of the own vehicle and under the help of various algorithms can detect and measure parking spaces more or less well.

[0003]

In particular, the search for sufficiently large longitudinal parking spaces, followed by lateral parking maneuvers, is an everyday challenge of drivers of motor vehicles. At the same time, the development of the vehicle design, both for visual and safety reasons, has steadily reduced the visible area around the vehicle, making the parking task even more difficult. In order to relieve the driver therefore and give back sovereignty, various parking assistance systems have been

developed to assist the driver of a motor vehicle when parking or in the final stage of parking to perform automatically.

[0004]

In its simplest form, such a parking assistant is a parking aid in which the distances of the vehicle forward and / or back to other vehicles are measured under obstacles and displayed on a display in the cockpit. If predetermined safety distances are exceeded, an optical, acoustic and / or haptic warning is output to the driver so that the driver can control his parking procedure accordingly. Such parking aids are now among the optional equipment of vehicles of the middle class.

[0005]

In a further embodiment, as described, for example, in DE 10 2005 017 360 A1, a parking assistant for parking a motor vehicle comprises at least one display device, a device for measuring parking spaces and / or parking pockets, a control device and a steering actuator, wherein the Device has a display device with a plurality of display states, which informs the driver about parking or parking bag related parameters and system states of the parking assistant. In the further expansion stage, an automatic parking operation is performed after prior measurement of the parking space, as described for example in DE 3813083 A1. The known device comprises four switches with respect to the choice of operating mode, via which the driver can specify the location and type of parking space. Thus, the driver can select between left parking space, left parking bag, right parking space or right parking bag.

[0006]

Furthermore, from the publication E. Wahl et al.: "Implementation of a parking assistant based on motion stereo", 16th Aachen Colloquium Vehicle and Engine Technology 2007, p. 871-879, a video-based method for parking space measurement known, which is based on motion stereo. The method distinguishes between two modes of operation, namely a first mode for measuring the parking space and determining its length. The second mode is for the refined reconstruction of the driving environment when resetting into the gap. In this way, warning functions or autonomous driving maneuvers can be realized.

[0007]

A disadvantage of a motion stereo method for determining 3D data of the surroundings of a motor vehicle by means of a monocamera is that the method necessarily requires movement of the motor vehicle in order to determine 3D data of the surroundings of the vehicle from the vehicle movement and the corresponding camera data can. When the vehicle is stationary, no 3D data can be determined by means of motion stereo due to a lack of proper movement of the vehicle, and the vehicle or the corresponding driver assistance system is, so to speak, "blind". This is disadvantageous, for example, in the case of an automatic extension from a parking space by means of a parking assistant. Shortly before starting the vehicle, due to the stoppage thereof, the motion stereo-based assistance systems have no information about the current environment of the vehicle. Also, the environment information is only slowly built on the first few meters of the vehicle movement, so that the systems have to resort to past, determined during the parking phase information, which are often out of date due to the elapsed time interval.

[0008]
The invention is therefore based on the object to improve the method for detecting the environment of a motor vehicle by means of motion stereo and in particular to be able to perform such a method for stationary vehicles.

[0009]

This object is achieved by a method for environment detection by means of motion stereo with the features of claim 1 and by a corre sponding device having the features of claim 9 and claim 10.

Preferred embodiments of the invention are subject of the dependent claims.

[0010]

In the inventive method for determining environmental data of a motor vehicle with at least one camera and for generating 3D data of the environment by means of motion stereo, the at least one camera performs a predetermined movement at standstill of the motor vehicle and it will be based on the distance traveled the movement Camera and its environment data by means of motion stereo generates the 3D data of the environment of the motor vehicle. This makes it possible even

when the motor vehicle is stationary to generate new 3D data by means of the camera movement, so that current environment data is available, for example when the motor vehicle is parked outside the Ausparkfunktion and not on outdated data or data from other sensors, such as ultrasound data with worse Triggering, must be resorted to.

[0011]

Preferably, the camera movement is formed by a camera pan. In this case, a camera pivot means a rotary movement of the camera, wherein the pivot point of the camera turn has a predetermined distance to the camera or to the image plane of the camera, so that the camera or its image plane a distance in space in the sense of a translational movement during the panning travels. This is necessary because the motion stereo method has a distance traveled by the camera as a prerequisite. Furthermore, the camera movement can be formed by a longitudinal movement of the camera. As a camera further preferred is a monocamera used.

[0012]

Said Kameraschwenk is preferably effected by an electromotive rotary motion. In particular, the camera can be further preferably arranged in an exterior mirror of the motor vehicle and the camera pan can be generated in this case by a movement of the outside mirror.

[0013]

Such a movement of the exterior mirror can be generated by folding or folding the exterior mirror. Folding in and out of the exterior mirrors is often used in today's motor vehicles to fold the exterior mirrors with their often large dimensions to the vehicle when the vehicle is parked. In this case, the exterior mirrors no longer protrude from the contour of the vehicle and the risk of damage to the mirrors is thus reduced. In order to perform the folding of the mirror, an electric motor drive is provided in the mirror base. Such outside mirrors with electromotive drive can therefore be used advantageously to effect a pivoting movement of a camera arranged in the outside mirror.

[0014]
If no folding and unfolding of the exterior mirror is provided in a motor vehicle, in a further preferred manner, the pivotal movement of the exterior mirror with the camera can be generated

by a door movement, if the outside mirror is arranged on the driver or passenger door.

[0015]

Of course, it is also possible to arrange the camera without using an outside mirror on a driver or passenger door.

Then the pivoting movement of the camera can be generated by the door movement when opening the door or door closing.

[0016]
Furthermore, it is possible to generate the longitudinal movement of the camera by means of an electromotive longitudinal actuator.

[0017]

If the motor vehicle is equipped with a sliding door, as is the case with some vans, then the camera can be arranged in the sliding door.

The movement of the sliding door as a purely translatory movement when opening or closing the door can also serve as a basis for an evaluation of the camera data by motion stereo to determine 3D data of the environment of the vehicle when it is stationary.

[0018]

A device according to the invention for carrying out the method explained above comprises a camera for detecting environment data of the surroundings of the motor vehicle, a hinged exterior mirror, wherein the camera is arranged in the exterior mirror, and a control unit for determining the environment of the motor vehicle from the camera movement and the surroundings data and for controlling the folding movement of the outside mirror, wherein the outside mirror has a displacement sensor for determining the movement of the mirror. An accurate determination of the position of the mirror and thus of the camera arranged in the mirror in order to be able to

determine three-dimensional points, ie 3D data, of the surroundings of the motor vehicle by means of the motion stereo method can be determined by means of the displacement sensor.

[0019]
A further device according to the invention for carrying out the method explained above comprises a camera for recording environment data of the environment of the motor vehicle, wherein the camera is arranged in a sliding door of a motor vehicle, and a control unit for determining the environment of the motor vehicle (1) from the surrounding data, wherein the sliding door has a displacement sensor for determining a camera path during movement of the sliding door and the control unit determines environmental data of the surroundings of the motor vehicle from the surroundings data and the camera path.

[0020]
Preferably comes as a camera monocamera used.

[0021]

A preferred embodiment of the invention will be explained below with reference to the drawing.

It shows

[0022]
fig. 1 in a motor vehicle with cameras arranged in the exterior mirrors in a schematic representation.

[0023]
1

shows a motor vehicle 1 in a standing state with a left door mirror 2 arranged on the driver's door and an outside mirror 3 arranged on the driver's door.

In each of the two exterior mirrors 2, 3, a monocamera, not shown, is arranged, wherein the

cameras monitor the lateral left area and the right area of the motor vehicle 1.

[0024]

The left and right camera of the exterior mirrors 2, 3 each have a lateral viewing area 4, 5, as shown schematically in FIG.

The viewing area 4, 5 depends on the camera used and can be an angle range of 130 ° to 160 ° when using wide-angle lenses, with a maximum of 180 ° are possible. Due to the distortion of extreme wide-angle lenses, the recalculated, equalized edge coordinates are subject to a large error.

[0025]

Shown here is a viewing area of approx. 30°. By means of the folding mechanism arranged in the outer mirrors, the outer mirrors 2, 3 execute the rotational movements 6, 7 indicated by rotation arrows on the left and right. During the illustrated rotational movements of the viewing areas 4, 5 of the cameras sweep the lateral vehicle area. Since the position of the exterior mirrors 2, 3 and thus of the cameras during the pivoting or folding movement 6, 7 is known with sufficient accuracy, for example via a not shown, can by mapping the position of the exterior mirror and the associated camera image on the pivot a motion Stereo analysis are carried out and there are also when the motor vehicle 1, the 3D data of the lateral environment of the motor vehicle first

[0026]

Since the distance between the axis of rotation of the pivoting movement of the cameras and the camera is relatively low, the baseline necessary for the calculation of 3D data by means of motion stereo is relatively small, so that the uncertainty or the measurement error at large obstacle distances relatively large. However, for distances up to 2 m, the accuracy is sufficient to permit automatic parking in or out of the park, as the inaccuracy for a distance of 200 cm, assuming a baseline of 5 or 10 cm, is approximately 4 cm. 10 cm. For obstacle distances smaller than 200 cm, the inaccuracy becomes exponentially smaller.

LIST OF REFERENCE NUMBERS

1 : Motor vehicle 2: Exterior mirror left with camera 3: Exterior mirror right with camera 4: Viewing range left camera 5: Viewing range right camera 6: Rotating mirror left 7: Rotating mirror right 8: Motor vehicle contour

QUOTES INCLUED IN THE DESCRIPTION

[0027]

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Cited patent literature

[0028]
DE 102005017360 A1 [0005] - DE 3813083 A1 [0005]

Cited non-patent literature

[0029]

- E. Wahl et al .: "Realization of a parking assistant based on motion stereo", 16.

Aachen Colloquium Vehicle and Engine Technology 2007, p. 871-879 [0006]

Notice

CLAIMS DE102009031809

1.
A method for determining environmental data of a motor vehicle (1) with at least one camera and for generating 3D data of the environment, characterized in that at standstill of the motor vehicle (1) the at least one camera performs a predetermined movement, wherein using the Movement covered path and the environment data 3D data are generated.

2.
A method according to claim 1, characterized in that the movement is formed by a Kameraschwenk or a longitudinal movement of the camera.

3.
Method according to one of the preceding claims, characterized in that the at least one camera is a monocamera.

4.
A method according to claim 2 or 3, characterized in that the camera pan is generated by an electromotive rotary motion.

5.
Method according to one of Claims 2 to 4, characterized in that the camera is arranged in an exterior mirror (2, 3) and the camera pan is generated by a movement of the exterior mirror (2, 3).

6.
A method according to claim 5, characterized in that the movement of the outer mirror (2, 3) is generated by folding or unfolding of the mirror.

7.
A method according to claim 5, characterized in that the movement of the outer mirror (2, 3) is generated by a door movement.

8.
A method according to claim 2 or 3, characterized in that the longitudinal movement is generated by an electromotive Längsaktuator.

9.
A method according to claim 2 or 3, characterized in that the longitudinal movement is generated by the opening or closing of a sliding door of the motor vehicle (1).

10.
Device for carrying out the method according to one of the preceding claims with a camera for detecting environmental data of the environment of the motor vehicle (1), a hinged exterior mirror (2, 3), wherein the camera in the exterior mirror (2, 3) is arranged, and a Control unit for determining the environment of the motor vehicle (1) from the environment data and for controlling the folding movement of the exterior mirror (2, 3), characterized in that the exterior mirror (2, 3) a displacement sensor for determining a camera path during movement of the exterior mirror (2 , 3) and the control unit from the environment data and the camera path 3D data of the environment of the motor vehicle determined.

11.
Device for carrying out the method according to one of the preceding claims with a camera for detecting environmental data of the environment of the motor vehicle (1), wherein the camera is arranged in a sliding door of a motor vehicle, and a control unit for determining the environment of the motor vehicle (1) from the Environment data, characterized in that the sliding door has a displacement sensor for determining a camera path during the movement of the sliding door and the control unit from the environmental data and the camera path 3D data of the environment of the motor vehicle (1) determined.

12.

Apparatus according to claim 10 or 11, characterized in that the camera is a monocamera.

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(54) Bezeichnung: Außenrückblickspiegel

(61) Zusatz zu: —
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(71) Anmelder: Maier, Imanuel, 7316 Köngen

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Außenrückblickspiegel

Es ist bekannt, die Außenrückspiegel von Fahrzeugen vom Fahrzeuginnern aus durch mechanische Hebelübertragungen zu verstellen.

Im Gegensatz hierzu ist der Außenrückspiegel nach der Erfindung elektrisch mittels eines Kreuztastschalters durch je einen Verstellmotor in zwei zueinander senkrechten Achsen einstellbar. Der eine Verstellmotor ist in dem Befestigungsglied des Rückblickspiegels untergebracht, während der andere Verstellmotor in dem Tragglied des Rückblickspiegels liegt. Der eine Verstellmotor verstellt also das Tragglied in der einen Achsrichtung, während der andere Verstellmotor den Rückblickspiegel in dazu senkrechter Achsrichtung einstellt. Auf diese Weise läßt sich der Spiegel vom dem Armaturenbrett aus jederzeit in jede gewünschte Richtung verstellen. Des weiteren sind Vorkehrungen getroffen, um ein spiel- und flatterfreies Verstellen zu gewährleisten.

Die Einzelheiten des Gegenstandes der Erfindung sind den auf der Zeichnung schematisch dargestellten Ausführungsbeispielen zu entnehmen. Hierbei zeigen

Fig. 1 den Schnitt durch einen Außenrückblickspiegel,

Fig. 2 einen Teil des Schnittes entsprechend Fig. 1 in anderer Ausführung,

Fig. 3 die Draufsicht auf den Rückblickspiegel im Schnitt nach Linie A-A in Fig. 1,

Fig. 4 die Draufsicht auf den Rückblickspiegel, teilweise im Schnitt nach Linie B-B in Fig. 1,

Fig. 5 einen Teil eines Rückblickspiegels in abgeänderter Ausführung, teilsweise im Schnitt,

Fig. 6 die Seitenansicht des Rückblickspiegels nach Fig. 5, teilweise im Schnitt,

Fig. 7, den Schnitt durch den Rückblickspiegel nach Linie C-C in Fig. 6,

Fig. 8 einen Teil eines weiteren Ausführungsbeispieles eines Rückblickspiegels, im Schnitt,

Fig. 9 die Seitenansicht des Rückblickspiegels nach Fig. 8, teilweise im Schnitt,

Fig.10 den Schnitt durch den Rückblickspiegel nach Linie D-D in Fig. 9,

Fig.11 den Schnitt durch den Rückblickspiegel nach Linie E-E in Fig.10,

Fig.12 den Querschnitt durch einen Kreuztastschalter,

Fig.13 den Langsschnitt durch einen Kreuztastschalter,

Fig.14 den Schnitt durch einen Teil des Kreuztastschalters in abgeänderter Ausführung,

Fig.15 das Schaltbild des Kreuztastschalters mit den Verstellmotoren.

Bei dem Ausführungsbeispiel nach Fig. 1 - 4 ist das Befestigungsglied 1 des Außenrückblickspiegels außen auf der Karosserie oder dem Wagenaufbau 4 z.B. mittels Befestigungsschrauben 5 unter Zwischenlegung einer elastischen Dichtungsunterlage 7 befestigt. Das Befestigungsglied 1 ist als langgestreckter Fußkörper ausgeführt und im Innern zylinderförmig zur Aufnahme eines Verstellmotors 11 ausgebildet. Der Verstellmotor 11 kann im Bedarfsfalle von einer elastischen Zwischenlage 12 umgeben sein. Die elektrischen Zuleitungen 6 führen vom Wageninnern bis in das Befestigungsglied 1 hinein. Mittels mehrerer auf dem Umfang verteilter Stellstifte 18 mit Gewinde läßt sich die Lage des Verstellmotors 11 genau festlegen.

Auf der waagerecht liegenden Achse des Verstellmotors 11 sitzt eine Schnecke 14, die in einen Schneckenradsektor 15 greift, der auf dem zylindrischen Teil 10 des Tragliedes 2 sitzt und mit diesem z.B. durch einen Mitnahmestift 16 fest verbunden ist. Beim Betätigen des Verstellmotors 1 verdreht sich also das Tragglied 2 nach links oder nach rechts, wobei der zylindrische Teil 10 in einem Ansatz 8 des Befestigungsgliedes 1 gelagert ist. Außerdem ist im Innern des Befestigungsgliedes 1 eine Zwischenwand 9 vorgesehen, die den Verstellmotor 11 von dem Übersetzungsgetriebe trennt.

Die Bewegungen des Schneckenradsektors 15 werden, wie aus Fig. 3 ersichtlich ist, beidseitig durch das Befestigungsglied 1 und die Zwischenwand 9 begrenzt. Die Schnecke 14 ist mittels Gewindestiften 13 auf der Achse des Verstellmotors 11 befestigt. Ein Bundbolzen 17 zum Ausschalten des Axialspieles der Schnecke 14 kann ebenfalls vorgesehen sein.

Der Schneckenradsektor 15 und der zylindrische Teil 10 des Traggliedes 2 sind außerdem durch eine Abstandbuchse 19 sowie einen Sicherungsring 21 unter Zwischenlegung einer Scheibe 20 in ihrer Lage gesichert. Anstelle der Teile 20 und 21 können auch, wie aus Fig. 2 ersichtlich ist, Muttern und Gegenmuttern 22 treten. Eine möglichst spielfreie Lagerung ist bei Außenrückblickspiegeln unbedingt erforderlich, um ein Flattern durch den Fahrtwind zu vermeiden.

Das verdrehbare Tragglied 2 ist zylinderförmig ausgebildet und nimmt in seinem Innern den Verstellmotor 23 auf, der ebenso wie der Verstellmotor 11 durch Stellstifte 28 in seiner Lage eingestellt werden kann. Die Zuleitungen 6 führen von dem Befestigungsglied 1 durch eine Längsbohrung in dem zylindrischen Teil 10 bis zu dem Verstellmotor 23.

Das Tragglied 2 ist nach außen durch eine Abschlußkappe 26 abgedeckt, die z.B. mittels Stiftschrauben 27 mit Spitzen fest darauf angebracht ist. Auf der Motorwelle des Verstellmotors 23 ist z.B. mittels Gewindestiften 13 eine Schnecke 24 befestigt, die in einen Schneckenradsektor 25 eingreift. Durch eine Abstandbuchse 29 wird die Lage der Schnecke 24 gesichert.

In die Abschlußkappe 26 ist eine Schwenkachse 30 seitlich eingesetzt. Der Schneckenradsektor 25 schwenkt um die Schwenkachse 30 nach oben und nach unten. Außerdem sitzt auf der Schwenkachse 30 das gabelförmige Ende 32 des Spiegelhalters 31, wobei der Schneckenradsektor 25 umfaßt wird und damit fest verbunden ist. Die gabelförmigen Enden 32 durchsetzen ferner die Abschlußplatte 26 in einem Schlitz 34, der zugleich beidseitig auch als Begrenzungsanschlag dient.

Auf dem Spiegelhalter 31 ist der Rückblickspiegel 3 z.B. mittels eines Bolzens 35 aufgesteckt, der mit einer Umfangsnute versehen ist und durch einen Stellstift 36 in seiner Lage gehalten wird. Im übrigen kann im Innern noch eine Stellschraube 33 angebracht sein, um eine spielfreie Lagerung des Schneckenradsektors auf der Schwenkachse 30 zu erhalten.

Bei Betätigung des weiter unten beschriebenen Kreuztastschalters werden nun der eine oder der andere der beiden Verstellmotoren 11 und 23 oder auch beide zugleich eingeschaltet, wobei sich das Tragglied 2 nach links oder nach rechts und der Spiegelhalter 31 nach oben oder nach unten bewegen. Dadurch läßt sich durch einen einzigen Schalter der Rückblickspiegel 3 in jede gewünschte Lage einstellen. Durch die spielfreien Lagerungen wird jede eingestellte Spiegelstellung zuverlässig festgehalten.

Das Ausführungsbeispiel nach Fig. 5 - 7 ist hauptsächlich für größere Rückblickspiegel gedacht. Außerdem ist die Anordnung des Befestigungsgliedes und des Traggliedes abgeändert.

Das Befestigungsglied 1a ist rohrförmig gestaltet und mit einem Ansatz 8a versehen, der in den rohrförmigen Wagenaufbauteil 4a eingesteckt und darin durch Befestigungsschrauben 5a befestigt ist. Im Innern des Befestigungsgliedes 1a ist der Verstellmotor 11 mit den Stellstiften 18 untergebracht, wobei die Zuleitungen 6 durch den Wagenaufbauteil 4a zugeführt werden.

Das Befestigungsglied 1a steht senkrecht und wird durch ein Aufsatzstück 37 nach oben abgedeckt, das mittels Schraubstiften 38 darauf befestigt ist. Auf der Achse des

Verstellmotors 11 ist mittels Gewindestiften 13 die Schnecke 14 befestigt, die in den Schneckenradsektor 15 greift. Durch einen Bundbolzen 17 a wird außerdem die genaue Lage der Schnecke 14 festgehalten.

Der Schneckenradsektor 15 sitzt auf dem zylindrischen Teil 10a des Traggliedes 2a und ist darauf z.B. durch einen Mitnahmestift 16 befestigt. Nach außen ist die Lage des Teiles 10a durch einen Sicherungsring 21 festgelegt. Der Schneckenradsektor 15 reicht bis in einen Schlitz 39 in dem Aufsatzstück 37, der zugleich als Begrenzungsanschlag dient. Gegebenenfalls können in dem Schlitz 39 noch Dichtungsstücke 40 z.B. aus Schaumgummi eingelegt werden, die den Schlitz 39 nach außen abdecken, ohne die Schwenkbewegungen des Schneckenradsektors 15 zu behindern.

In dem ebenfalls rohrförmigen Tragglied 2a ist der Verstellmotor 23 untergebracht, dessen Lage durch Stellstifte 28 eingestellt wird und dessen Zuleitungen 6 durch eine Bohrung in dem Tragglied 2a von dem Aufsatzstück 37 zu dem Verstellmotor 23 führen. Auf der Welle des letzteren ist mittels Gewindestiften 13 die Schnecke 24 befestigt, die in den Schneckenradsektor 25 greift. Die Lage der Schnecke 24 wird z.B. durch einen Bundbolzen 17 a festgehalten. Das Tragglied 2a liegt waagerecht.

Auf dem Tragglied 2a ist z.B. mittels Stiftschrauben 27 die Abschlußkappe 26 befestigt, die mit einem Schlitz 34 versehen ist, durch den der Schneckenradsektor 25 hindurchtritt. Dieser ist im übrigen in der Schwenkachse 30 schwenkbar gelagert und besteht mit dem Spiegelhalter 31 a des Rückspiegels 3 aus einem Stück. Auch hier kann der Schlitz 34 gegebenenfalls durch Dichtungsstücke 40 nach außen abgedeckt werden, ohne die Schwenkbewegungen des Spiegels 3 zu beeinträchtigen.

Das Ausführungsbeispiel nach Fig. 8 - 11 ist hauptsächlich für große und schwere Rückblickspiegel geeignet, wie sie z.B. bei Lastzügen oder bei Schienenfahrzeugen verwendet werden. Die Ausführung entspricht dem Beispiel nach Fig. 5 bis Fig. 7, jedoch sind die Schnecken 14 und 24 für sich gelagert und einstellbar, um die Achsen der Verstellmotoren nicht unzulässig hoch zu belasten.

Auf dem Wagenaufbauteil 4 a ist das senkrecht verlaufende Befestigungsglied 1a mittels seines Ansatzes 8a durch Befestigungsschrauben 5a befestigt. Die Zuleitungen 6 führen zu dem Verstellmotor 11 im Innern des Befestigungsgliedes 1a, der mittels Stellstiften 16 festgehalten ist.

Auf dem Ende des Befestigungsgliedes 1a ist eine Aufsatzplatte 42 z.B. mittels Schraubstiften 38 mit Abschlußdeckel 42 a befestigt, auf der das Aufsatzstück 37 a z.B. mittels Schrauben 38 a angebracht ist. Auf der Welle des Verstellmotors 11 ist z.B. mittels Gewindestiften 13 ein Kupplungsstück 46 befestigt, dessen Klauen einen Mitnahmebolzen 45 umgreifen, der den Lagerzapfen 44 des der Schnecke 14 durchsetzt. Der Lagerzapfen 44 ist beidseitig in Lagerbuchsen 43 gelagert, die in Schlitzen 41 in dem Aufsatzstück 37 a verschiebbar und durch beidseitig angeordnete Gewindestifte 13 a genau einstellbar sind. Die Schnecke 14 greift in den Schneckenradsektor 15 auf dem durch den Sicherungsring 21 gesicherten zylindrischen Teil 10a des verdrehbaren Traggliedes 2a. Durch den Mitnahmestift 16 wird der Schneckenradsektor 15 mitgenommen.

Im Innern des Traggliedes 2a ist der Verstellmotor 23 untergebracht und in seiner Lage durch Stellstifte 28 gehalten. Die Zuleitungen 6 treten aus dem Aufsatzstück 37a durch eine Quer- und Längsbohrung in das Innere des Traggliedes 2a. Auf dem letzteren ist mittels Stiftschrauben 27 die Abschlußplatte 26 a befestigt, auf der die Abschlußkappe 25 mittels Schrauben 49 angebracht ist. Auf der Welle des Verstellmotors 23 ist mittels Gewindestiften 13 das Kupplungsstück 46 befestigt, das mit ihrer Klaue in eine Nute des Lagerzapfens 44 a der Schnecke 24 greift.

Die Schnecke 24 ist beidseitig in der Abschlußkappe 26 mittels ihrer Lagerzapfen 44 a gelagert und greift außerdem in den Schneckenradsektor 25, der auf der Schwenkachse 30 schwenkbar gelagert ist und die Abschlußkappe 26 in dem Schlitz 34 durchsetzt.

Die Lagerung der Schwenkachse 30 in der Abschlußkappe 26 erfolgt in einem Langloch 47 der letzteren. Mittels Gewindestiften 48 und Gegenstiften 48 a (vgl. Fig. 11), läßt sich die Schwenkachse 30 genau einstellen, so daß das Lagerspiel zwischen dem Schneckenradsektor 25 und der Schnecke 24 ausgeglichen wird. Der Schneckenradsektor 25 geht im übrigen in den Spiegelhalter 31 a des Rückblickspiegels 3 über. Durch diese Lagerung des Schneckentriebes werden die Wellen von beiden Verstellmotoren mechanisch entlastet und eine flatterfreie Einstellung des Rückblickspiegels in jeder Lage erreicht und aufrecht erhalten.

Die Betätigung der beiden Verstellmotoren 11 und 23 wird in allen Ausführungsbeispielen durch einen Kreuztastschalter hervorgerufen, der am zweckmäßigsten am Armaturenbrett des Fahrzeuges angebracht wird und je nach seiner Stellung den einen oder den anderen der beiden Verstellmotoren in der jeweils gewünschten Drehrichtung einschaltet und dadurch den Rückblickspiegel entweder

nach oben oder nach unten, bzw. nach links oder nach rechts verstellt. Eine gleichzeitige Betätigung nach zwei ~~allen~~ Richtungen ist ebenfalls möglich, so daß die Verstellung oder Neueinstellung des Rückblickspiegels in jede beliebige Lage schnell und sicher erfolgt.

In Fig. 12 bis 14 ist ein Ausführungsbeispiel eines Kreuztastschalters dargestellt. Außen an dem Schaltgehäuse 50 sind vier kreuzförmig angeordnete einpolige Tastumschalter 51 fest angebracht. Die Schaltachse 52 wird von dem Bolzen 53 durchsetzt, wobei ihre Durchbohrung einen größeren Durchmesser besitzt, als dem Bolzendurchmesser entspricht. Außerdem sind die Schaltachse 52 und der Bolzen 53 von einem Stift 54 miteinander verbunden, um den die Schaltachse 52 nach links ~~oder~~ und rechts ausgeschwenkt werden kann. Der Bolzen 53 ist in dem Schaltgehäuse 50 gelagert, so daß die Schaltachse 52 auch in zu der vorgenannten Richtung senkrechter Richtung ausgeschwenkt werden kann.

In die Schaltachse 52 sind außerdem vier Schaltstössel 55 eingesetzt, die durch Gegenmuttern 56 nachgestellt werden können. Die Schaltstössel 55 durchsetzen das Schaltgehäuse 50 und betätigen die außen angebrachten Tastumschalter 51. Die Schaltachse 52 durchsetzt außerdem das Schaltgehäuse 50 und endet in dem Betätigungsknopf 57. Mittels einer Bundmutter 58 ist das Schaltgehäuse 50 an dem

Armaturenbrett 59 befestigt. Außerdem ist die Bundmutter 58 mit einer Durchbohrung 60 versehen, deren Durchmesser größer ist, als der Durchmesser der Schaltachse 52. Mittels des Betätigungsknopfes 57 läßt sich somit die Schaltachse in jede beliebige Richtung ausschwenken, wobei die in der Schwenkrichtung liegenden Tastumschalter 51 so betätigt werden, daß sich der Rückblickspiegel in die gewünschte Richtung verstellt.

Um ein unbeabsichtigtes Verstellen zu vermeiden, ist es zweckmäßig, den Betätigungsknopf 57 bei Nichtgebrauch festzulegen. Dies kann z.B. dadurch geschehen, daß auf die Schaltachse 52 zwischen der Bundmutter 58 und dem Betätigungsknopf 57 eine Stellmutter 61 zwischengefügt ist, die einen konischen Ansatz aufweist, der bei einer Verdrehung der Stellmutter 61 in die konische Aussparung an der äußeren Stirnseite der Bundmutter 58 eingreift und die Schaltachse 52 zentral in ihrer Ausschaltstellung festlegt. Die letztere kann also nicht mehr ausgeschwenkt werden, so daß eine unbeabsichtigte Verstellung des Rückblickspiegels nicht vorkommen kann.

Im übrigen kann gemäß Fig. 14 an Stelle der Stellmutter 61 auch ein unverdrehbares, jedoch längsverschiebbares Stellglied 62 treten, wobei zwischen diesem und dem in diesem Falle kleineren Abschlußknopf 57 a eine Druckfeder 63 zwischengelegt ist, die bewirkt, daß das Stellglied 62 mit seinem Konus stets nach innen gegen die Bundmutter 58

gedrückt wird und eine unbeabsichtigte Verstellung des Kreuztastschalters versperrt. Zur Betätigung ist es dann lediglich notwendig, das Stellglied 62 herauszuziehen und zusammen mit der Schaltachse (52) in die gewünschte Schwenkstellung zu bringen. Beim Loslassen geht dann das Stellglied 62 selbsttätig wieder zurück und bringt die Schaltachse 52 in ihre gesicherte Ausschaltlage.

Das Schaltbild des Kreuztastschalters zeigt Fig. 15. Aus ihm ist ersichtlich, daß der Verstellmotor 11 mittels der Tastumschalter 61 durch Ausschwenken der Schaltachse 52 in beide Drehrichtungen eingeschaltet werden kann. Das gleiche ist auch bezüglich der Drehrichtungen des Verstellmotors 23 der Fall.

Im übrigen ist es auch möglich, die Schneckenradsektoren 15 und 25 durch Druckfedern 64 zu belasten, wie dies beispielsweise in Fig. 1 oben dargestellt ist. Durch die Druckfedern 64 wird ein Flattern des Rückblickspiegels einwandfrei unterbunden. Die Anordnung kann auch so getroffen werden, daß bei Betätigung der einzelnen Tastumschalter 51 je ein mit diesen gekoppelter Elektromagnet eingeschaltet wird, der die zugehörige Druckfeder 64 von dem Schneckenradsektor abhebt, so daß die Verstellung unbehindert erfolgt. Sobald der Kreuztastschalter sich jedoch wieder in seiner Ausgangsstellung befindet, wird der Stromkreis zu den genannten Elektromagneten unterbrochen und die Druckfedern 64 drücken wieder auf die Schneckenradsektoren.

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Patentansprüche

1. Außenrückblickspiegel für Fahrzeuge, der vom Fahrzeuginnern aus verstellbar ist, dadurch gekennzeichnet, daß er elektrisch mittels eines Kreuztastschalters durch je einen Verstellmotor (11, 23) in zwei zueinander senkrechten Richtungen einstellbar ist, von denen der eine (11) in dem Befestigungsglied (1, 1a) des Rückblickspiegels und der andere (23) in dem Tragglied (2, 2a) des Rückblickspiegels untergebracht ist.

2. Außenrückblickspiegel nach Anspruch 1, dadurch gekennzeichnet, daß der eine in dem waagerecht oder senkrecht liegenden Befestigungsglied (1, 1a) untergebrachte Verstellmotor (11) mittels eines Schneckentriebes mit dem nach beiden Seiten schwenkbaren Tragglied (2, 2a) verbunden ist, während der in dem Tragglied (2, 2a) untergebrachte Verstellmotor (23) über einen Schneckentrieb den nach oben und unten schwenkbaren Rückblickspiegel (3) verstellt.

3. Außenrückblickspiegel nach Anspruch 1 und 2, dadurch gekennzeichnet, daß die Verstellmotoren (11, 23) durch Stellstifte (18, 28) einstellbar sind.

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4. Außenrückblickspiegel nach Anspruch 1 - 3, dadurch gekennzeichnet, daß die auf dem Achsen der Verstell - motoren (11, 23) sitzenden Schnecken (14, 24) in Schneckenradsektoren (15, 25) eingreifen, die mit dem schwenkbar in dem Befestigungsglied (1, 1a) gelagerten Traglied (2, 2a) bzw. mit dem Spiegelhalter (31, 31a) verbunden sind.

5. Außenrückblickspiegel nach Anspruch 1 - 4, dadurch gekennzeichnet, daß die achsiale Lage der Schnecken (14, 24) durch Bundbolzen (17, 17a) und/oder Abstandbuchsen (29 gesichert ist.

6. Außenrückblickspiegel nach Anspruch 1 - 5, dadurch gekennzeichnet, daß der Schneckenradsektor (15) über einen Mitnahmestift (16) mit dem zylindrischen Teil (10, 10a) des Tragliedes (2, 2a) verbunden und in seiner Lage durch eine Abstandbuchse (19) sowie durch einen Sicherungsring (21) oder eine Mutter und Gegenmutter (22) gesichert ist.

7. Außenrückblickspiegel nach Anspruch 1 - 6, dadurch gekennzeichnet, daß der Schneckenradsektor (25) auf einer in einer Abschlußkappe (26) des Tragliedes (2, 2a) gelagerten Schwenkachse (30) gelagert ist, welche die Abschlußkappe (26) in einem Schlitz (34) durchsetzt und den Spiegelhalter (31) trägt bzw. in diesen (31a) übergeht.

8. Außenrückblickspiegel nach Anspruch 1 - 7, dadurch gekennzeichnet, daß der Spiegelhalter (31) mit seinen gabelförmigen Enden (32) den Schneckenradsektor (25) umgreift und mit diesem zusammen um die Schwenkachse (30) schwenkbar ist.

9. Außenrückblickspiegel nach Anspruch 1 - 8, dadurch gekennzeichnet, daß der Schneckentrieb des Verstellmotors (11) in einem auf das Tragglied (1a) aufgesetzten Aufsatzstück (37, 37a) untergebracht ist und die Schnecke (14) mittels Lagerzapfen (44) darin gelagert sowie mittels einer Kupplung mit der Achse des Verstellmotors (11) gekuppelt ist.

10. Außenrückblickspiegel nach Anspruch 1/1 9, dadurch gekennzeichnet, daß die Lagerbuchsen (43) für die Lagerzapfen (44) in Langlöchern (41) in dem Aufsatzstück (37a) durch beidseitig angeordnete Gewindestifte (13a) einstellbar sind.

11. Außenrückblickspiegel nach Anspruch 1 - 10, dadurch gekennzeichnet, daß die Schnecke (24) durch Lagerzapfen (44) in der Abschlußkappe (26) gelagert und durch eine Kupplung mit der Achse des Verstellmotors (23) verbunden ist.

12. Außenrückblickspiegel nach Anspruch 1 - 11, dadurch gekennzeichnet, daß die Schwenkachse (30) in einem Langloch (47) in der Abschlußkappe (26) gelagert und durch Gewindestifte (48) und Gegenstifte (48a) einstellbar ist.

13. Außenrückblickspiegel nach Anspruch 1 - 12, dadurch gekennzeichnet, daß an dem Schaltgehäuse (50) des Kreuztastschalters kreuzweise vier Tastumschalter (51) befestigt sind, und die in dem Schaltgehäuse (50) zentral untergebrachte Schaltachse (52) durch einen Betätigungsknopf (57) nach jedem Tastumschalter (51) zu ausschwenkbar ist.

14. Außenrückblickspiegel nach Anspruch 13, dadurch gekennzeichnet, daß die Schaltachse (52) schwenkbar auf einem Bolzen (53) sitzt, der in dazu senkrechter Richtung in dem Schaltgehäuse (50) schwenkbar gelagert ist und außerdem mit nachstellbaren Schaltstösseln (55) zur Betätigung der Tastumschalter (51) versehen ist.

15. Außenrückblickspiegel nach Anspruch 13 und 14, dadurch gekennzeichnet, daß die Rundmutter (58) zur Befestigung des Schaltgehäuses (50) mit einer Durchbohrung (60) versehen ist, deren Durchmesser größer als der Durchmesser der Schaltachse (52) ist.

16. Außenrückblickspiegel nach Anspruch 13 - 15, dadurch gekennzeichnet, daß auf der Schaltachse (52) außerhalb der Rundmutter (58) eine Stellschraube (62) aufgeschraubt ist, die durch Verdrehung mit ihrem kegelförmigen Ansatz in eine hohlkegelige Aussparung der Rundmutter (58) eingreift und die Schaltachse (52) in ihrer zentralen Ausschaltlage festhält.

17. Außenrückblickspiegel nach Anspruch 13 - 16, dadurch gekennzeichnet, daß auf der Schaltachse (52) außerhalb der Rundmutter (58) ein längsverschiebbares Stellglied (62) angebracht ist, das mit seinem kegeligen Ansatz durch Druck einer eingelegten Druckfeder (63) in eine hohlkegelige Aussparung der Rundmutter (58) eingreift und die Schaltachse (52) in ihrer zentralen Ausschaltlage festhält.

18. Außenrückblickspiegel nach Anspruch 1 - 17, dadurch gekennzeichnet, daß die Schneckenradsektoren (15, 25) durch Druckfedern (64) in ihrer Lage gehalten sind, die durch an die einzelnen Tastumschalter (51) des Kreuztastschalters angeschlossene Elektromagneten bei eingeschalteten Verstellmotoren (11, 23) abgehoben werden können.

Fig. 4

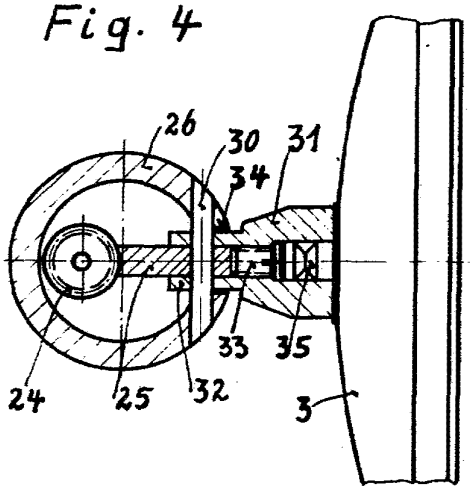


Fig. 1

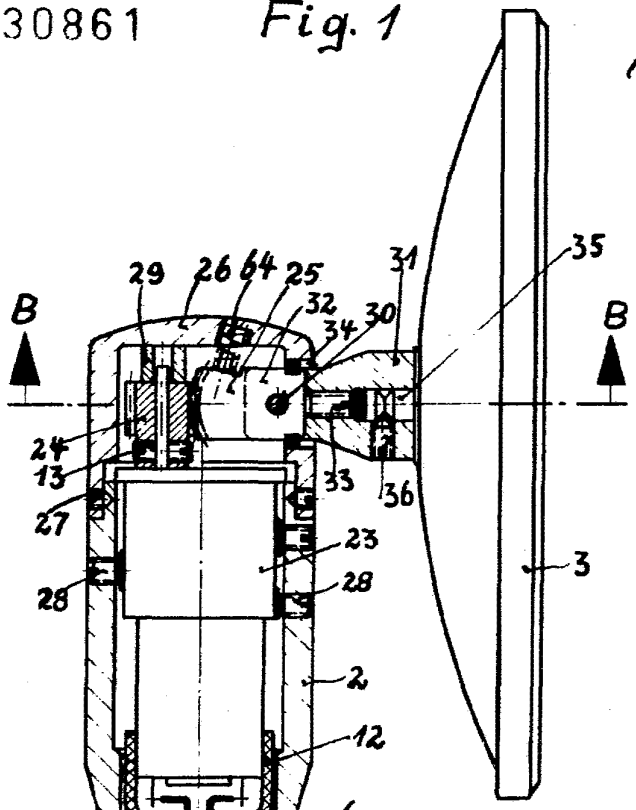


Fig. 2

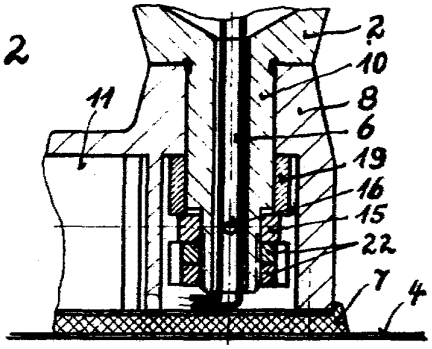
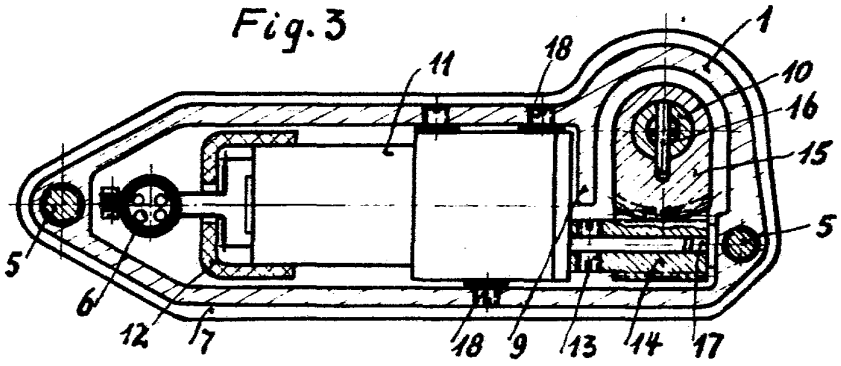


Fig. 3



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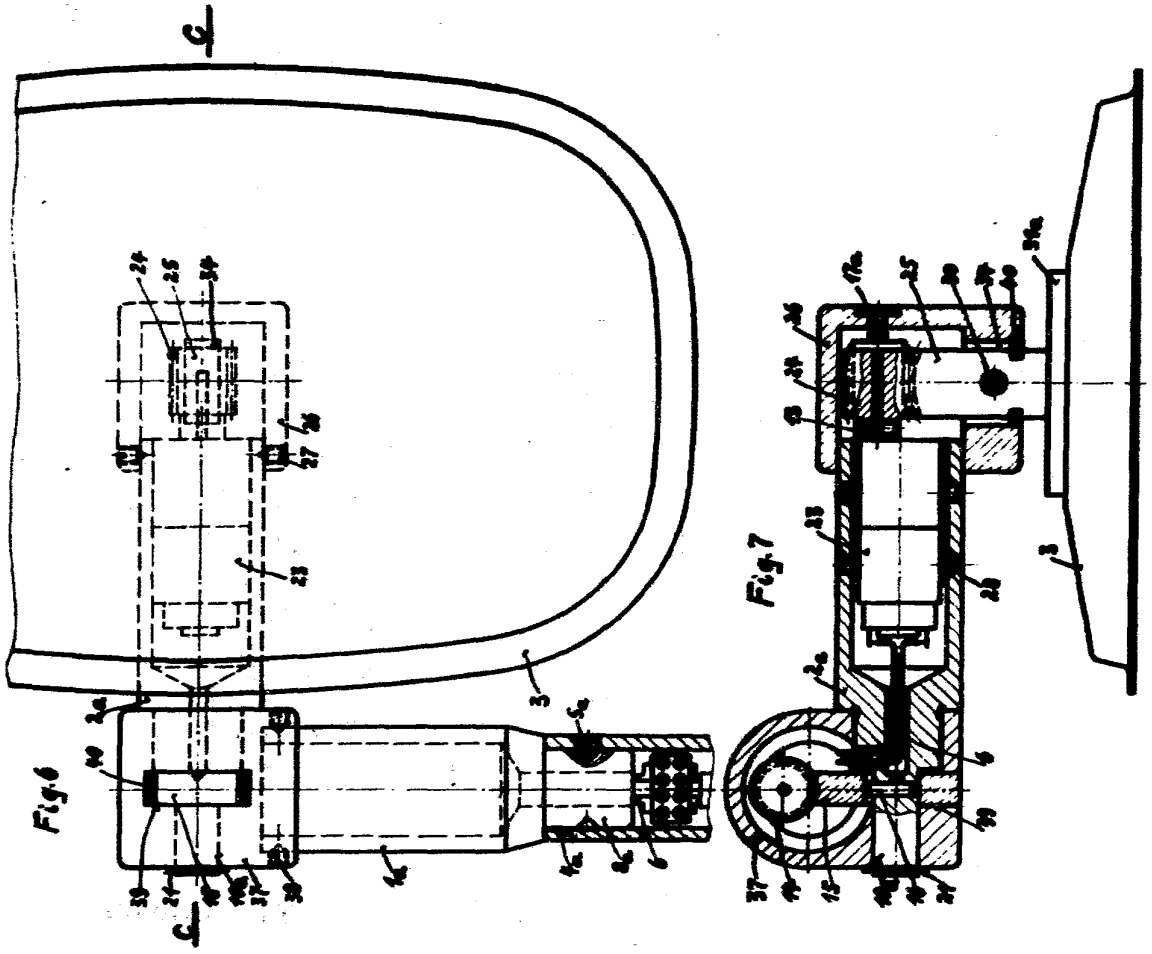

Fig.6

Fig.7

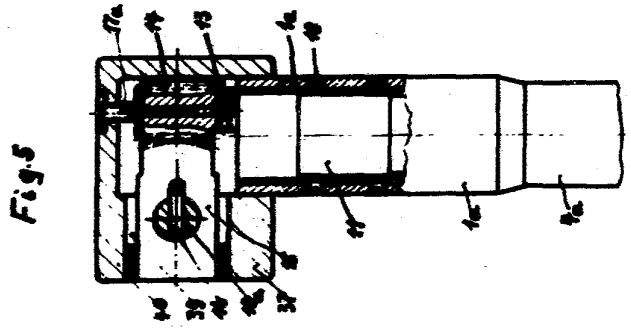

Fig.8

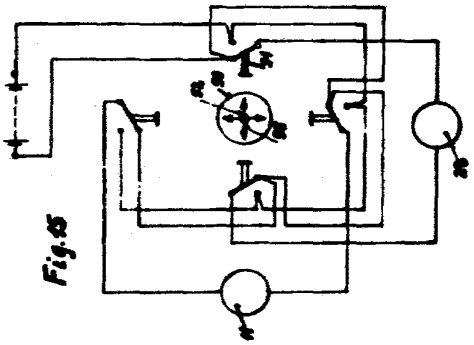

Fig.9

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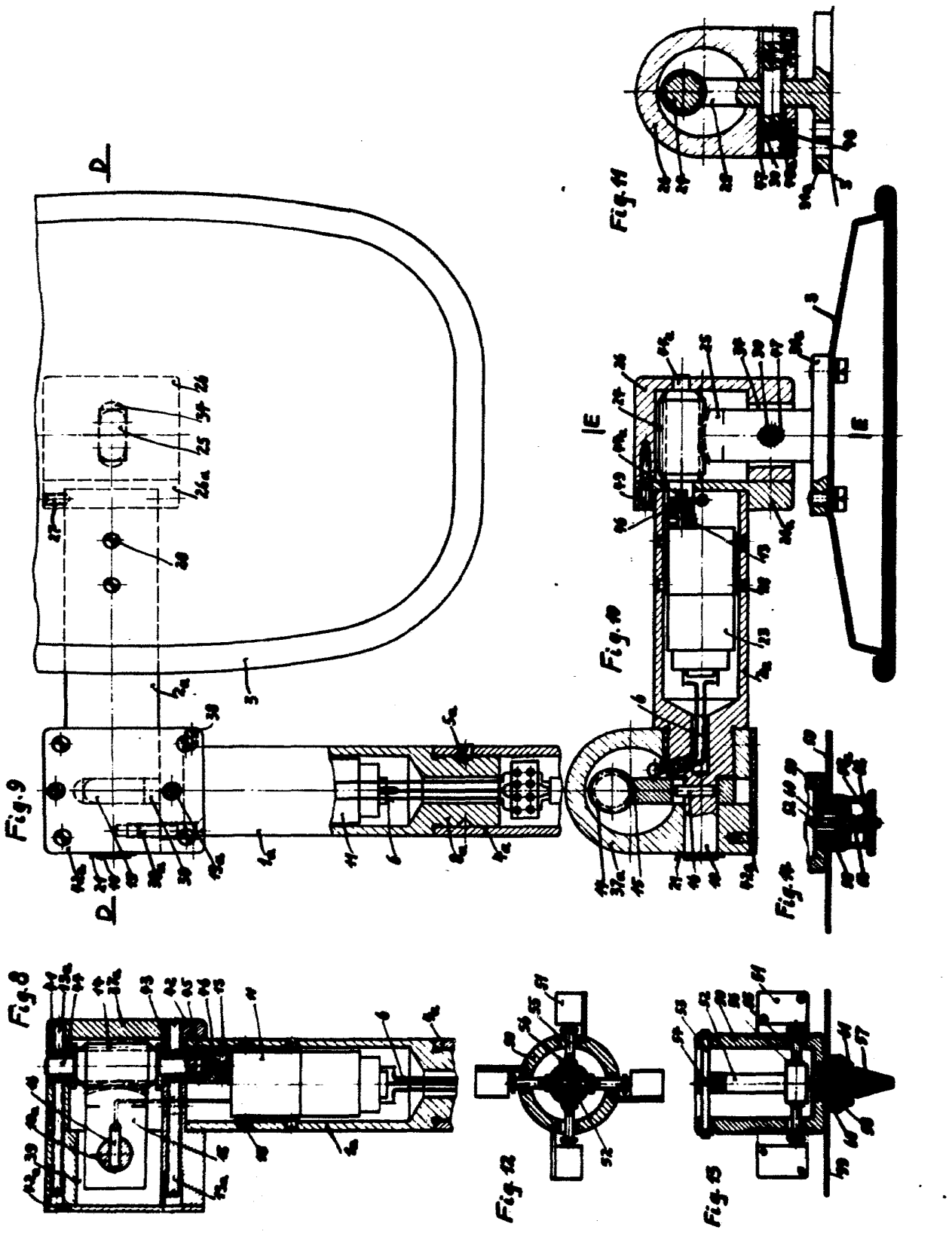

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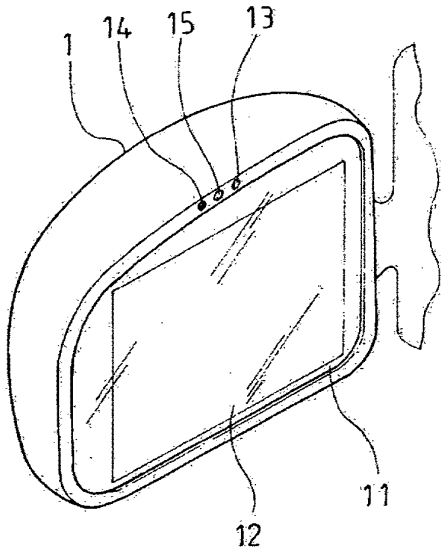
Die folgenden Angaben sind den vom Anmelder eingereichten Unterlagen entnommen

(54) Bezeichnung: **Ein elektronischer Fahrzeug-Aussenspiegel mit einer Infrarot-Breitwinkelkamera für eine verbesserte Sicherheit**

(57) Hauptanspruch: Elektronischer Fahrzeug-Außenspiegel mit einer elektronischen Breitwinkelkamera für die verbesserte Sicherheit, umfassend:
einen lichtdurchlässigen reflektierenden Glasspiegel (11), der in ein Außenspiegelgehäuse (1) auf einer linken oder rechten Seite eines Fahrzeuges eingesetzt ist;
ein an der Rückseite des reflektierenden Außenspiegelgehäuses (1) montierten Flüssigkristalldisplay (12);
eine Miniatur-Infrarot-Breitwinkelkamera (13);
einen Detektor (14);
ein erstes lichtemittierendes Element (15); und
einen im Innern des Fahrzeuges installierten Steuerschaltkreis (2), der elektrisch mit dem Flüssigkristalldisplay (12), der Kamera (13), dem Detektor (14) und mit dem ersten lichtemittierenden Element (15) und daneben mit einem Stellschalter (24) und einem Blinklichtschalter (25), die üblicherweise im Innern des Fahrzeuges installiert sind, verbunden ist,
dadurch gekennzeichnet, dass die Infrarot-Breitwinkelkamera (13), der Detektor (14) und das erste lichtemittierende Element (15) in einem Rahmen um das Außenspiegelgehäuse (1) eingebaut sind, und
dass während des Normalbetriebs des Fahrzeuges der lichtdurchlässige reflektierende Glasspiegel (11) auf die gleiche Weise wie...



Beschreibung

HINTERGRUND DER ERFINDUNG

(a) Umfeld der Erfindung

[0001] Die vorliegende Erfindung betrifft einen elektronischen Fahrzeug-Außenspiegel mit einer infrarot-Breitwinkelkamera für die verbesserte Sicherheit, insbesondere einen Aufbau eines Außenspiegels, der mit einem Stellschalter oder mit direkter Lichteinstrahlung angeregt wird, wenn das Fahrzeug geradeaus fährt oder nach links/rechts abbiegt, um eine Situation hinter dem Fahrzeug auf LCD physisch anzuzeigen, und mit dem ebenfalls auf eine ungewöhnliche Situation zum Warnen des Lenkers des Fahrzeuges durch Blinken oder mit einem akustischen Signal hingewiesen werden soll, wobei ein toter Winkel, der mit dem Außenspiegel nicht gesehen werden kann, eliminiert wird, um die Fahrsicherheit zu verbessern.

(b) Beschreibung der herkömmlichen Ausführungsart

[0002] Wenn ein Lenker eines Fahrzeuges nach links oder rechts abbiegen will wirft er üblicherweise zuerst einen Blick nach links und rechts, um die Situation hinter seinem Fahrzeug vor dem Abbiegen jeweils einzuschätzen und zu beurteilen, wobei er gleichzeitig das Blinklicht zur Richtungsanzeige einschaltet. Mit dem herkömmlichen Außenspiegel können jedoch nicht alle Winkel erfasst werden, um eine Übersicht über den ganzen Bereich hinter dem Fahrzeug zu behalten. Außerdem ist kein Außenspiegel vorhanden, der wie ein auf dem Markt erhältlicher Rückradar funktioniert. Daher begeht ein Lenker des Fahrzeuges beim Wechseln der Fahrspur zahlreiche Risiken. Beim Abbiegen mit dem Fahrzeug ist die Sicht mit dem Außenspiegel zu stark eingeschränkt, so dass das Risiko von Verkehrsunfällen relativ hoch ist. Aus diesen Gründen bedarf es einer verbesserten Ausführung des herkömmlichen Außenspiegels. Auf Grund von langjährigen Erfahrungen auf diesem Gebiet hat sich der Erfinder mit der Schaffung einer verbesserten Ausführungsart für einen Aufbau des Außenspiegels befasst und die vorliegende Erfindung geschaffen. Mit der vorliegenden Erfindung beabsichtigt der Erfinder, die Nachteile der herkömmlichen Außenspiegel zu beseitigen, um die Fahrsicherheit zu verbessern.

ZUSAMMENFASSUNG DER ERFINDUNG

[0003] Das Hauptziel der vorliegenden Erfindung besteht in der Schaffung eines elektronischen Fahrzeug-Außenspiegels mit einer Infrarot-Breitwinkelkamera für die verbesserte Sicherheit, der mit einem Stellschalter oder mit direkter Lichteinstrahlung beim Geradeausfahren des Fahrzeuges oder beim Abbiegen des Fahrzeuges aktiviert wird, um eine jeweilige Situation hinter dem Fahrzeug auf einem LCD des Außenspiegels physisch anzuzeigen, und mit dem ebenfalls ungewöhnliche Situationen erkannt werden und der Lenker durch Blinken oder akustische Signale auf solche Situationen aufmerksam gemacht wird, um den toten Winkel im Außenspiegel zu eliminieren und um die Fahrsicherheit zu verbessern.

[0004] Der elektronische Fahrzeug-Außenspiegel mit einer Infrarot-Breitwinkelkamera für die verbesserte Sicherheit nach der vorliegenden Erfindung ist aus einem lichtdurchlässigen reflektierenden Glasspiegel, der in einem Außenspiegelgehäuse eingesetzt ist, einem auf der Rückseite dieses lichtdurchlässigen reflektierenden Glasspiegels montierten Flüssigkristalldisplay, einer Infrarot-Breitwinkelkamera, einem Detektor, einem ersten lichtemittierenden Element und einem Steuerschaltkreis, der elektronisch mit den oben genannten Komponenten verbunden ist, aufgebaut. Die Infrarot-Breitwinkelkamera, der Detektor und das erste lichtemittierende Element sind in einem Rahmen um das Außenspiegelgehäuse eingebaut. Während dem Normalbetrieb des Fahrzeuges, funktioniert der lichtdurchlässige reflektierende Glasspiegel auf die gleiche Weise wie der konventionelle Außenspiegel und reflektiert wie üblich die Situationen hinter dem Fahrzeug. Beim Abbiegen mit dem Fahrzeug nach links oder rechts, oder wenn der Lenker des Fahrzeuges einen Stellschalter beim Geradeausfahren einschaltet, werden das Flüssigkristalldisplay, die Infrarot-Breitwinkelkamera und der Detektor eingeschaltet. Auf dem Flüssigkristalldisplay wird die jeweilige Situation hinter dem Fahrzeug physisch angezeigt, so dass der Lenker des Fahrzeuges die Situation hinter dem Fahrzeug direkt entsprechend einschätzen und beurteilen kann. Wird mit dem Detektor außerdem eine ungewöhnliche Situation festgestellt, werden mit dem Steuerschaltkreis ein Blinken und akustische Signale ausgelöst, um den Lenker des Fahrzeuges auf diese Situation aufmerksam zu machen. Auf diese Weise wird der tote Winkel, der mit dem Außenspiegel nicht gesehen werden kann, eliminiert und die Fahrsicherheit verbessert.

KURZBSCHREIBUNG DER ZEICHNUNGEN

[0005] Fig. 1 zeigt eine perspektivische Ansicht zum schematischen Darstellen eines Außenspiegels nach einer Ausführungsart der vorliegenden Erfindung.

[0006] Fig. 2 zeigt eine perspektivische Explosionsansicht zum schematischen Darstellen eines Außenspiegels nach einer Ausführungsart der vorliegenden Erfindung.

[0007] Fig. 3 zeigt ein Blockdiagramm zum schematischen Darstellen des Steuerschaltkreises eines Außenspiegels nach einer Ausführungsart der vorliegenden Erfindung.

[0008] Fig. 4 zeigt eine Darstellung des Anbaus eines Außenspiegels nach einer Ausführungsart der vorliegenden Erfindung.

[0009] Fig. 5 und Fig. 6 zeigen Diagramme zum schematischen Darstellen der Funktionsweise nach einer Ausführungsart der vorliegenden Erfindung.

DETAILLIERTE BESCHREIBUNG DER BEVORZUGTEN AUSFÜHRUNGSARTEN

[0010] Mit Bezugnahme auf die Fig. 1 bis Fig. 3, zeigen die Fig. 1 und Fig. 2 je eine perspektivische Ansicht, bzw. eine perspektivische Explosionsansicht, in denen ein Außenspiegel nach einer Ausführungsart der vorliegenden Erfindung schematisch dargestellt ist. Die Fig. 3 zeigt ein Blockdiagramm, das den Steuerschaltkreis eines Außenspiegels nach einer Ausführungsart der vorliegenden Erfindung schematisch darstellt. Der Außenspiegel nach der vorliegenden Erfindung ist aus einem lichtdurchlässigen reflektierenden Glasspiegel **11**, der in ein Außenspiegelgehäuse **1** eingesetzt ist, einem an der Rückseite des Außenspiegelgehäuses **1** montierten Flüssigkristalldisplay **12**, einer Miniatur-Infrarot-Breitwinkelkamera **13**, einem Detektor **14** (beispielsweise einem Infrarot- oder Ultraschalldetektor), einem ersten lichtemittierenden Element **15**, das lichtemittierende Dioden enthält, mit denen Lichtstrahlen in je einer anderen Farbe ausgestrahlt werden, und aus einem Steuerschaltkreis **2**, der in einer Schalttafel im Innern eines Fahrzeuges installiert und elektrisch mit dem Flüssigkristalldisplay **12** verbunden ist, zusammengebaut, wobei die Miniatur-Infrarot-Breitwinkelkamera **13**, der Detektor **14** und das erste lichtemittierende Element **15** in einem Rahmen um das Außenspiegelgehäuse **1** eingebaut sind. Bei dieser gezeigten Ausführungsart sind die Miniatur-Infrarot-Breitwinkelkamera **13**, der Detektor **14** und das erste lichtemittierende Element **15** in einem oberen Rand des Außenspiegelgehäuses **1** eingebaut.

[0011] Im Steuerschaltkreis **2** ist ein Einzelchip-Mikroprozessor **21** integriert, der im Voraus mit einem Steuerprogramm programmiert wurde. Dabei ist dieser Einzelchip-Mikroprozessor **21** zum Empfangen der Bild- und Erkennungssignale elektrisch mit der Miniatur-Infrarot-Breitwinkelkamera **13** und mit dem Detektor **14** verbunden. Der Einzelchip-Mikroprozessor **21** ist ebenfalls elektrisch mit dem Flüssigkristalldisplay **12** und mit dem ersten lichtemittierenden Element **15** verbunden. Der Einzelchp-Mikroprozessor **21** ist außerdem elektrisch mit einem tonabgebenden Element **22** (wie beispielsweise einem Summer oder einem Lautsprecher) verbunden, während ein zweites lichtemittierendes Element **23**, das lichtemittierende Dioden enthält, Lichtstrahlen in je einer anderen Farbe ausstrahlt. Dieses tonabgebende Element **22** und das zweite lichtemittierende Element **23** sind im Innern des Fahrzeuges installiert. Die Leitstation des Einzelchip-Mikroprozessors **21** ist elektrisch mit einem Stellschalter **24** und mit einem Blinklichtschalter **25** verbunden, die ursprünglich im Fahrzeug installiert sind.

[0012] Während dem Normalbetrieb des Fahrzeuges, ist das Flüssigkristalldisplay **12** nicht eingeschaltet und projiziert auch keine Lichtstrahlen auf die Rückseite des lichtdurchlässigen reflektierenden Glasspiegels **11**, so dass dieser lichtdurchlässige reflektierende Glasspiegel **11** auf die gleiche Weise wie ein konventioneller Außenspiegel funktioniert und eine jeweilige Situation hinter dem Fahrzeug anzeigt. Beim Abbiegen des Fahrzeuges nach links oder rechts, oder wenn der Lenker des Fahrzeuges den Stellschalter **24** beim Geradeausfahren mit dem Fahrzeug einschaltet, werden das Flüssigkeitskristalldispiay **12**, die Miniatur-Infrarot-Breitwinkelkamera **13** und der Detektor **14** eingeschaltet. Wenn das Flüssigkeitskristalldisplay **12** eingeschaltet ist, dringt dessen Licht durch den lichtdurchlässigen reflektierenden Glasspiegel **11** und zeigt die Situation hinter diesem lichtdurchlässigen reflektierenden Glasspiegel **11**, damit der Lenker des Fahrzeuges die jeweilige Situation hinter dem Fahrzeug direkt entsprechend einschätzen und beurteilen kann. Gleichzeitig erkennt der Detektor **14** die jeweilige Situation und sendet ein Erkennungssignal an den Einzelchip-Mikroprozessor **21**. Wenn sich ein anderes Objekt (ein Fahrzeug oder eine Person) dem Fahrzeug nähert, empfängt der Einzelchip-Mikroprozessor **21** das Signal und überprüft dieses Signal. Falls dieses Signal auf eine ungewöhnliche Situation hinweist, regt der Einzelchip-Mikroprozessor **21** die ersten lichtemittierenden Elemente **15** an, um dieses sich annähernde Objekt zu warnen und um ebenfalls das tonabgebende Element **22** und das zweite lichtemittierende Element **23** anzuregen, um den Lenker des Fahrzeuges entsprechend zu warnen. Diese Ausführungsart soll daher zur Verbesserung der Fahrsicherheit beitragen.

[0013] Die Fig. 4 zeigt eine Ansicht eines Zusammenbaus eines Außenspiegels nach einer Ausführungsart der vorliegenden Erfindung. Der Steuerschaltkreis **2** ist im Innern eines Fahrzeuges **3** eingebaut, wobei die Kabel der Komponenten des linken und rechten Außenspiegels der vorliegenden Erfindung durch die Karosserie des Fahrzeuges durchragend verlegt und elektrisch an diesen Steuerschaltkreis **2** angeschlossen sind. Der Lenker des Fahrzeuges kann daher die Komponenten des linken und rechten Außenspiegels zum Aufnehmen von Bildern, für das Erkennen, Warnen und zum Beobachten der Situationen, auf der linken und rechten Seite neben dem Fahrzeug mit dem linken bzw. rechten Außenspiegel ansteuern.

[0014] Die Fig. 5 und Fig. 6 zeigen Diagramme, die die Funktionsweisen des Außenspiegels einer Aus-

führungsart nach der vorliegenden Erfindung schematisch darstellen. Mit erneuter Bezugnahme auf die Fig. 2 und Fig. 3 funktioniert der lichtdurchlässige Glasspiegel **11**, während dem Normalbetrieb des Fahrzeuges, auf die gleiche Weise wie konventionelle Außenspiegel und zeigen die Situation hinter dem Fahrzeug an. Beim Abbiegen des Fahrzeuges nach links oder rechts, oder wenn der Lenker den Stellschalter **24** auf der Steuerkonsole beim Fahren in einer geraden Richtung betätigt, werden das Flüssigkristalldisplay **12**, die Infrarot-Breitwinkelkamera **13** und der Detektor **14** eingeschaltet, wonach mit den Kameras **13** die jeweiligen Situationen hinter dem Fahrzeug erfasst werden und die Detektoren **14** ein, sich dem Fahrzeug näherndes, Objekt feststellen. Die mit den Kameras **13** erfasste Situation wird im Flüssigkristalldisplay **12** angezeigt, wobei das Licht der Spiegelung zur Anzeige dieser Situation durch den lichtdurchlässigen reflektierenden Glasspiegel **11** dringt. Die Situationen hinter dem Fahrzeug werden somit physisch auf dem lichtdurchlässigen Glasspiegel **11** angezeigt, damit der Lenker des Fahrzeuges die jeweilige Situation hinter seinem Fahrzeug direkt und besser entsprechend einschätzen und beurteilen kann.

[0015] Gleichzeitig erkennt der Detektor **14** die Bewegung des Objektes **4** und sendet ein Erkennungssignal an den Einzelchip-Mikroprozessor **21**, mit dem dieses Erkennungssignal empfangen und überprüft wird. Wenn sich das Objekt **4** auf eine ungewöhnliche Weise dem Fahrzeug nähert und innerhalb eines bestimmten Abstandes zum Fahrzeug kommt, regt der Einzelchip-Mikroprozessor **21** das erste lichtemittierende Element **15** zum Blinken an, um das sich dem Fahrzeug von außen nähernde Objekt **4** zu warnen. Gleichzeitig regt der Einzelchip-Mikroprozessor **21** das tonabgebende Element **22** zur Abgabe eines akustischen Warnsignals (beispielsweise eines Pieptons) und das zweite lichtemittierende Element **23** zum Blinken an, um den Lenker des Fahrzeuges zu warnen und um ihn an entsprechend zu treffende Maßnahmen zu erinnern. Mit diesen Funktionen soll die Fahrsicherheit verbessert werden.

[0016] Mit den oben beschriebenen Ausführungsarten sollen lediglich Beispiele der vorliegenden Erfindung angeführt werden, mit denen jedoch der Umfang der voliegenden Erfindung keineswegs eingeschränkt werden soll. Gleichartige Modifizierungen oder Abänderungen nach dem Geist der vorliegenden Erfindung sollen mit in den Umfang der vorliegenden Erfindung gehören. Mit der vorliegenden Erfindung soll ein elektronischer Außenspiegel für Fahrzeuge mit einer Infrarot-Breitwinkelkamera, zur Verbesserung der Fahrsicherheit, geschaffen werden, der aus einem lichtdurchlässigen Glasspiegel und einem Flüssigkeitsdisplay aufgebaut ist, wobei mit dem Blinklichtschalter zum Anzeigen der einzuschlagenden Richtung oder mit einem Stellschalter beim Abbiegen des Fahrzeuges in eine andere Richtung oder beim Geradeausfahren mit dem Fahrzeug die jeweilige Situation hinter dem Fahrzeug erkannt werden soll, wobei ebenfalls eine ungewöhnliche Situation erkannt wird und den Lenker des Fahrzeuges durch Blinken oder einem Summton entsprechend warnt, um die Fahrsicherheit weiter zu verbessern.

[0017] Die Erfindung betrifft somit einen elektronischen Fahrzeug-Außenspiegel mit einer elektronischen Breitwinkelkamera für die verbesserte Sicherheit, der einen lichtdurchlässigen reflektierenden Glasspiegel (**11**), der in ein Außenspiegelgehäuse (**1**) auf einer linken oder rechten Seite eines Fahrzeuges eingesetzt ist, ein an der Rückseite des reflektierenden Außenspiegelgehäuses (**1**) montierten Flüssigkristalldisplay (**12**), ein Infrarot-Breitwinkelkamera (**13**), einen Detektor (**14**), ein lichtemittierendes Element (**15**) und einen Steuerschaltkreis (**2**) umfasst, wobei der Steuerschaltkreis (**2**) elektrisch mit diesen Komponenten verbunden ist. Die Kamera (**13**), der Detektor (**14**) und das lichtemittierende Element (**15**) sind in einem Rahmen um das Außenspiegelgehäuse (**1**) eingebaut. Während des Normalbetriebs des Fahrzeuges wird mit dem lichtdurchlässigen reflektierenden Glasspiegel (**11**) die jeweilige Situation hinter dem Fahrzeug gezeigt. Das Flüssigkristalldisplay (**12**) wird mit dem Blinklichtschalter (**25**) oder mit dem Stellschalter (**24**) angeregt, um die Situation hinter dem Fahrzeug physisch anzuzeigen, wobei der Lenker des Fahrzeuges die Situation hinter seinem Fahrzeug direkt entsprechend einschätzen und beurteilen kann. Wenn der Detektor (**14**) außerdem eine ungewöhnliche Situation feststellt, werden mit dem Steuerschaltkreis (**2**) ein Blinken bzw. akustische Signale ausgelöst, um den Lenker des Fahrzeuges auf diese Situationen aufmerksam zu machen. Mit dieser erfindungsgemäßen Ausführungsart soll der tote Winkel des Außenspiegels eliminiert und die Fahrsicherheit verbessert werden.

Schutzansprüche

1. Elektronischer Fahrzeug-Außenspiegel mit einer elektronischen Breitwinkelkamera für die verbesserte Sicherheit, umfassend:
einen lichtdurchlässigen reflektierenden Glasspiegel (**11**), der in ein Außenspiegelgehäuse (**1**) auf einer linken oder rechten Seite eines Fahrzeuges eingesetzt ist;
ein an der Rückseite des reflektierenden Außenspiegelgehäuses (**1**) montierten Flüssigkristalldisplay (**12**);
eine Miniatur-Infrarot-Breitwinkelkamera (**13**);
einen Detektor (**14**);
ein erstes lichtemittierendes Element (**15**); und
einen im Innern des Fahrzeuges installierten Steuerschaltkreis (**2**), der elektrisch mit dem Flüssigkristalldisplay (**12**), der Kamera (**13**), dem Detektor (**14**) und mit dem ersten lichtemittierenden Element (**15**) und

daneben mit einem Stellschalter (**24**) und einem Blinklichtschalter (**25**), die üblicherweise im Innern des Fahrzeuges installiert sind, verbunden ist,
dadurch gekennzeichnet, dass die Infrarot-Breitwinkelkamera (**13**), der Detektor (**14**) und das erste lichtemittierende Element (**15**) in einem Rahmen um das Außenspiegelgehäuse (**1**) eingebaut sind, und
dass während des Normalbetriebs des Fahrzeuges der lichtdurchlässige reflektierende Glasspiegel (**11**) auf die gleiche Weise wie ein konventioneller Außenspiegel funktioniert und die Situation hinter dem Fahrzeug anzeigt, und
dass beim Abbiegen des Fahrzeuges nach links oder rechts oder wenn der Lenker des Fahrzeugs den Stellschalter betätigt das Flüssigkristalldisplay (**12**), die Infrarot-Breitwinkelkamera (**13**) und der Detektor (**14**) eingeschaltet werden, und
dass der lichtdurchlässige reflektierende Glasspiegel die jeweilige Situation hinter dem Fahrzeug dem Lenker physisch anzeigt, und
dass beim Feststellen einer ungewöhnlichen Situation eines, sich dem Fahrzeug nähernden, Objektes (**4**) innerhalb eines bestimmten Abstandes mit dem Detektor (**14**) das erste lichtemittierende Element (**15**) zum Blinken angeregt wird.

2. Elektronischer Fahrzeug-Außenspiegel mit einer elektronischen Breitwinkelkamera für die verbesserte Sicherheit nach Anspruch 1, dadurch gekennzeichnet, dass der Steuerschaltkreis (**2**) mit einem Einzelchip-Mikroprozessor (**21**) ausgestattet ist, der elektrisch mit dieser Infrarot-Breitwinkelkamera (**13**) und mit dem Detektor (**14**) verbunden ist, wobei eine Leitstation des Einzelchip-Mikroprozessors (**21**) elektrisch mit dem Flüssigkristalldisplay (**12**) und dem ersten lichtemittierenden Element (**15**) verbunden ist.

3. Elektronischer Fahrzeug-Außenspiegel mit einer elektronischen Breitwinkelkamera für die verbesserte Sicherheit nach Anspruch 1, dadurch gekennzeichnet, dass der Steuerschaltkreis (**2**) ebenfalls elektrisch mit einem tonabgebenden Element (**22**) und mit einem zweiten lichtemittierenden Element (**23**) verbunden ist, wobei dieses tonabgebende Element (**22**) und das zweite lichtemittierende Element (**23**) im Innern des Fahrzeuges installiert sind, wobei beim Feststellen eines sich dem Fahrzeug ungewöhnlich annähernden Objektes (**4**) mittels des Detektor (**14**) und, wenn dieses Objekt (**4**) innerhalb eines bestimmten Abstandes kommt, das tonabgebende Element (**22**) und das zweite lichtemittierende Element (**23**) ein akustisches Signal abgeben bzw. blinken, um den Lenker des Fahrzeuges auf diese Situation aufmerksam zu machen.

Es folgen 5 Blatt Zeichnungen

Anhängende Zeichnungen

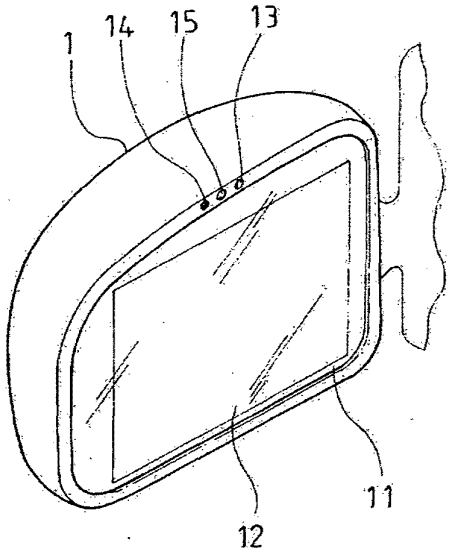


FIG.1

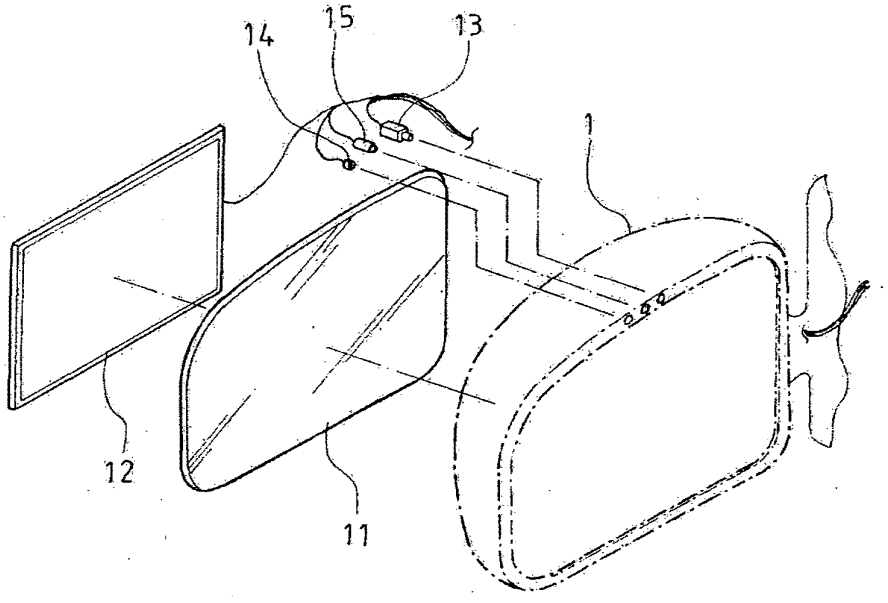


FIG.2

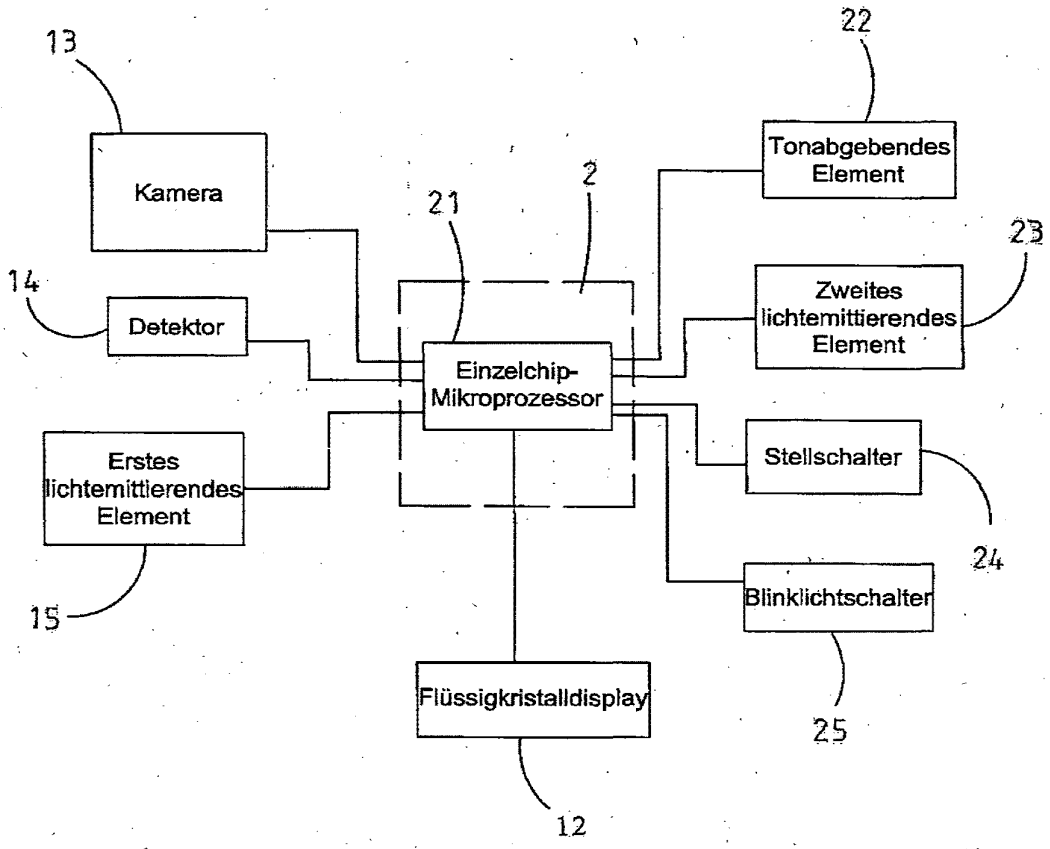


FIG.3

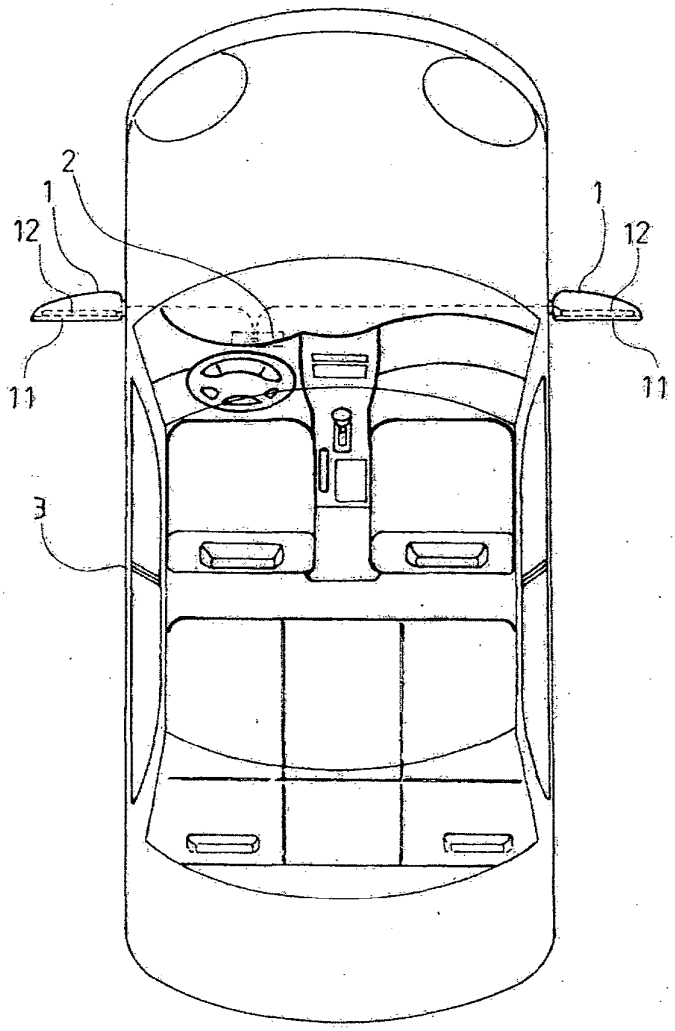


FIG.4

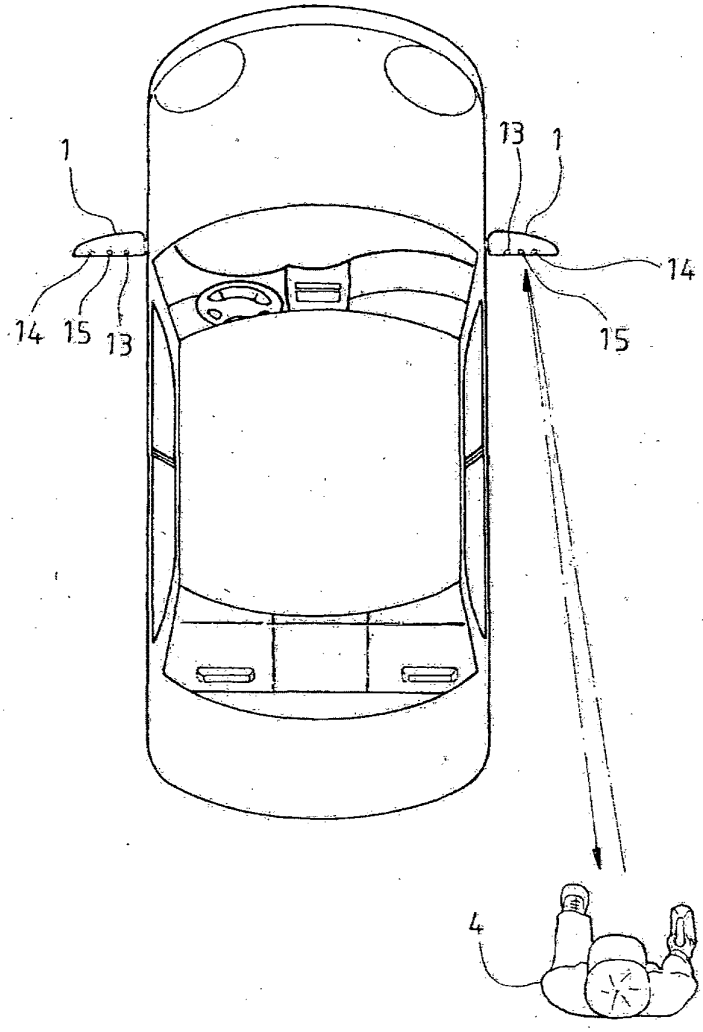


FIG.5

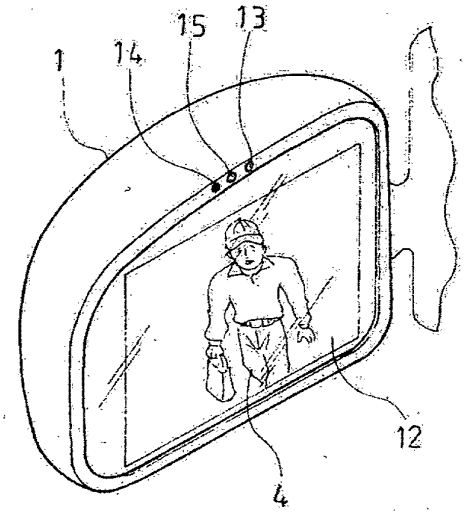


FIG.6

Notice

DESCRIPTION DE202010005203

BACKGROUND OF THE INVENTION

(a) Environment of the invention

[0001]
The present invention relates to an electronic vehicle exterior mirror with an infrared wide-angle camera for improved safety, in particular a structure of an exterior mirror, which is excited with a control switch or direct light irradiation when the vehicle is traveling straight or turns left / right to a To physically indicate the situation behind the vehicle on the LCD, and also to indicate an unusual situation for warning the driver of the vehicle by flashing or with an acoustic signal, whereby a blind spot, which can not be seen with the outside mirror, is eliminated to improve driving safety.

(b) Description of the conventional embodiment

[0002]

Typically, when a driver of a vehicle wants to turn left or right, he first casts a glance to the left and to the right to assess and assess the situation behind his vehicle before turning, simultaneously turning on the flashing light to indicate direction.

However, with the conventional exterior mirror, not all angles can be captured to keep track of the

entire area behind the vehicle. There is also no exterior mirror that works like a rear radar available on the market. Therefore, a driver of the vehicle commits numerous risks when changing the lane. When turning with the vehicle, the visibility with the outside mirror is too limited, so that the risk of traffic accidents is relatively high. For these reasons, it requires an improved version of the conventional exterior mirror. Based on many years of experience in the field, the inventor has devised an improved exterior mirror structure design and provided the present invention. With the present invention, the inventor intends to eliminate the disadvantages of the conventional outside mirrors in order to improve the driving safety.

SUMMARY OF THE INVENTION

[0003]
The main object of the present invention is to provide an electronic vehicle exterior mirror with an infrared wide-angle camera for improved safety, which is activated with a position switch or with direct light irradiation when driving straight ahead of the vehicle or when turning the vehicle to a respective situation behind the Physically display vehicle on an LCD of the exterior mirror, and with the also unusual situations are detected and the driver is made aware of such situations by flashing or audible signals to eliminate the blind spot in the exterior mirror and to improve driving safety.

[0004]

The electronic vehicle wing mirror with an infrared wide-angle camera for improved safety according to the present invention is composed of a translucent reflecting glass mirror inserted in an outside mirror housing, a liquid crystal display mounted on the back side of this translucent reflecting glass mirror, an infrared wide-angle camera, a detector , a first light emitting element and a control circuit electronically connected to the above components.

The wide-angle infrared camera, the detector and the first light-emitting element are mounted in a frame around the outside mirror housing. During normal operation of the vehicle, the translucent reflective glass mirror functions in the same way as the conventional side mirror and, as usual, reflects the situations behind the vehicle. When turning with the vehicle to the left or right, or when the handlebar of the vehicle turns on a position switch when driving straight ahead, the liquid crystal display, the infrared wide-angle camera and the detector are turned on. On the liquid crystal display, the situation behind the vehicle is physically displayed, so that the driver of the vehicle can assess and assess the situation directly behind the vehicle. In addition, when the

detector detects an unusual situation, flashing and audible signals are triggered by the control circuitry to alert the driver of the vehicle to this situation.

In this way, the blind spot, which can not be seen with the outside mirror, eliminated and improved driving safety.

SHORT DESCRIPTION OF THE DRAWINGS

[0005]
fig. Fig. 1 is a perspective view schematically showing an outside mirror according to an embodiment of the present invention.

[0006]
2shows an exploded perspective view for schematically illustrating an outside mirror according to an embodiment of the present invention.

[0007]
3Fig. 10 is a block diagram schematically showing the control circuit of an outside mirror according to an embodiment of the present invention.

[0008]
4shows a representation of the installation of an exterior mirror according to an embodiment of the present invention.

[0009]
5and Fig. 6 are diagrams schematically showing the operation according to one embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0010]

With reference to FIGS. 1 to 3, FIGS. 1 and 2 each show a perspective view and an exploded perspective view, respectively, schematically illustrating an outside mirror according to an embodiment of the present invention.

3 is a block diagram schematically illustrating the control circuit of an outside mirror according to an embodiment of the present invention.

The exterior mirror according to the present invention is composed of a translucent reflective glass mirror 11 inserted into an exterior mirror housing 1, a liquid crystal display 12 mounted on the back of the exterior mirror housing 1, a miniature infrared wide-angle camera 13, a detector 14 (e.g. Ultrasonic detector), a first light-emitting element 15 including light-emitting diodes which emit light beams of a different color, and a control circuit 2 installed in a dashboard inside a vehicle and electrically connected to the liquid crystal display 12 wherein the miniature infrared wide-angle camera 13, the detector 14 and the first light-emitting element 15 are mounted in a frame around the outer mirror housing 1.

In this embodiment shown, the miniature infrared wide-angle camera 13, the detector 14 and the first light-emitting element 15 are installed in an upper edge of the outer mirror housing 1.

[0011]

In the control circuit 2, a single-chip microprocessor 21 is integrated, which has been programmed in advance with a control program.

In this case, this single-chip microprocessor 21 for receiving the image and detection signals is electrically connected to the miniature infrared wide-angle camera 13 and to the detector 14.

The single chip microprocessor 21 is also electrically connected to the liquid crystal display 12 and to the first light emitting element 15. The single-chip microprocessor 21 is also electrically connected to a sound-emitting element 22 (such as a buzzer or a speaker), while a second light-emitting element 23 containing light-emitting diodes emits light rays of a different color. This sound emitting element 22 and the second light emitting element 23 are installed inside the vehicle. The control station of the single-chip microprocessor 21 is electrically connected to a control switch 24

and to a flashing light switch 25, which are originally installed in the vehicle.

[0012]

During normal operation of the vehicle, the liquid crystal display 12 is not turned on and also projects no rays of light to the back of the translucent reflecting glass mirror 11, so that this translucent reflecting glass mirror 11 functions in the same manner as a conventional outside mirror and displays a respective situation behind the vehicle , When turning the vehicle to the left or right, or when the handlebar of the vehicle turns on the control switch 24 when driving straight ahead with the vehicle, the Flüssigkeitskristalldispiay 12, the miniature infrared wide-angle camera 13 and the detector 14 are turned on. When the liquid crystal display 12 is turned on, its light penetrates through the translucent reflecting glass mirror 11 and shows the situation behind this translucent reflecting glass mirror 11 so that the driver of the vehicle can directly assess and judge the respective situation behind the vehicle.

At the same time, the detector 14 recognizes the respective situation and transmits a detection signal to the single-chip microprocessor 21. When another object (vehicle or person) approaches the vehicle, the single-chip microprocessor 21 receives the signal and checks this signal. If this signal indicates an unusual situation, the single-chip microprocessor 21 will excite the first light-emitting elements 15 to warn this approaching object and also to excite the sound-emitting element 22 and the second light-emitting element 23 corresponding to the handlebar of the vehicle to warn. This embodiment should therefore contribute to the improvement of driving safety.

[0013]

4 shows a view of an assembly of an outside mirror according to an embodiment of the present invention. The control circuit 2 is installed inside a vehicle 3, with the cables of the components of the left and right outside mirrors of the present invention being laid projectingly through the body of the vehicle and electrically connected to this control circuit 2. The driver of the vehicle can therefore control the components of the left and right outside mirrors for taking pictures, for recognizing, warning and observing the situations on the left and right sides next to the vehicle with the left and right side mirrors, respectively.

[0014]

FIGS. 5 and 6 are diagrams schematically illustrating the operations of the outside mirror of one embodiment of the present invention. Referring again to FIGS. 2 and 3, during normal operation of the vehicle, the translucent glass mirror 11 functions in the same manner as conventional exterior mirrors and displays the situation behind the vehicle. When turning the vehicle to the left or right, or when the handlebar actuates the control switch 24 on the control console when driving in a straight direction, the liquid crystal display 12, the wide-angle infrared camera 13 and the detector 14 are turned on, after which with the cameras 13, the respective Situations are detected behind the vehicle and detect the detectors 14, approaching the vehicle, object. The situation detected by the cameras 13 is displayed in the liquid crystal display 12, the light of the reflection penetrating through the translucent reflecting glass mirror 11 to indicate this situation.

The situations behind the vehicle are thus physically displayed on the translucent glass mirror 11 so that the driver of the vehicle can assess and assess the respective situation behind his vehicle directly and better accordingly.

[0015]

At the same time the detector 14 detects the movement of the object 4 and sends a detection signal to the single-chip microprocessor 21, with which this detection signal is received and checked. When the object 4 approaches the vehicle in an unusual manner and comes within a certain distance of the vehicle, the single-chip microprocessor 21 causes the first light-emitting element 15 to blink to warn the object 4 approaching the vehicle from the outside. At the same time, the single-chip microprocessor 21 excites the sound-emitting element 22 to emit an audible warning signal (eg a beep) and the second light-emitting element 23 to flash to warn the driver of the vehicle and to remind him to take appropriate action. These functions are intended to improve driving safety.

[0016]

With the above-described embodiments, only examples of the present invention are given, with which, however, the scope of the present invention should by no means be restricted. Similar modifications or alterations of the spirit of the present invention are intended to be included within the scope of the present invention. The present invention is an electronic wing mirror for vehicles with an infrared wide-angle camera, to improve driving safety, to be created, which is composed of a translucent glass mirror and a liquid display, with the flashing light switch for indicating the

direction to be taken or with a control switch when turning the vehicle in a different direction or when driving straight ahead with the vehicle, the respective situation behind the vehicle to be detected, also an unusual situation is detected and warns the driver of the vehicle by flashing or a buzzer accordingly to further improve driving safety.

[0017]

The invention thus relates to an electronic vehicle exterior mirror with an electronic wide-angle camera for improved safety, comprising a translucent reflective glass mirror (11) which is inserted into a wing mirror housing (1) on a left or right side of a vehicle, one at the back of the reflective mirror housing (1) mounted liquid crystal display (12), an infrared wide-angle camera (13), a detector (14), a light-emitting element (15) and a control circuit (2), wherein the control circuit (2) electrically connected to these components is. The camera (13), the detector (14) and the light-emitting element (15) are mounted in a frame around the exterior mirror housing (1). During normal operation of the vehicle, the translucent reflecting glass mirror (11) shows the respective situation behind the vehicle. The liquid crystal display (12) is energized by the flasher switch (25) or the control switch (24) to physically indicate the situation behind the vehicle, whereby the driver of the vehicle can directly assess and judge the situation behind his vehicle.

In addition, if the detector (14) detects an unusual situation, the control circuit (2) will flash or beep to alert the driver of the vehicle to these situations. With this embodiment of the invention, the blind spot of the outside mirror is eliminated and driving safety is improved.

Notice

CLAIMS DE202010005203

1.
An electronic vehicle exterior mirror having an electronic wide-angle camera for enhanced safety, comprising: a translucent reflective glass mirror (11) inserted in a wing mirror housing (1) on a left or right side of a vehicle; a liquid crystal display (12) mounted on the back surface of the reflecting outside mirror case (1); a miniature infrared wide-angle camera (13); a detector (14); a first light emitting element (15); and a control circuit (2) installed in the interior of the vehicle and electrically connected to the liquid crystal display (12), the camera (13), the detector (14) and the first light emitting element (15) and next to it with a setting switch (24) and a flashing light switch (25), which are usually installed in the interior of the vehicle, characterized in that the infrared wide-angle camera (13), the detector (14) and the first light-emitting element (15) in a frame around the exterior mirror housing (1), and that during normal operation of the vehicle, the translucent reflective glass mirror (11) functions in the same manner as a conventional side mirror and indicates the situation behind the vehicle, and that when turning the vehicle to the left or right or when the handlebar the vehicle controls the liquid crystal display (12), the wide-angle infrared camera (1 3) and the detector (14) are turned on, and that the translucent reflective glass mirror physically indicates the respective situation behind the vehicle to the driver, and that upon determining an unusual situation of an object (4) approaching the vehicle within a certain distance the first light-emitting element (15) is made to blink with the detector (14).

2.
An electronic vehicle exterior mirror comprising an electronic wide-angle camera for enhanced safety according to claim 1, characterized in that the control circuit (2) is provided with a single-chip microprocessor (21) electrically connected to said wide-angle infrared camera (13) and to said detector (14), wherein a control station of the single-chip microprocessor (21) is electrically

connected to the liquid crystal display (12) and the first light-emitting element (15).

3.

An electronic vehicle exterior mirror comprising an electronic wide angle camera for enhanced safety according to claim 1, characterized in that the control circuit (2) is also electrically connected to a sound emitting element (22) and to a second light emitting element (23), said sound emitting element (22) and the second light-emitting element (23) are installed in the interior of the vehicle, wherein upon detection of an object unusually approaching the vehicle (4) by means of the detector (14) and if this object (4) comes within a certain distance in that the sound emitting element (22) and the second light emitting element (23) emit an acoustic signal to alert the driver of the vehicle to this situation.

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(54) Door mirror with a small dead angle

(57) A door mirror with a small dead angle which enables the driver to easily see the areas where the right and left front and rear wheels are touching the ground that could not been seen so far with the conventional door mirrors due to dead angles, and to easily see the horizontal forward direction (if there are oncoming cars) on the side of the assistant driver's seat at the time of passing another car ahead by manipulating buttons on the driver's seat and, then, automatically returns to its initial state. The door mirror with a small dead angle has a support arm which includes a straight-moving drive, a slide plate that slides in the lengthwise direction thereof, and a mirror case (10) pivoted on the slide plate to rotate. The door mirror may be further equipped with movable sources of light, may be constructed so as to be folded and may contain a fine adjustment mechanism in the mirror case. The door mirror is further equipped with a control/electrically moving mechanism by which the mirror case is automatically moved up to the coordinates that have been set in advance in a CPU enabling the driver to see the otherwise dead-angled areas, and the mirror case is returned back either manually or automatically.

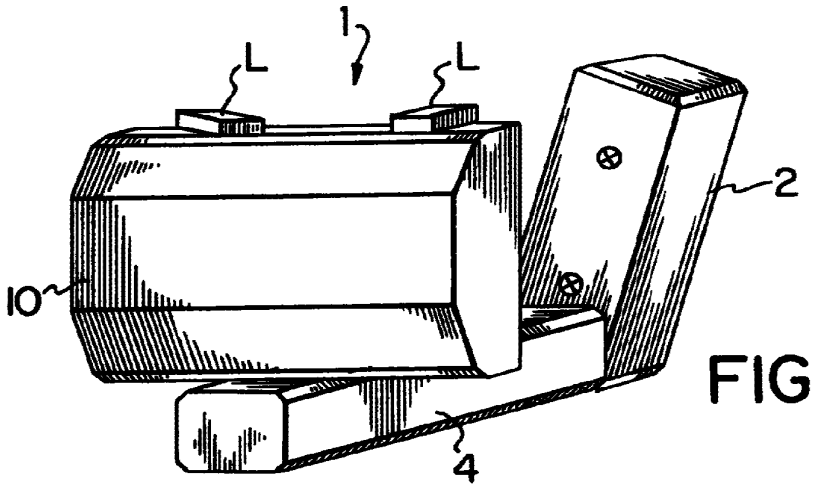

FIG. 1

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Description

Technical Field

The present invention relates to a door mirror with a small dead angle. More specifically, the invention relates to a door mirror with a small dead angle which makes it possible to easily see the areas where the right and left front and rear wheels are touching the ground that could not been seen so far with the conventional door mirrors, and to easily see the horizontal forward direction on the side of the assistant driver's seat at the time of passing another car ahead by manipulating buttons at the driver's seat.

Background Art

A variety of contrivances have heretofore been proposed to decrease dead angles of a door mirror from the standpoint of safety.

Japanese Unexamined Patent Publication No. 116568/1993 discloses a device for changing the visual field of a rearview mirror by turning at least one of either the right door mirror or the left door mirror by a required angle in a direction in which the dead angle will be eliminated based upon a control signal output from a control means in response to at least either an on-signal or an off-signal from a turn signal lamp switch of a car (or in response to an on-signal from a reverse gear detection switch).

According to this proposal, the mirror automatically returns back to the original position after the use. However, the door mirror is not allowed to swivel which is not capable of coping with a change in the position of the eyes when the car is driven by a different driver. Besides, when traveling forward, the movement of the mirror is triggered by the on-signal of the turn signal lamp switch; i.e., the areas of dead angles come into a visual field after the turn signal is output. When driving into a running lane from a ramp on an express way or when changing the lane in an ordinary manner, therefore, the turn signal is flashed first without seeing the rearview inviting a danger in that the car may be struck from behind by a succeeding car. Besides, it could happened that the distances to the succeeding cars were incorrectly recognized since the visual field obtained in this state was different from the visual field obtained at an ordinary position.

Japanese Unexamined Patent Publication No. 191349/1994 proposes a rearview mirror that eliminates dead angles, according to which when it is attempted to enter into, or come out from, a garage or a parking area, the visual field near the rear wheels is maintained by moving mirrors that are remotely controlled by electricity, hydraulic pressure or pneumatic pressure. According to this proposal, however, the moving mirrors move by only a small amount. Moreover, in the case of a car with a right-side steering wheel, it is impossible to watch the front left wheel from the driver's seat. Besides, fine adjustment is not accomplished, either, to comply with the position of the driver's eyes.

In U.K. and Japan, the cars keep to the left and have a steering wheel on the right side of the car. However, though not all of them, many imported cars manufactured in foreign countries still have a steering wheel on the left side. When used in Japan, the cars with a left-sided steering wheel have a demerit in that difficulty is involved in passing another car ahead particularly in a facing traffic lane. If the right-side mirror could be automatically controlled to a preset position where it faces forwards in a horizontal direction and if the horizontal forward view could be seen, then, it is allowed to easily confirm the presence of the oncoming cars without risking to move into the right lane to an excess degree. It is then made possible for a driver of a car with the left-sided steering wheel to safely pass the car ahead. With the conventional simply constructed remotely-controlled door mirror, however, a lot of time was needed for adjusting the position, and the door mirror could not be quickly moved to an angle for seeing the horizontal forward view in a "one-touch" operation and could not be quickly returned back to the initial position, either. It needs not be pointed out that the same holds true even for the cars with the right-sided steering wheel when they are used in countries where the traffic rule is that keep to the right when you drive.

In an attempt to provide a wide-view door mirror that is very useful in handling the cars in garages and parking areas, and in moving the cars back and forth on very narrow roads, the present inventors have forwarded keen study and have arrived at the present invention as a result of making such contrivances as sliding the door mirror itself along a support arm that extends in the direction of width of the car and digitally setting the directions in advance.

Disclosure of the Invention

The object of the present invention is to provide a door mirror with a small dead angle, according to which the mirror surface of the door mirror on one side or on both sides is automatically moved to an angular position that is set in advance when an indoor switch is operated by a driver at any time, so that the field which is usually within dead angles comes into a visual field temporarily, and then the mirror surface automatically returns back.

Another object of the present invention is to provide a door mirror with a small dead angle which makes it easier for the drivers of the cars with the left-sided steering wheel (many of the imported cars are of this type) used in Japan or U.K. to pass another car ahead.

A further object of the present invention is to provide a door mirror with a small dead angle which enables the position and angle of the mirror surface to be adjusted finely and easily depending upon a change in the positions of the eyes when the car is used by a different driver.

A still further object of the present invention is to

provide a door mirror with a small dead angle which is held within the amount of protrusion beyond the car body of a conventional door mirror, and which can be expanded as required and can be stored.

Yet further object of the present invention is to provide a door mirror with a small dead angle that is capable of covering otherwise dead-angled visual fields, offering dazzle-proof view to the driver and having movable sources of light that move together with the mirror surface.

According to the present invention, there are provided:

A door mirror with a small dead angle characterized by having a base plate 2 that also serves as a portion for being mounted on a door, a support arm 4 pivotally attached to the base plate and being allowed to be tilted, a straight-moving screw inserted in the support arm 4, a slide plate 8 that pivotally engages with the straight-moving screw 5 and slides in the lengthwise direction of the support arm 4 along a guide 6, and a mirror case 10 that is pivotally attached to the slide plate 8 in a manner to be turned (claim 1);

A door mirror with a small dead angle according to claim 1, wherein the mirror case 10 and/or the support arm 4 is provided with one or more movable sources L of light that are not dazzling to the driver (claim 2);

A door mirror with a small dead angle which can be folded according to claim 1 or 2, wherein the base plate 2 comprises a base plate 2A and an auxiliary base plate 2B which is pivotally attached to the door intimately and in a folding manner, and the support arm 4 is pivotally attached to the auxiliary base plate 2B (claim 3);

A door mirror with a small dead angle according to any one of claims 1 to 3, wherein the mirror case 10 is a rearview mirror case containing a mechanism for finely adjusting a mirror surface 3 longitudinally and transversely (claim 4); and

A door mirror with a small dead angle according to any one of claims 1 to 4, wherein a CPU stores in advance the coordinates (X, α, β) of the mirror case 10 to reproduce mirror surface positions P_1, P_2, P_3, --- at which visual fields S_1, S_2, S_3, --- that cannot be seen at an ordinary mirror surface position due to dead angles, can be seen by a driver on the driver's seat, the mirror case 10 automatically moves up to said coordinates enabling the field to be seen when the driver depresses buttons carrying indications of desired visual fields S_1, S_2, S_3, ---, and provision is made of a control function which causes the mirror surface to return back to the initial position set by the driver when the driver manipulates switches, when a predetermined period of time passes, when a car reaches a predetermined forwardly travelling speed, or when an ignition key is turned off (claim 5).

Brief Description of the Drawings

Fig. 1 is a perspective view of a left-side door mirror of a car with the right-sided steering wheel enabling the front left wheel to be seen according to an embodiment;

Fig. 2 is a perspective view of the left-side door mirror in an intermediate attitude (moving) to enable the front left wheel to be seen according to the embodiment;

Fig. 3 is a perspective view of the left-side door mirror in an intermediate attitude (moving) in which a mirror case 10 has moved in a horizontal direction only according to the embodiment;

Fig. 4 is a perspective view of the left-side door mirror in a standard state (during the ordinary driving condition) set by a driver according to the embodiment;

Fig. 5 is a sectional view illustrating part of the embodiment that corresponds to Fig. 1;

Fig. 6 is a sectional view illustrating part of the left-side door mirror according to the embodiment that corresponds to Fig. 2;

Fig. 7 is a sectional view illustrating part of the embodiment that corresponds to Fig. 3;

Fig. 8 is a sectional view illustrating part of the embodiment that corresponds to Fig. 4;

Fig. 9 is a perspective view of a mirror controller;

Fig. 10 is a wiring diagram of a mirror control system;

Fig. 11 is a block diagram of the mirror control system; and

Fig. 12 is a perspective view illustrating a state where the front left wheel 20 is seen by an eye E of a driver.

Description of Embodiment

The present invention will now be described in detail by way of an embodiment.

Referring to Figs. 1 to 8, reference numeral 1 denotes a door mirror with a small dead angle according to an embodiment of the present invention, 2 denotes a base plate, 3 denotes a mirror surface, 4 denotes a support arm, 5 denotes a straight-moving screw, 6 denotes a guide, 8 denotes a slide plate, 10 denotes a mirror case, and symbol L denotes movable sources of light. In the following description, reference numerals may take subscripts like 1L, 3L to represent those related to the door mirror of the left side, and 1R, 3R to represent those related to the door mirror of the right side.

The door mirror 1 according to this embodiment is basically constituted by a plastic or metallic hollow base plate 2 secured by bolts or the like to a front end portion of a front door of a car, a support arm 4 which extends nearly in the direction of width of the car body from the base plate 2 and is pivotally attached to rotate nearly in the forwardly and reversely rotating directions of the wheel, and a mirror case 10 which is pivotally attached

to nearly the central upper portion of the support arm 4 to rotate nearly in the directions in which the front wheels are directed and is equipped with nighttime illumination lamps L, L.

The mirror case 10 is equipped with a widely known device for finely adjusting the angle of the mirror surface. A pair of movable sources of light (nighttime illumination lamps) L, L are mounted on the upper portions of the mirror case in a nonparallel manner to be widened in a direction opposite to the mirror surface. Either one of these nighttime illumination lamps L, L is turned on, that does not directly project light to the eyes of the driver when small lamps (parking lamps) or head lamps are turned on and, besides, when another special switch is turned on. They are not turned on at the time of confirming the oncoming cars (when the mirror case is directed to a forward horizontal direction) when the driver is attempting to pass another car ahead. Therefore, the drivers of the oncoming cars are not dazzled.

Fig. 10 is a wiring diagram of a mirror control system which is roughly constituted by a mirror control unit 40, drive units 50, 51 inside the right and left mirrors, and a mirror controller 30.

The mirror control unit 40 is constituted by a CPU (microprocessor), motor drive circuits 101, 102, 103, 104, 105, 107, 108, 109, 110, and a lamp turn-on circuit 111. The CPU sends drive signals related to turning the switches on and off to the motor drive Circuits 101 to 110, and stores the rotational angles of the motors. Upon receiving signals from the CPU, the motor drive circuits 101 to 110 feeds drive voltages to the motors M_1 to M_{10} of the drive units 50 and 51 in the right and left mirrors. Upon receiving a turn-on signal from the CPU and being served with the electric power through a light switch SW_{HL}, the lamp turn-on circuit 111 supplies a turn-on voltage to the nighttime illumination lamps of the drive units 50 and 51 in the right and left mirrors.

The drive unit 50 in the left mirror includes a straight-moving screw motor M_6, a storing position limit switch SW_{6A} and an expanded position limit switch SW_{6B} for halting the straight-moving screw motor M_6 at a predetermined position, an α-axis motor M_7 and a β-axis motor M_8 for turning the mirror case, a γ-axis motor M_9 and a δ-axis motor M_{10} for finely adjusting the mirror surface, limit switches SW_7, SW_8, SW_9 and SW_{10} for detecting points that serve as references for controlling the α-axis, β-axis, γ-axis and δ-axis, and nighttime illumination lamps L_{LF} and L_{LR}. The straight-moving screw motor M_6 is a DC motor, and other motors M_7, M_8, M_9 and M_{10} are step motors. Like the drive unit 50 in the left mirror, the drive unit 51 in the right mirror includes a straight-moving screw motor M_1, expanded position and storing position limit switches SW_{1A} and SW_{1B}, motors M_2, M_3, M_4 and M_5 of the α-axis, β-axis, γ-axis and δ-axis, limit switches SW_2, SW_3, SW_4 and SW_5, and nighttime illumination lamps L_{RF} and L_{RR}.

Fig. 9 shows the appearance of the mirror controller 30, wherein a front panel 31 includes longitudinal and transverse fine adjustment switches SW_U, SW_D, SW_L and SW_R, a right-and-left change-over switch SW_{SEL}, memory operation switches SW_{MA}, SW_{MB}, SW_{MC}, SW_{MD} and SW_{MW}, and an indicator LED. The longitudinal and transverse fine adjustment switches SW_U and SW_D are used to control the angle of γ-axis of the mirror surfaces 3L and 3R and to control the angle of the α-axis of the support arms 4L and 4R, the longitudinal and transverse fine adjustment switches SW_L and SW_R are used to control the angle of the δ-axis of the mirror surfaces 3L and 3R and to control the angle of the β-axis of the mirror cases 10L and 10R, and the right-and-left change-over switch SW_{SEL} transmits to the CPU which one of the drive units in the right and left mirrors be selected to be controlled. The memory operation switches are used to store in the CPU the state of the drive units in the right and left mirrors, and to reproduce from the CPU the state of the drive units of the right and left mirrors.

Fig. 11 is a block diagram illustrating a relationship of control in the mirror control system.

The operation of this embodiment will now be described with reference to Fig. 10.

[1]Operation of the mirror in an ordinary driving condition.

When the up-and-down direction adjustment switches SW_U and SW_D and the right-and-left direction adjustment switches SW_R and SW_L of the mirror controller 30 are depressed while the IG key switch SW_{IG} is being closed, the CPU causes, through the drive circuits 104, 109, 105 and 110, the γ-axis motor M_4 or M_9 and the δ-axis motor M_5 or M_{10} to be rotated in the directions in which the adjustment switches are depressed in the mirror of either side selected by the right-and-left change-over switch SW_{SEL}. The CPU converts the rotational angles (deviations from the origins) of the motors of when they are no longer driven into pulse counts and stores them as return positions set by the driver. The origins are those positions where the limit switches SW_2, SW_3, SW_4, SW_5, SW_7, SW_8, SW_9, and SW_{10} are closed.

[2] Setting the mirror position again.

(1) When the IG key switch SW_{IG} is closed from the open state, the CPU drives, through the straight-moving screw drive circuit 101, the right mirror straight-moving screw motor M_6 toward the returning direction for a predetermined period of time (e.g., five seconds). The slide plates 8L and 8R (see Fig. 8) move accompanying the turn of the straight-moving screw and come into a halt at a return position where the return position limit switches SW_{1A} and SW_{6A} are opened. Here, however, when the switches SW_{1A} and SW_{6A} have been opened at a moment when the IG key switch SW_{IG} is closed, the slide plates 8L and 8R do not move, as a matter of course.

(2) As the IG key switch SW_{IG} is closed, the CPU causes, through the drive circuit 107, the step motor M_7 that drives the α-axis of the left mirror to rotate in a direction in which a protrusion T_7 (see Fig. 8) for detecting the position approaches the limit switch SW_7. Upon detecting the closure of the switch SW_7, the CPU causes, through the drive circuit 107, the motor M_7 to rotate up to a rotational angle that has been stored as a return position in the form of a pulse count, so that the direction of the α-axis of the left mirror returns back to the return position set by the driver. Likewise, the β-axis (M_8, 108, T_8, SW_8), γ-axis (M_9, 109, T_9, SW_9) and δ-axis (M_{10}, 110, T_{10}, SW_{10}) of the left mirror and the α-axis (M_2, 102, T_2, SW_2), β-axis (M_3, 103, T_3, SW_3), γ-axis (M_4, 104, T_4, SW_4) and δ-axis (M_5, 105, T_5, SW_5) of the right mirror return to the initial positions set by the driver.

[3] Operation of the mirror in a state of expanded visual field.

(1) The switches SW_U, SW_D, SW_R, and SW_L of the mirror controller 30 may be depressed in excess of the rotational ranges (ranges for finely adjusting the mirror surface in the mirror case) of the γ-axis 24 and the δ-axis 25 (see Fig. 7) that have been set in the CPU in advance as pulse counts in a state where the right-and-left change-over switch SW_{SEL} has been closed toward the side of the left mirror. Then, the CPU causes, through the straight-moving screw drive circuit 101, the straight-moving screw motor M_5 to be driven toward the expanding direction for a predetermined period of time (e.g., five seconds) and further causes, through the drive circuits 109 and 110, the γ-axis motor M_9 and the δ-axis motor M_{10} to be rotated up to the center of the range of rotation. Expansion stands for moving the mirror case up to the extreme outer end of the support arm 4 (see Fig. 8) in order to establish the state without dead angle. The straight-moving screw motor M_6 comes into a halt as the circuit is opened by the operation of the expansion position limit switch SW_{6B} (transfer to the state of an expanded visual field).

Thereafter, as the up-and-down direction adjustment switches SW_U, SW_D and the right-and-left direction adjustment switches SW_R, SW_L of the mirror controller 30 are depressed, the CPU causes, through the drive circuits 109 and 110, the corresponding γ-axis motor M_9 and the δ-axis motor M_{10} to rotate in the directions in which the buttons are depressed. Here, when the buttons are operated in excess of the above-mentioned range of rotation, the CPU causes, through the drive circuits 107 and 108, the α-axis motor M_7 and the β-axis motor M_8 in the mirror case to be rotated in the directions in which the adjustment switches are depressed for a period of time in which they are kept depressed. It is thus made possible to see any objects that are desired to be seen (e.g., area where the front left wheel is touching the ground) from the driver's seat. In this case, the γ-axis motor M_9 and the δ-axis motor M_{10} are rotated through the drive circuits 109 and 110 up to the center of the range of rotation, so that the mirror surface can be easily operated next time. The CPU further sends to the turn-on circuit 111 a lamp turn-on signal to illuminate the area to where the mirror surface is faced in comparison with the angle of gaze of the driver that has been set in the CPU as a pulse count. When the light switch SW_{HL} is closed (during the night), the electric power is supplied to the circuit 111 and, hence, either the nighttime illumination lamp L_{LF} or L_{LR} of the corresponding direction is turned on. In the foregoing was described the operation of the door mirror of the left side.

Next, when the switch SW_{SEL} is closed to the side of the right mirror, the CPU executes the same operations as those for the above-mentioned left mirror concerning the straight-moving screw motor M_1, γ-axis motor M_4, δ-axis motor M_5, α-axis motor M_2, β-axis motor M_3, drive circuits 101, 104, 105, 102, 103, expansion position limit switch SW_{1B}, nighttime illumination lamps L_{RF}, L_{RR}, and turn-on circuit 111 in response to the operations of the switches SW_U, SW_D, SW_R, and SW_L of the mirror controller 30.

(2) When either the right or left mirror is in a state of expanded visual field, the CPU causes, through the right and left straight-moving screw drive circuits 101, the straight-moving screw motors M_1 and M_6 to be driven in the returning direction for a predetermined period of time (e.g., five seconds) and causes, through the drive circuits 102, 107, 103, 108, 104, 109, 105, 110, the right and left α-axis, β-axis, γ-axis and δ-axis motors M_2, M_7, M_3, M_8, M_4, M_9, M_5 and M_{10} to be rotated up to the rotational angles (pulse counts) that have been stored as return positions set by the driver (return to the ordinary driving condition) (1) when there is no signal from the speed sensor SSR_V for a preset period of time (e.g., one minute), the reverse gear switch SW_{RV} of the vehicle has not been set to the reverse state, and none of the direction adjustment switches SW_U, SW_D, SW_R, and SW_L of the mirror controller 30 are depressed, (2) when the vehicle speed has exceeded a preset forward speed (the reverse gear switch SW_{RV} of the vehicle is not in the reverse state, and the speed sensor SSR_V is detecting a speed of, for example, 10 Km/h), or (3) when the IG key switch SW_{IG} is opened from the closed state. Under the ordinary driving condition, therefore, the state of expanded visual field of the mirror is not established to maintain safe driving.

[4] Setting and calling the memory.

(1) With the IG key switch SW_{IG} being turned on, when any one of the memory switches SW_{MA}, SW_{MB}, SW_{MC}, and SW_{MD} is depressed within a predetermined period time (e.g., within 10 seconds) after the memory switch SW_{MW} has been depressed, the CPU stores the expanded/returned state of the right and left mirror slide plates 8R, 8L at that moment and rotational angles (pulse counts) of the right and left α-axis, β-axis, γ-axis and δ-axis motors M_2, M_7, M_3, M_8, M_4, M_9, M_5 and M_{10} together with the memory switches (memory operation).

(2) With the IG key switch SW_{IG} being turned on, when any one of the memory switches SW_{MA}, SW_{MB}, SW_{MC}, and SW_{MD} is depressed, the CPU stores the expanded/returned state of the right and left mirror slide plates 8R, 8L at that moment and rotational angles (pulse counts) of the right and left α-axis, β-axis, γ-axis and δ-axis motors M_2, M_7, M_3, M_8, M_4, M_9, M_5 and M_{10} as return positions set by the driver, turns on the indicator LED that forms a pair with a memory switch that is depressed, causes, through the straight-moving screw drive circuit 101, the straight-moving screw motors M_1 and M_6 to be rotated in order to reproduce the expanded/returned state of the right and left mirror slide plates 8R and 8L that are stored in the memory together with the switches, and causes, through the drive circuits 102, 107, 103, 108, 104, 109, 105, 110, the motors M_2, M_7, M_3, M_8, M_4, M_9, M_5 and M_{10} in order to reproduce the rotational angles (pulse counts) of the right and left α-axis, β-axis, γ-axis and δ-axis (operation for calling memory)

(3) When a memory switch forming a pair with an indicator LED that is turned on is depressed in a state where the memory is called, the CPU causes, through the straight-moving screw drive circuit 101, the straight-moving screw motors M_1 and M_6 to rotate in order to reproduce the expanded/returned state of the right and left mirror slide plates 8R and 8L that are stored as return positions set by the driver at a moment when the operation is assumed for calling the memory, and further causes, through the drive circuits 102, 107, 103, 108, 104, 109, 105, 110, the motors M_2, M_7, M_3, M_8, M_4, M_9, M_5 and M_{10} in order to reproduce the rotational angles (pulse counts) of the right and left α-axis, β-axis, γ-axis and δ-axis (operation for resetting the memory). When either the right mirror or the left mirror is in a state of expanded visual field as a result of calling memory, the CPU resets the memory depending upon any one of the return conditions (1), (2) and (3) into the ordinary driving condition mentioned in [3]-(2) above.

(4) When the memory switches SW_{MA}, SW_{MB}, SW_{MC}, and SW_{MD} are in an initial state (as when a new car is bought), the CPU is storing in advance the rotational angles (pulse counts) of the α-axis, β-axis, γ-axis and δ-axis of the right and left mirrors such that the positions that are mostly desired to be seen are reflected on the mirrors (e.g., the memory switches SW_{MA}, SW_{MB}, SW_{MC}, and SW_{MD} have been so adjusted and stored in the CPU that the areas where the front left wheel and front right wheeel, front left wheel and rear right wheel, rear left wheel and rear right wheel, and rear left wheel and front right touching the ground, can be seen on the right and left mirrors). Accordingly, the areas that are mostly desired to be seen can be easily viewed without the need to dare to set the positions.

5. Electrically powered folding.

Though not shown in Fig. 10, the mirror can be electrically folded by providing the folding mechanism of the base plate 2 with an electric motor and by providing a switch inside the room.

The embodiment of the present invention makes it possible to accomplish all of the above-mentioned objects.

That is, there is provided a door mirror with a small dead angle with which a driver manipulates indoor switches as required to automatically move the mirror surface of the door mirror of one side or both sides up to a predetermined angular position, so that the areas which are usually within dead angles are temporarily brought into view and then the mirror surface is returned back to the initial state. Moreover, the door mirror makes it easier to pass another car ahead particularly when driving a car with the left-sided steering wheel (many imported cars), f.i. in U.K. or in Japan where the traffic rule is that keep to the left when you drive. Furthermore, the door mirror with a small dead angle of the present invention makes it possible to easily and finely adjust the position and angle of the mirror surface depending upon a change in the position of the eyes of when the car is used by a different driver. The door mirror is confined within the amount of protrusion beyond the car body of a conventional door mirror, and can be expanded and stored as required.

Besides, the door mirror of the present invention is equipped with movable sources of light that move together with the mirror surface and illuminate the areas that are so far within dead angles without causing dazzle to the driver. Therefore, the driver is allowed to confirm the conditions even in the darkness.

Claims

1. A door mirror with a small dead angle characterized by having a base plate 2 that also serves as a portion for being mounted on a door, a support arm 4 pivotally attached to the base plate and being allowed to be tilted, a straight-moving drive inserted in the support arm 4, a slide plate 8 that pivotally engages with the straight-moving drive 5 and slides

in the lengthwise direction of the support arm 4 along a guide 6, and a mirror case 10 that is pivotally attached to the slide plate 8 in a manner to be turned.

2. A door mirror with a small dead angle according to claim 1, wherein the mirror case 10 and/or the support arm 4 is provided with one or more movable sources L of light that are not dazzling to the driver.

3. A door mirror with a small dead angle which can be folded according to claim 1 or 2, wherein the base plate 2 comprises a base plate 2A and an auxiliary base plate 2B which is pivotally attached to the door intimately and in a folding manner, and the support arm 4 is pivotally attached to the auxiliary base plate 2B.

4. A door mirror with a small dead angle according to any one of claims 1 to 3, wherein the mirror case 10 is a rearview mirror case containing a mechanism for finely adjusting a mirror surface 3 longitudinally and transversely.

5. A door mirror with a small dead angle according to any one of claims 1 to 4, wherein a CPU stores in advance the coordinates (X, α, β) of the mirror case 10 to reproduce mirror surface positions P_1, P_2, P_3, --- at which visual fields S_1, S_2, S_3, --- that cannot be seen at an ordinary mirror surface position due to dead angles, can be seen by a driver on the driver's seat, the mirror case 10 automatically moves up to said coordinates enabling the field to be seen when the driver depresses buttons carrying indications of desired visual fields S_1, S_2, S_3, ---.

6. A door mirror with a small dead angle according to any one of claims 1 to 5, characterized by a control function which causes the mirror surface to return back to the initial position set by the driver when the driver manipulates switches, when a predetermined period of time passes, when a car reaches a predetermined forwardly travelling speed, or when an ignition key is turned off.

7. A door mirror with a small dead angle according to any one of claims 1 to 6, characterized in that the straight-moving drive (5) is formed by a screw-drive.

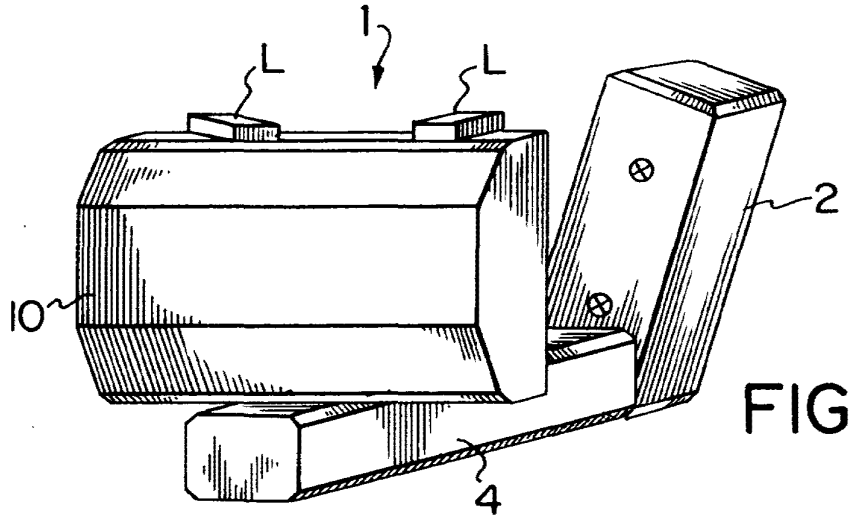


FIG. 1

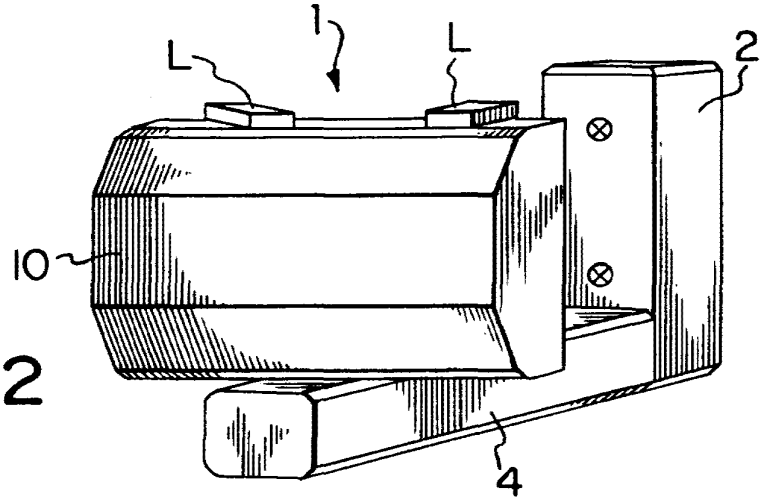


FIG. 2

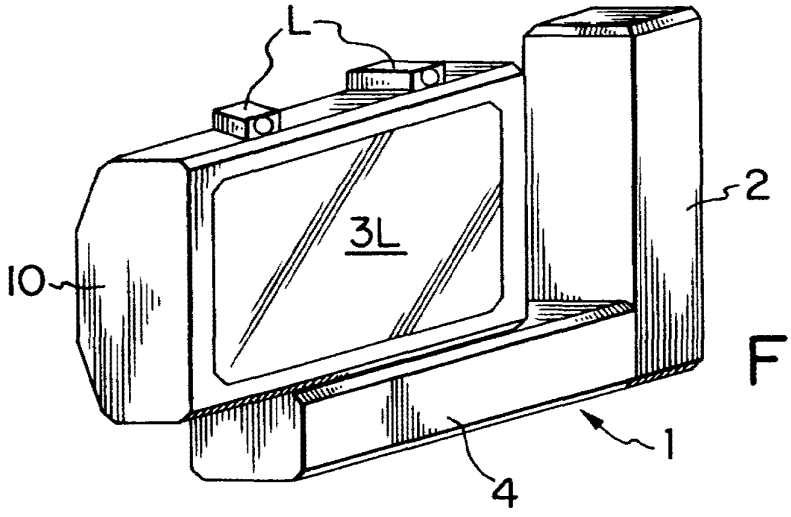


FIG. 3

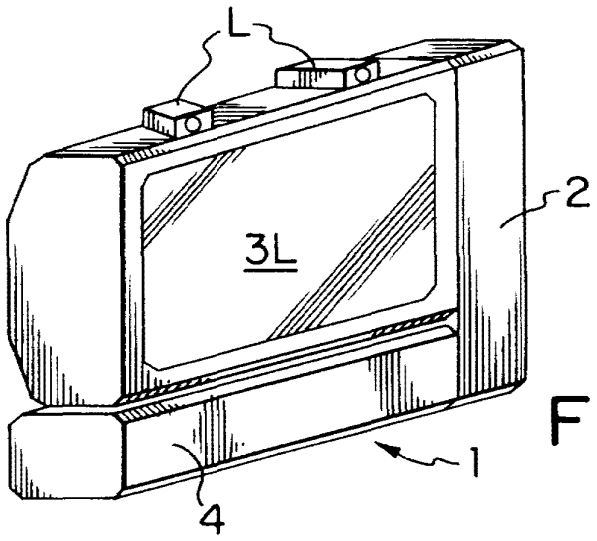
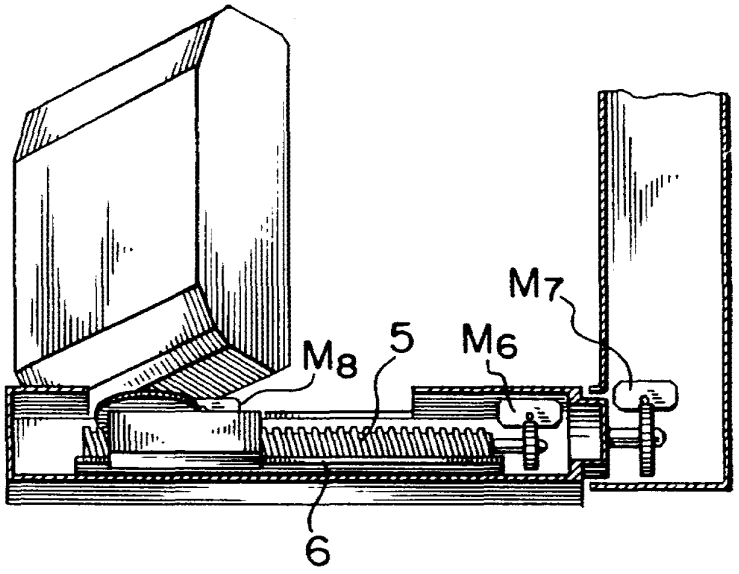


FIG. 4

FIG. 5



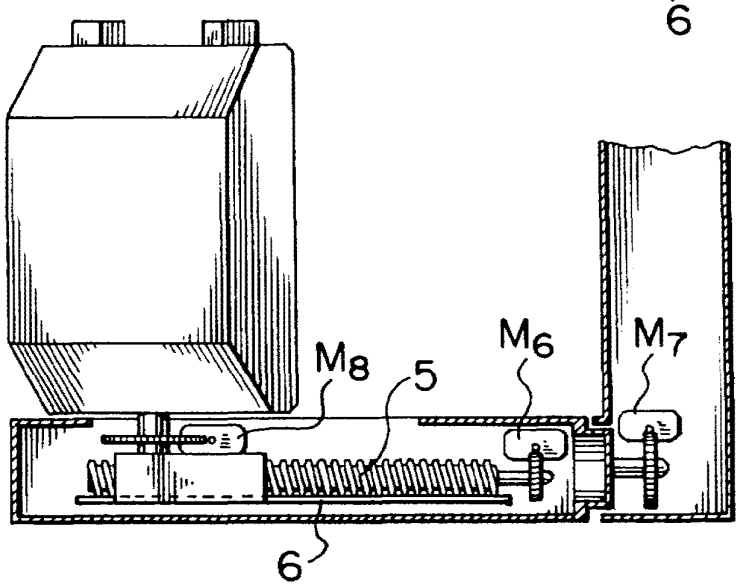


FIG. 6

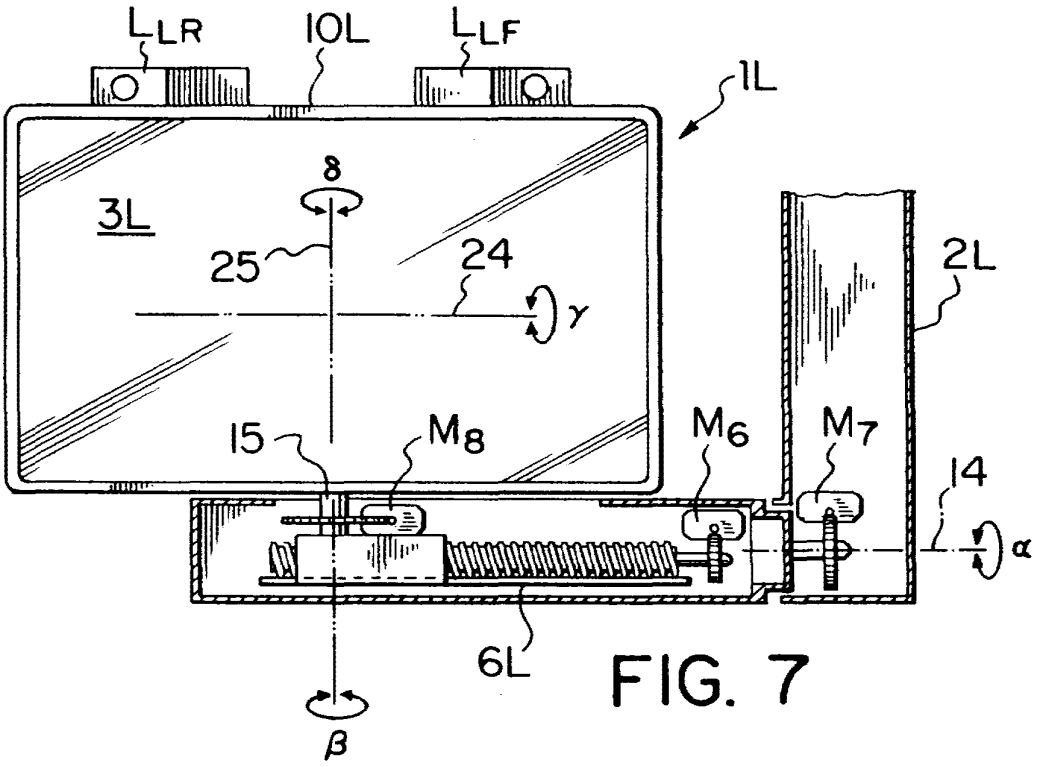


FIG. 7

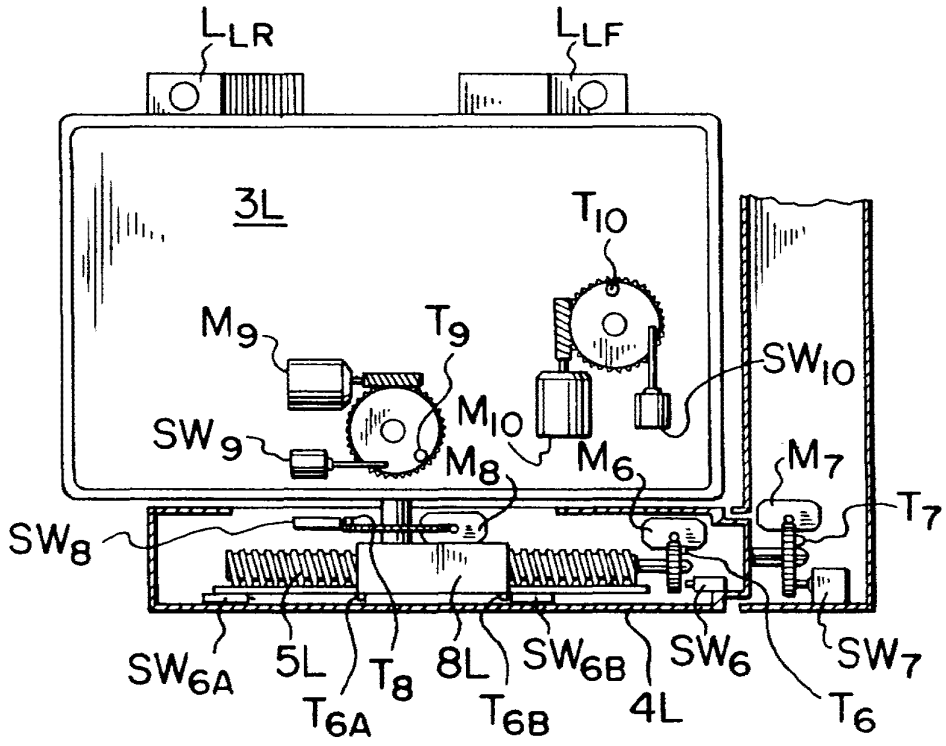


FIG. 8

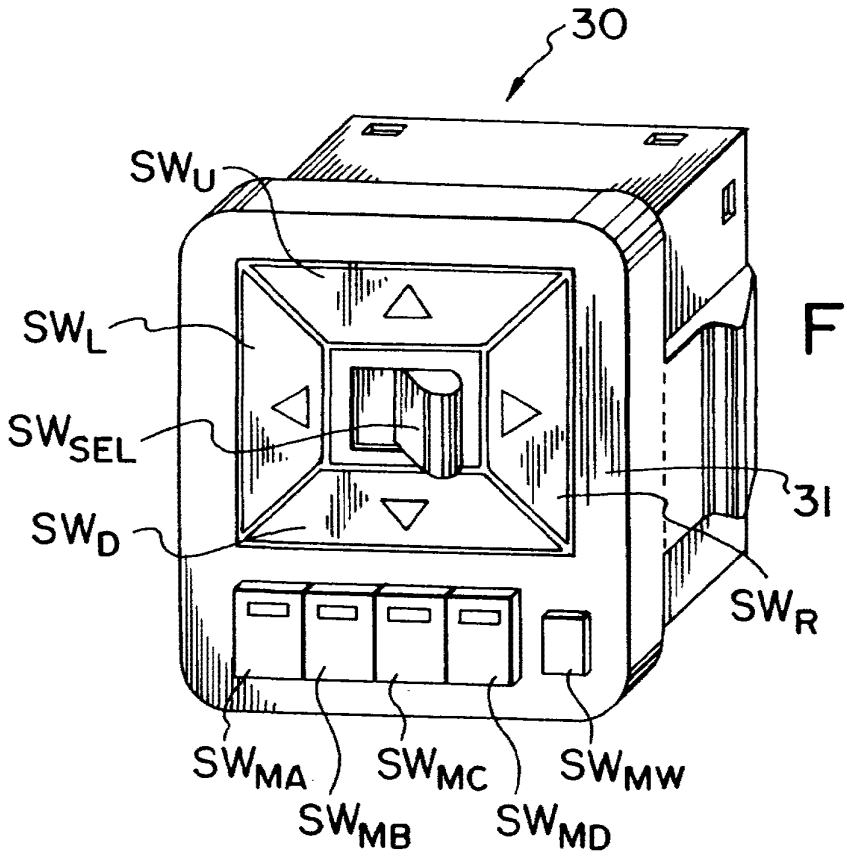


FIG. 9

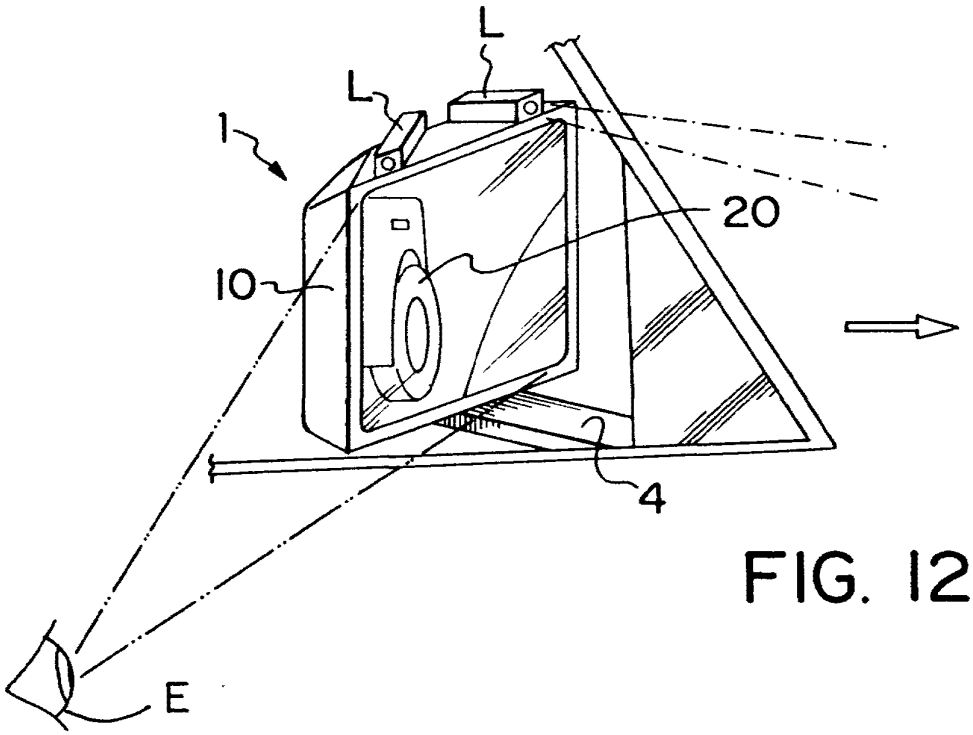
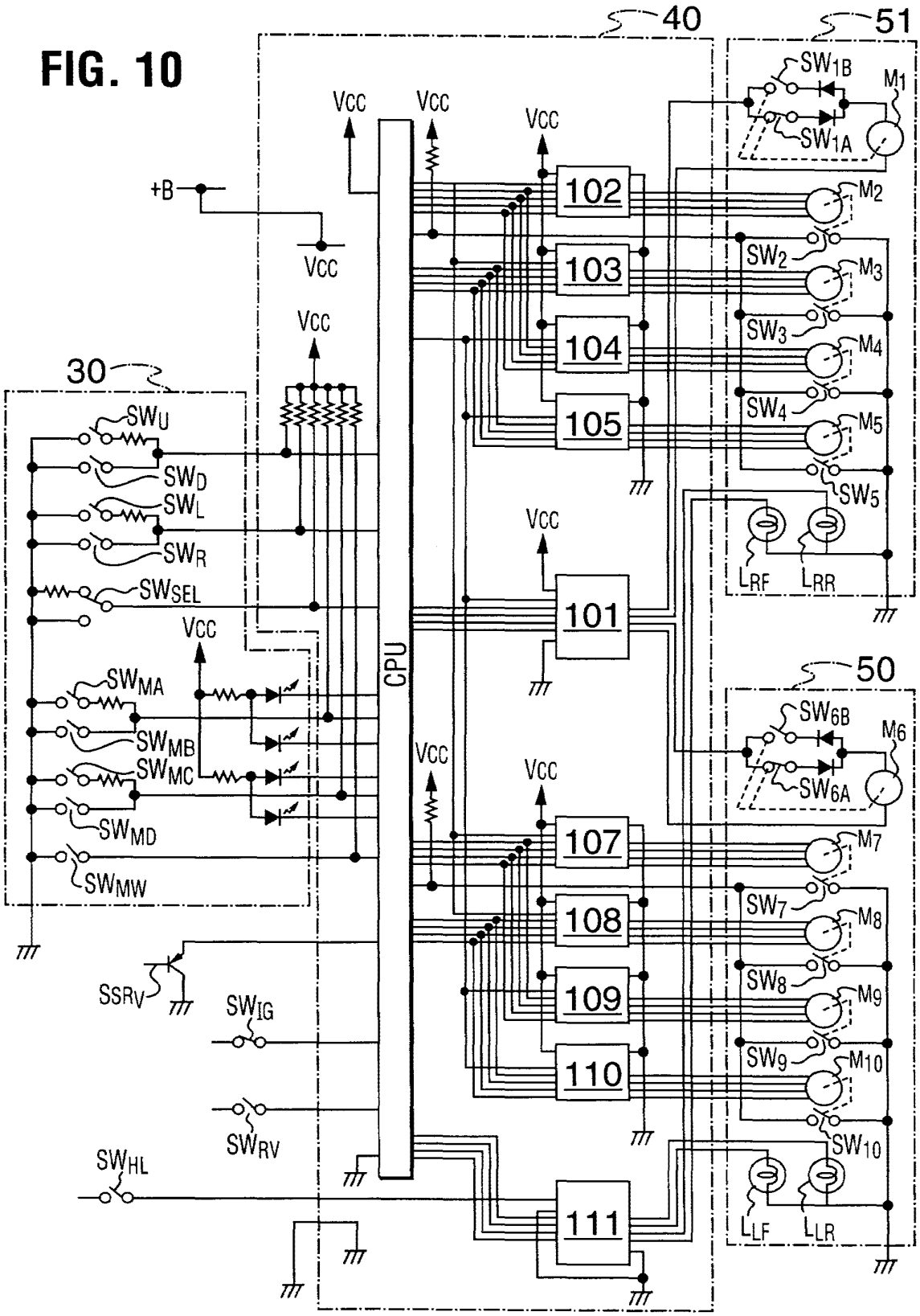


FIG. 12

FIG. 10



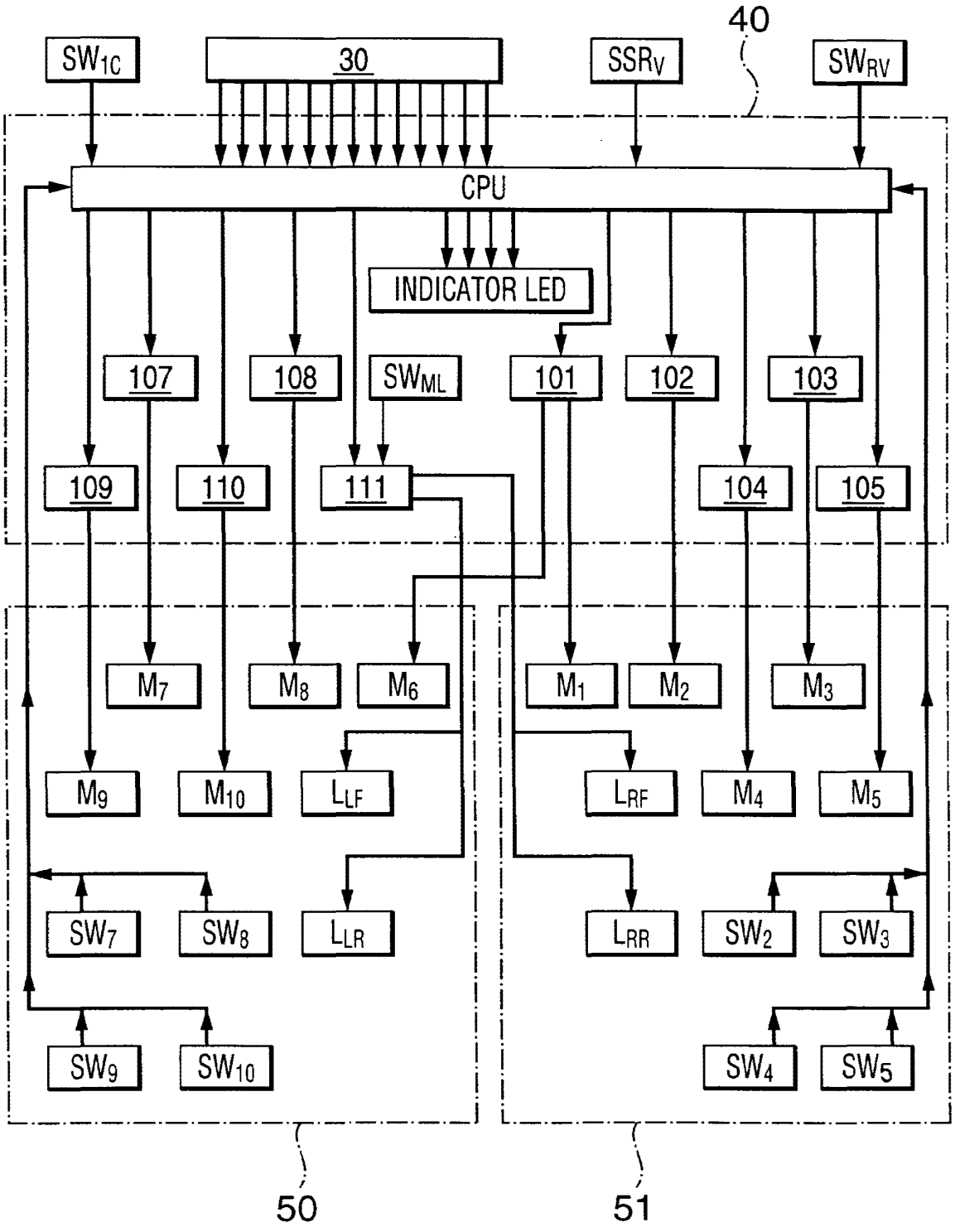


FIG. 11

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Remarks:
Amended claims in accordance with Rule 137(2) EPC.

(54) Plastic glass mirror for vehicles

(57) The invention related to a rear view mirror (1) using a plastic glass material to combine several functions as fixing and heating.

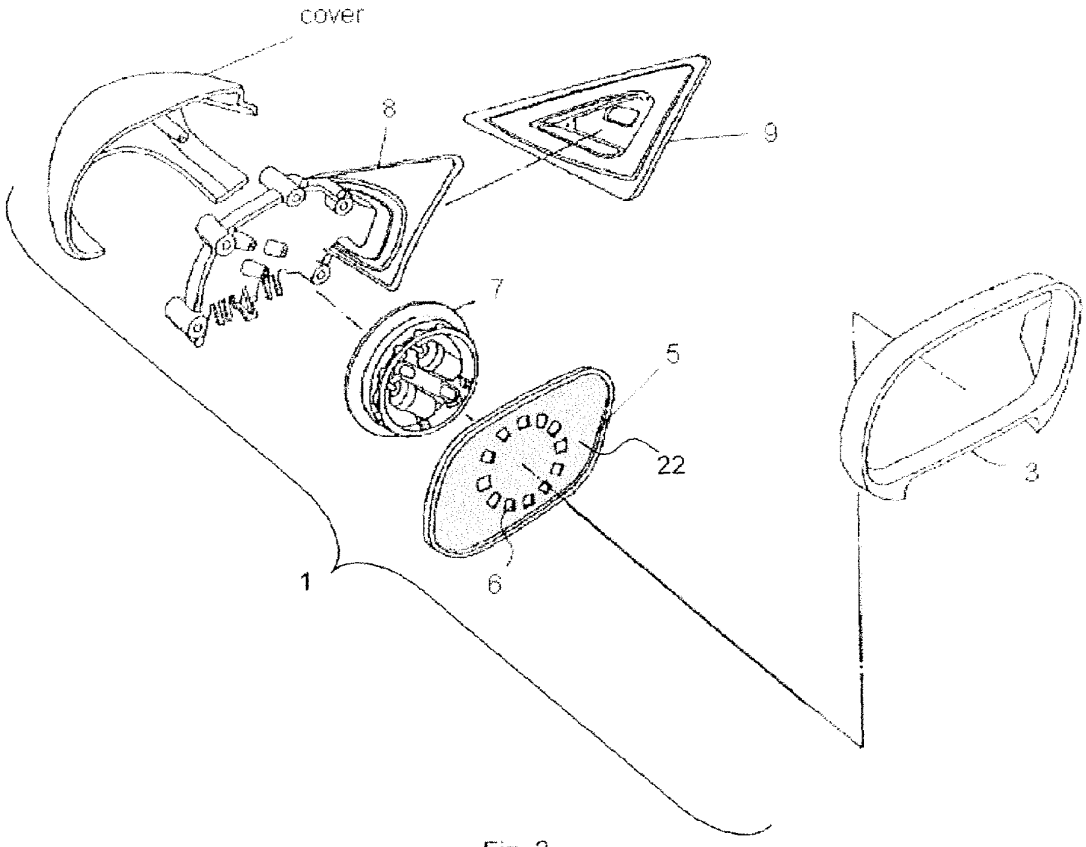


Fig. 2

EP 2 112 022 A1

Description

[0001] The present invention relates to a mirror device, in particular for automotive vehicle outer rearview mirror formed by a plastic material.

State of the Art

[0002] Plastic glass is known in prior art to replace normal silica glasses. For example in EP1412158 a method is disclosed that allows producing plastic glass in a high quality. Typical plastics include optical grade injection mouldable material, optical grade polycarbonates, methacrylates or methacrylate modified polycarbonates. Suitable materials are obtainable from General Electric, for instance, plastics sold under the trade designations MAKROLON 2207 and LEXAN LSI are particularly suitable in processes. Also, it is necessary to provide optical quality polished mould surfaces to maintain the optical properties of the finished part.

[0003] A conventional rear view mirror for a vehicle comprises as schematically shown in Fig.1 separate parts for heating of the mirror glass and for fixing the mirror glass on a backing plate. It is also known in prior art that the heating device is not a separate part as a heating foil but directly layered on the mirror glass. For example the heating circuits of conventional mirror bodies of outer rearview mirrors for automotive vehicles are achieved by depositing resistive ink on a Mylar layer. Said deposition is generally obtained by screen printing. Specifically, the heating circuit is typically obtained by depositing a metal alloy on the back face of the mirror.
In the EP 0677434 a solution is proposed that heats the mirror with a resistive metal layer. This layer is sputtered on the mirror glass and contacted by electrodes separated by isolating layer in between. The electrodes are connected at one side of the mirror, a solution that uses a two-way connector for the power supply of the circuit and thus eases the associated electric bundle.

[0004] It is the objective of the invention to ease a rear view mirror for a vehicle by combining parts and to optimize the use of a plastic glass replacing a silica glass.
In automotive use plastic glass is advantageous for the weight of the glass is much lower than the weight of silica glass.
Especially the fact that plastic glass does not split reduce injury risk of passengers and pedestrians. Another advantage of the plastic glass is that all fixation means are produced in one moulding step and the use of a conventional backing plate is avoided.

[0005] Another advantage is that the light weighting material of plastic glass allows the use of heating means with an additional thin metal layer.
The very good accuracy of the radius different to mineral mirrors allows to reduce the volume of the mirror and the needed material.
It is an object of the present invention to provide a mirror for automotive vehicle rearview mirror having an electric circuit capable of permitting to maintain an acceptable and better distributed current density, while optimizing and simplifying the construction of said circuit.

Short description of the drawings

[0006]

Fig. 1 is a schema of a mirror construction in prior art
Fig. 2 is a solution according the invention
Fig. 3 is a schema for the process to produce a plastic glass for the invention
Fig. 4 is part of the process in fig. 3
Fig. show the schematic plastic glass structure
Fig. 6 shows a part of the process of Fig. 3
Fig. 7 shows a device for the process
Fig. 8 shows the device of Fig. 7 with a mask
Fig. 9-10 shows examples of the heater solution

Description of the invention

[0007] Fig. 1 shows a typical design of a rear view mirror.1. The mirror housing is built by a cover member 10, an internal housing part 8 and a bezel member 3. The housing is connected to a bracket part 9 and fixed at the vehicles contour. The reflective element is installed in the housing. A mirror glass 2 is attached to a heating device 4. This heating device is normally a foil comprising heating wires and prepared to be glued either on the mirror glass 2 and on the backing plate 5. The heating element foil has normally a second objective to protect the mirror to split. The backing plate 5 is a moulded plastic element that is prepared to support the mirror 2 and to fix the glass and the heater on top of a motor actuator 7. The motor actuator for the adaptation of mirror view is fixed by clips.6 on the backing plate 5.

[0008] Fig. 2 shows a schematic view of a rear view mirror 1 with a housing 10 and 8 and 3. In the housing a plastic mirror 22 is installed. The plastic mirror 22 is produced with the clips 6 used to connect the mirror to the actuator 7. The heating layer is directly deposited to the plastic material.

[0009] A rear view mirror according this inventional structure does replace backing plate, heating foil and glass mirror by a single coated plastic glass mirror.

[0010] Fig. 3 describes the schematic process to produce a plastic glass mirror. The fist step 31 of moulding the plastic glass is described on prior art EP1412158. The plastic glass is moulded with a first surface with optical quality and a second surface that comprises the clips for the actuator and the ribs and taps for contacting the heater.
Plastic mirror fixing clips are optimised for several glass drive actuators 7. For some designs additional springs are used. This means that the fixing clips and spring positions must be optimized for each type of glass actuator. If the pressure onto the fixing clips is too high, it is possible, that visible distortion occurs onto the mirror surface.

If the pressure is too low or if slackness of the glass drive rim exists between the spring and the clip, the plastic glass mirror and the resulting image will vibrate.

[0011] In the rim area of the moulded plastic mirror a distortion occurred due to cooling effects caused by the temperature difference between the mould (110 C°) and the injected plastic material (280 C°).

This difference lead to a rapid cooling of the thin (2mm - 3 mm) plastic mirror and thus to an area with decreasing thickness within 3 to 4 mm from the rim around the plastic mirror shape.

To solve the problem, a frame structure in the moulding tool is added to the rear rim surface. This resulted into a higher volume of hot plastic material in this area during injection, which cools down more slowly.

With a 1.5 mm frame the distortion can be eliminated. One preferred embodiment uses a .frame structure thickness has been extended from 1.5 mm to a width of 2.2 mm.

[0012] An additional technical challenge is to avoid distortion on the plastic glass surfaces originated by ejection pins. A distortion occurred in the mirror image at areas, where the ejection pins are located to eject the part out of the mould. To overcome these problems the diameter of the ejection pins must have a minimum diameter size of around 12 mm.

[0013] In the moulding step 31 also the contact noses for the heater contacts are moulded. The noses or ribs are designed in a way they can be easily contacted with a plug and do not break during the process. The design of the contact can be done in any way a person skilled in the art would do.

The plastic glass substrates are cleaned and controlled after the moulding step 31. Additional ultra sonic activation step, an IR heating step and a final drying step can be done if necessary.

[0014] After the step 31 of moulding the plastic glass substrate undergoes the metallization steps to apply the reflective layer and for the heated mirror the electrical resistive layer.

[0015] Fig. 4 shows schematically a metallization process line 41. The plastic glass substrates are fixed in a support drum with the first optical "flat" surface without any rib, clip, etc at the inside diameter of the drum. The whole line works in a batch mode. In the first process station 43 the support drum with the mirror substrates is loaded. In the following stations plasma for a plasma vapour deposition process 44 is activated and the layers are applied. The metallization of the reflective layer is an AL Ti layer with a reflectivity of around 60%.

[0016] The next metallization steps are described later on for they are only necessary if a heater is required. The mirrors are unloaded in station 45. After the metallization line the next steps 33 and 34 are the hard coating of the mirror.

The hard coating process is first a flow coating process and than a spray coating process. The plastic glass is ready after the last step 35 which is a healing process.

[0017] Fig 6 shows a schematic class 100 clean room with the steps to apply hard coating on the surfaces of the metallised mirror.

The mirrors are supplied to the automatic line. After an ultrasonic cleaning 61, the mirrors are rinsed in water also under ultrasonic waves 62. In the next step 63 demineralised water and ultrasonic waves are used to finalize the cleaning steps. In Step 64 the mirrors are dried in infrared drying step and cooled down in step 65. Step 66 comprises a dipping in a bath of hard coating material. The material is in a preferred embodiment Silicone Hard Coat SHC 5020 GE Bayer. The material is solved in Isobutanol. The material is specified to by used on cast or moulded plastic articles. The silicon hard coating does not need a primer and has a good clarity.

Another material for the hard coating is GE587B with a good adhesion on the plastic material but also on the alloy. The material can be used in dip and spray coating processes.

The 1st layer of hard coat has a thickness of ~ 4 μm to 5 μm. The surface of the first dipped hard coat layer is very smooth. The roughness is much smaller than wavelengths of visible light. Therefore a defined reflexion is possible. This would lead to interference colours, especially with monochromatic light.

[0018] The dip coating results in a homogenous film of 4-5 micrometer under the condition the mirrors are extracted by a constant extraction speed from 3 to 5 mm/s. To finalize the hard coating an additional spraying step 68 must be applied. This is necessary for the mirror would show effects by interfering rays and diffraction phenomenon. To eliminate interference, a second and a third hard coat application step could be required.

The flash off time before spaying is in area of 10 - 40 s. This second and third hard coat layer is sprayed by maintaining of temperature, drop size, viscosity and further parameters. As a result, the surface has a defined roughness that reduces interference by reflecting the light to different directions.This second layer has a thickness of 2 μm to 3 μm..

To avoid all negative effects a hard coat layer thickness of 6 - 10 μm is required The resulting surface resolves the interference problem.

The spray out speed is in area 100 - 200 mm/s

The plastic mirror is cured in a oven at around 130 degree Celsius for 30 to 45 minutes.

The mirrors are than exported from clean room for further use.

[0019] Using the hard coat results in that the image on the mirror shows distortion in the rim area. The width of the distortion is up to 5 mm. The reason is the surface tension of the liquid hard coat material, which leads to an increase of thickness at the end / rim of the surface (edge effect).

To eliminate the problem adaptation of the hard coat's surface energy to that of the mirror's surface could be done. One way to overcome the problem is to increase the edge radius along the rim of the mirror shape to an

value of the edge radius of more than 0.6 mm
One of these layers could be used a coloured hard coat in order to simulate interferential mineral mirror.

[0020] Fig. 5 shows a schematic plastic glass mirror with all layers. The plastic glass material 50 is coated at the first surface by metal layer TiAl as reflective layer. On the second surface the heating metallization 52 is coated. The heating layer 52 is contacted by electrodes 53 via pins 54. The whole structure is overlaid by a hard coating layer 55.

[0021] For plastic mirror that should be heated for deicing the metallization process is amended by several steps. In Fig. 7 a sketched example of a transport support is described. A support drum 71 includes bars 72 as support to fix mirror substrate and mirror PVD templates 73The mirrors are installed and fixed in the template 73 in a way that the reflective mirror layer is facing inwards and the surface of the substrate including the clips and contact structures are facing outwardly of the drum. The template or holder 73 has a structure so that the metal layers of the reflecting surface and the metal layer of the heating surface are separated by a defined leak. After the metallization of the reflecting layer with Al Ti, another target is used outside the drum to metallize the heating laying. The same alloy Al - Ti in percentage can be used for the both side. The resistance of the alloy is with less than 100 micro Ohm cm very low. The thickness of an optimal heating alloy layer could support the heating so that enough current could flow. But the thickness is limited by the adhesion of the layer on the plastic material. In a preferred embodiment the thickness of the alloy layer is between 0,07 to 0,09 micrometer.

[0022] In a next process step a template as seen in Fig. 8 covers the surface of the coated surface. Only the spaces the electrodes and the contacts are free. The electrodes are deposited in a next PVD process step using Cu as conductive drain.
In order to get the best homogeneity of the current lines two separated copper bus bars are deposited in a structure as explained in the examples of figures 9 to 11.
For adaptation of contact positions to current series contact alignment, the design of the heating layer needs to be optimized.
The location of the contacts is targeted to be at the car's side of the mirror shape, both "+" and "-" on the same side. Tests showed, that heater design with the shape of an "U" will cause a high current at the turn area of the U. Since current density is oriented along the lowest resistance between the contacts / drains, the highest value occurs at the inner radius of the U-turn, where the shortest distance between the contact areas exists. Therefore the risk of a burn through or a hot-spot preferably exists in that region. A bigger radius would solve the hot spot issue, but could cause a big non heated gap. Heater U-design requires a 4 x higher thickness of the layer, due to longer distance between "+" and "-". Increasing the thickness of the heater layer is not feasible because the deposition rate is too low and the batch time would increase by factor 4.The adhesion between the plastic substrate and the NiTi heater alloy and also between the copper drain bar and the NiTi heater alloy will decrease.

[0023] Figure 9 shows a mirror device 22 for an automotive vehicle outer rearview mirror (not shown) equipped with a defrosting function. Said device 22 comprises a substrate 110 of plastic material which is substantially plane or slightly curved for improved viewing angle. The external surface of substrate 110 is reflecting in a mirror-like manner and covers a thin heating resistive layer 111 of heat conducting alloy, for example nickel- and titanium-based. The resistive layer 111 is connected to a copper-made supply circuit comprising two electrodes 112 and 114 forming "+" and "-" connection points, respectively. Said electrodes 112 and 114 are connected through a two-way connector 115 to an external power supply (not shown), the current of which comes for example from the battery of the vehicle. The electrodes are locally insulated from the heating resistive layer 111 through an insulating material 120.

[0024] According to this embodiment, the heating resistive layer 111 is in the form of an elongated C with flattened legs, the ends 116 and 117 of said legs being in the immediate vicinity of each other and carrying electrodes 112 and 114, respectively. Thus, it is possible to connect the electrodes to a two-way electric bundle 115, which is much simpler to install than the prior art bundles. Moreover, the current intensity is well distributed to preserve the circuit reliability. Specifically, this allows maintaining a current density in the curved portion which is higher than that of the straight portion but lower than that of the connection electrodes.

[0025] Figure 10 shows an alternative embodiment, wherein the heating resistive layer 110 occupies substantially the entire surface of the substrate 110, except for two thin peripheral strips defining the two electrodes 112 and 114. Specifically, a first strip 112 extends along one lateral edge 111 a of the heating resistive layer 111 so as to form the first I-shaped electrode 112, and a second strip extends along a longitudinal edge 111b and the other lateral edge 11 c so as to form the second L-shaped electrode 114. An insulating material 120 is also provided between the electrodes and the heating resistive layer 111. Alternatively to the method to apply isolating material the heating alloy can be vaporized with a laser beam. The resulting gap shows the surface of the plastic substrate and is isolating electrodes and heating alloy.

[0026] Figure 11 shows another alternative embodiment, wherein the heating resistive layer 111 is in the form of a U with legs close to one another, the ends 118 and 119 of said legs being located in the immediate vicinity of each other and carrying electrodes 112 and 114, respectively.

[0027] Advantageously, the reflective layer is disposed above the heating resistive layer or is formed by the latter.

[0028] It goes without saying that the detailed description of the subject matter of the invention, as given by way of illustrations only, is in no way limiting, technical

equivalents falling within the scope of the present invention, as well.

Claims

1. A rear view mirror (1), comprising a housing (10, 8,3) an motor actuator (7) and a reflective element (5), wherein the reflective element (5) is a plastic material substrate (50) with a first surface coated with at least a reflective layer (51) and a second surface with at least a set of molded fixing elements (6) to be fixed at the motor actuator.

2. A rear view mirror (1) according claim 1 wherein the edge radius along the rim of the mirror shape has an value of more than 0.6 mm.

3. A rear view mirror (1) according claim 1 wherein the plastic material substrate (50) is molded in tool which has a deepened frame along the rim of the mirror substrate shape.

4. A rear view mirror (1), according claim 1 wherein the reflective layer is a Al Ti layer.

5. A rear view mirror (1), according claim 1 wherein the reflective element (50) is protected by a hard coat applying in first and a second layer of the same hard coat material avoiding light wave interference effects.

6. A rear view mirror (1), according claim 1 wherein the hard coat process includes a slow extraction of the hard coat dip bath following a specific speed adapted to each shape of mirror.

7. A rear view mirror (1), according claim 1 wherein the second surface is coated with a heating resistive alloy of Ti - Al or Ni - Ti.

8. A rear view mirror according claim 7 with a plurality of spaced apart electrodes (112, 114) attached to the heating resistive layer, said electrodes (112, 114) being adapted to induce a current through the heating resistive layer between, wherein the electrodes (112, 114) are located on a same side of the substrate (110) and are disposed in the immediate vicinity of each other.

9. A rear view mirror according claim 7 **characterized in that** it comprises two electrodes (112, 114) provided in the form of strips of electrically conducting material, for example copper-based, and the heating resistive layer (111) is formed of a metal alloy, the electrodes being electrically insulated from the heating resistive layer by an insulating mean (120).

Amended claims in accordance with Rule 137(2) EPC.

1. A rear view mirror (1) comprising a housing (10, 8, 3) an motor actuator (7) and a reflective element (5), **characterized in that** the reflective element (5) is a plastic material substrate (50) with a first surface coated with at least a reflective layer (51) and a second surface with at least a set of molded fixing elements (6) to be fixed at the motor actuator and molded contact noses for heater contacts.

2. A rear view mirror (1) according claim 1 wherein the edge radius along the rim of the mirror shape has an value of more than 0.6 mm.

3. A rear view mirror (1) according claim 1 wherein the plastic material substrate (50) has a frame area along the rim of the mirror substrate shape with increase thickness..

4. A rear view mirror (1), according claim 1 wherein the reflective layer is a Al Ti layer.

5. A rear view mirror (1), according claim 1 wherein the reflective element (50) has a protection hard coat layer with a first and a second layer of the same hard coat material , the first layer deposited by a dipping process, the second layer applied by a spaying process..

6. A rear view mirror (1), according claim 5 wherein the first hard coat layer is smooth with a roughness smaller than wavelengths of visible light.

7. A rear view mirror (1), according claim 1 wherein the second surface is coated with a heating resistive alloy of Ti - m Al or No Ti.

8. A rear view mirror according claim 7 with a plurality of spaced apart electrodes (112, 114) attached to the heating resistive layer, said electrodes (112, 11A) being adapted to induce a current through the heating resistive layer between, wherein the electrodes (112, 114) are located on a same side of the substrate (110) and are disposed on one side of the mirror substrate.

9. A rear view mirror according claim 7 **characterized in that** it comprises two electrodes (112, 114) provided in the form of strips of electrically conducting material, for example copper-based, and the heating resistive layer (111) is formed of a metal alloy, the electrodes being locally electrically insulated from the heating resistive layer by an insulating mean (120).

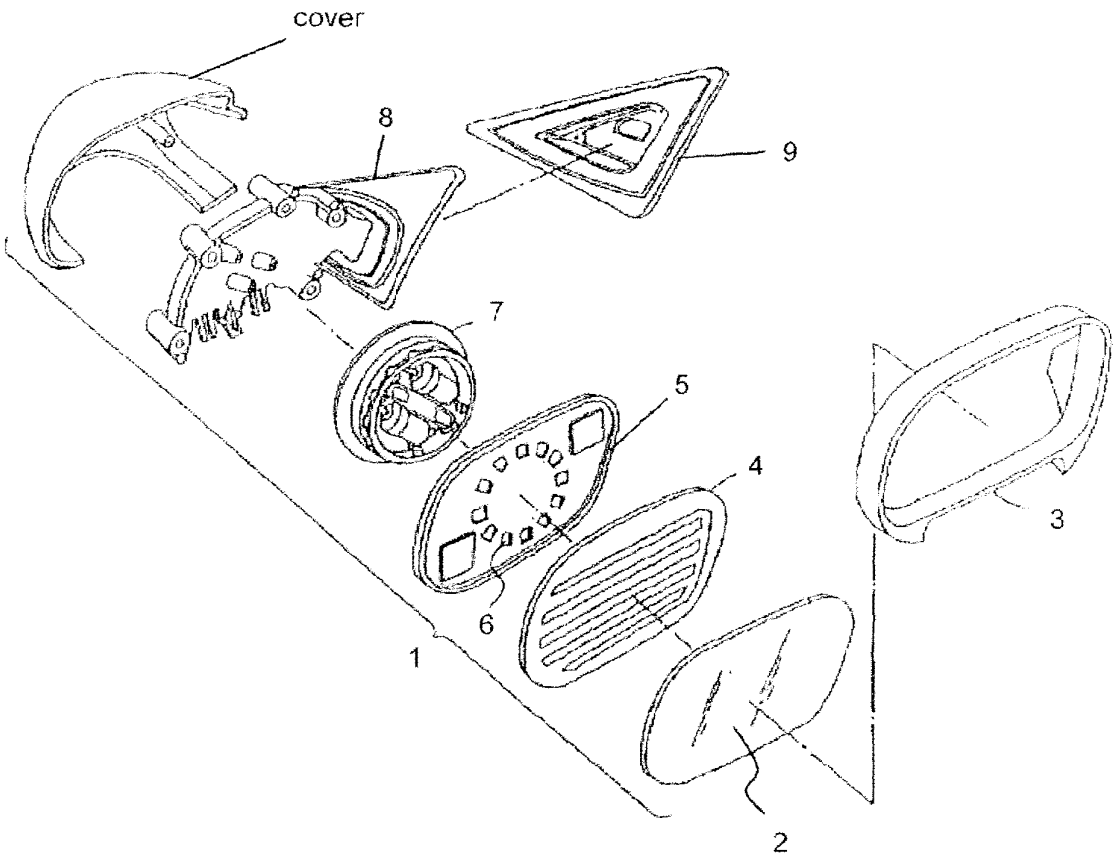


Fig. 1

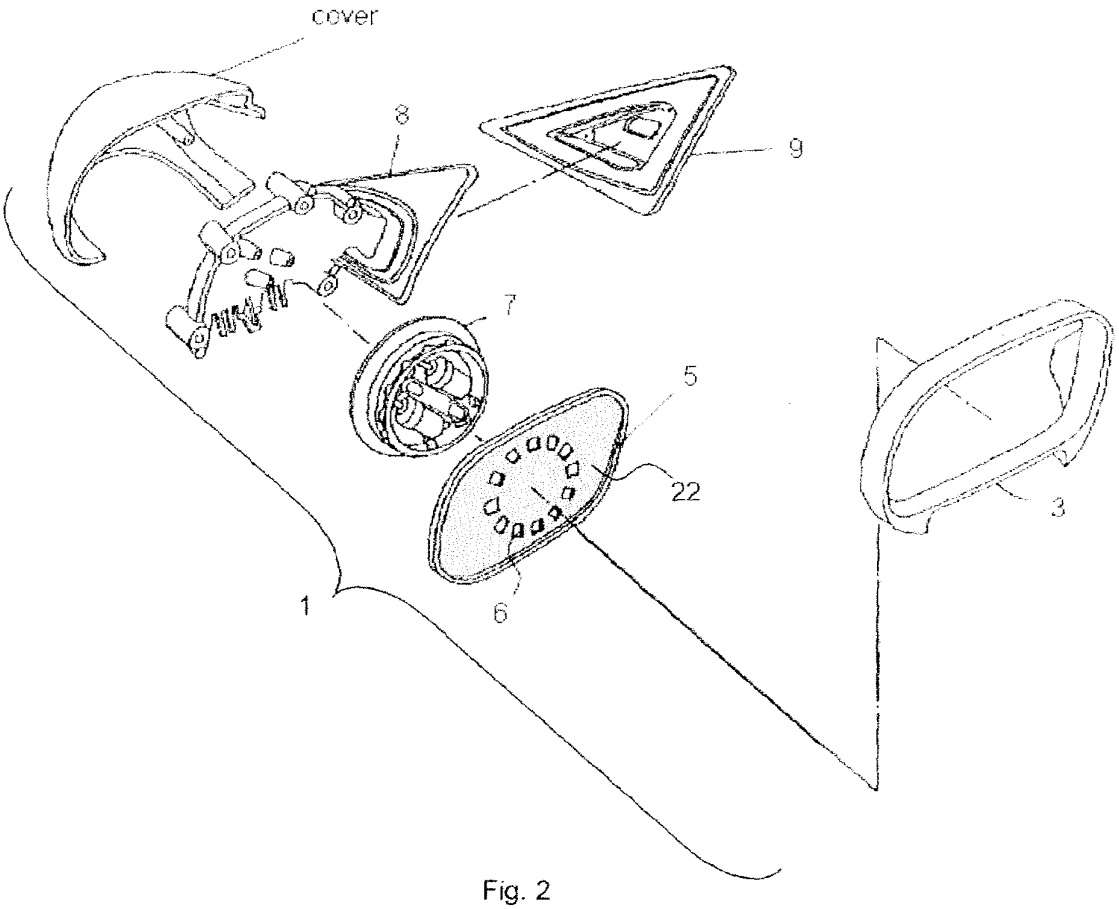


Fig. 2

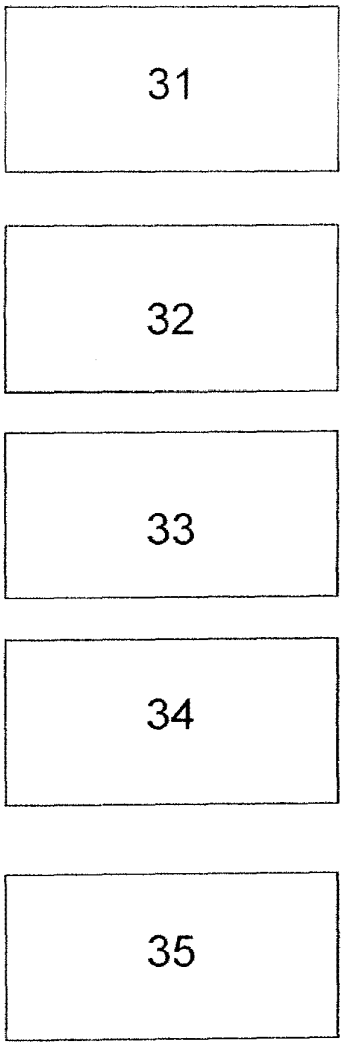


Fig. 3

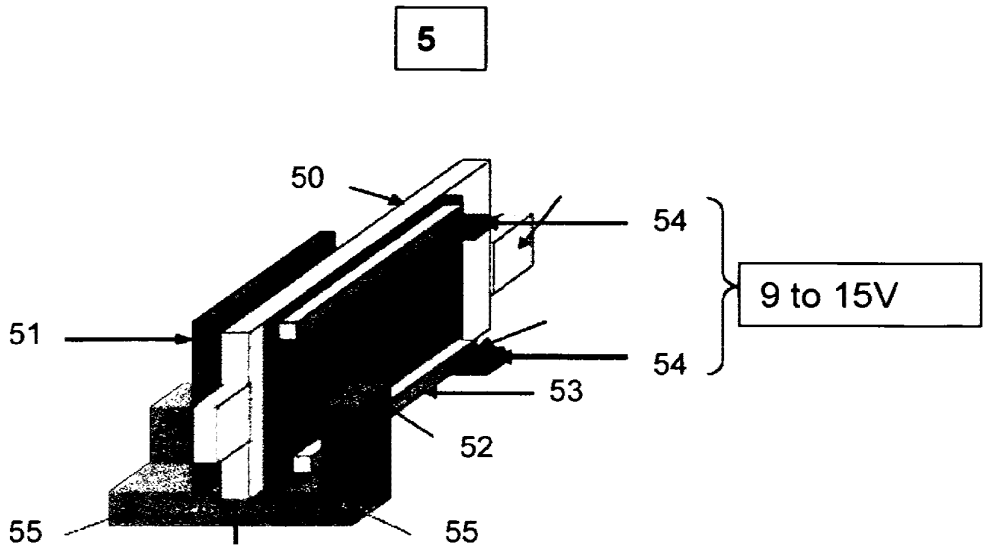


Fig. 5

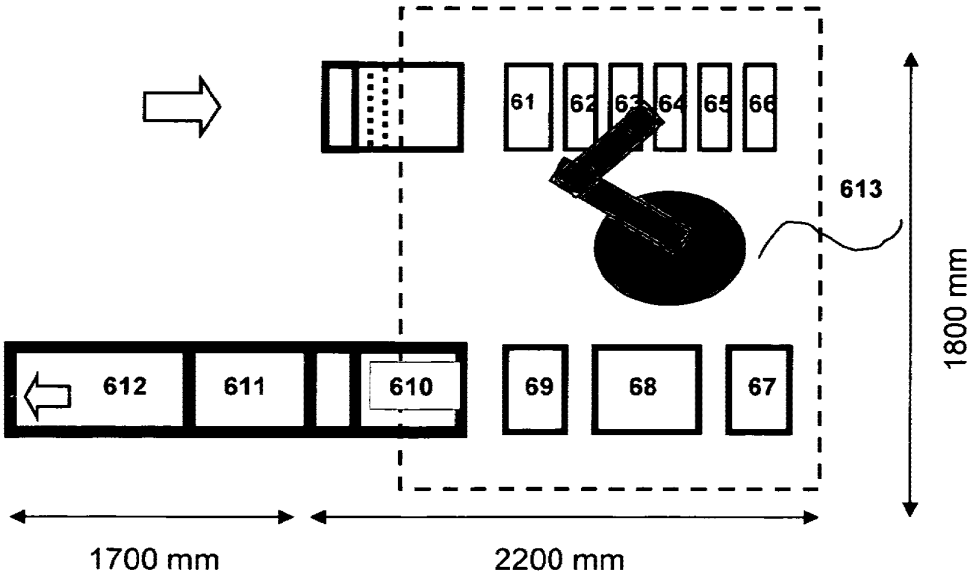


Fig. 6

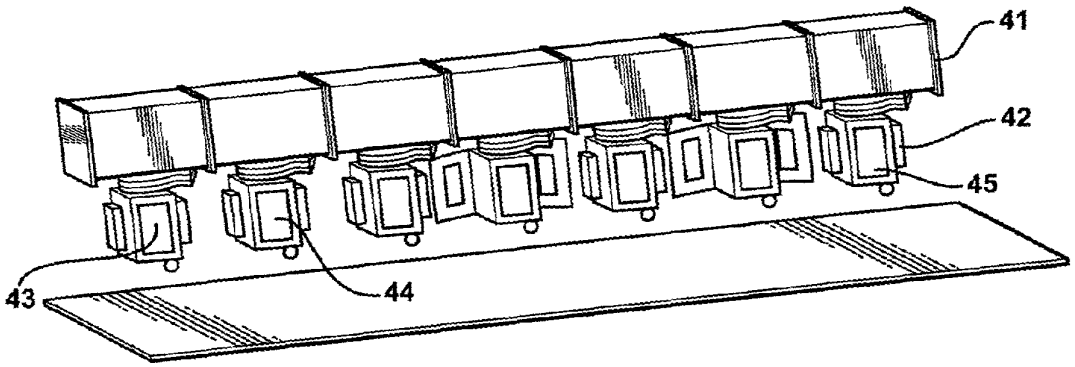


FIG. 4

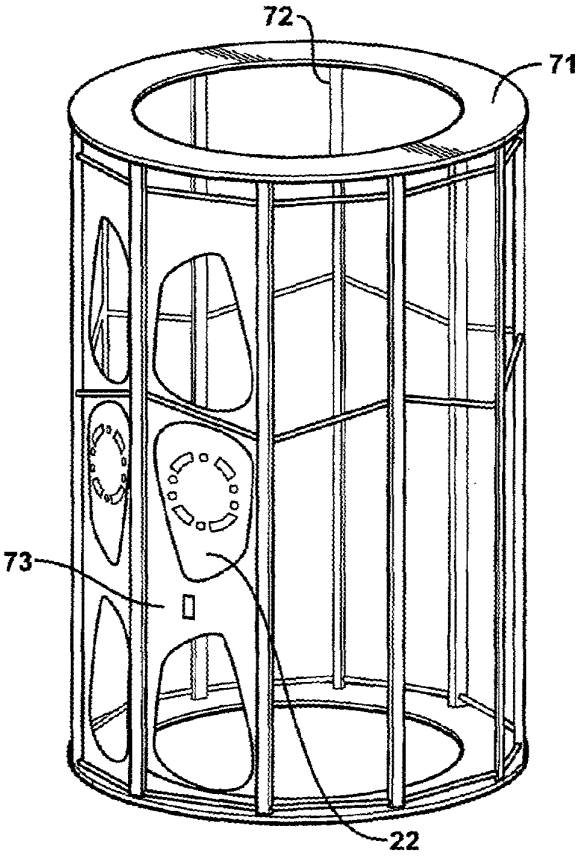
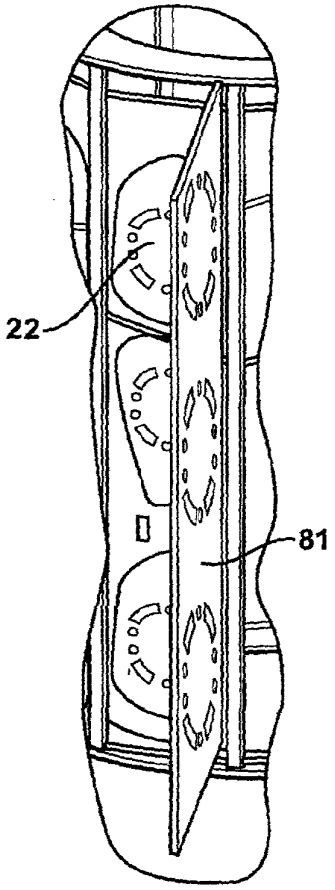


FIG. 7

FIG. 8



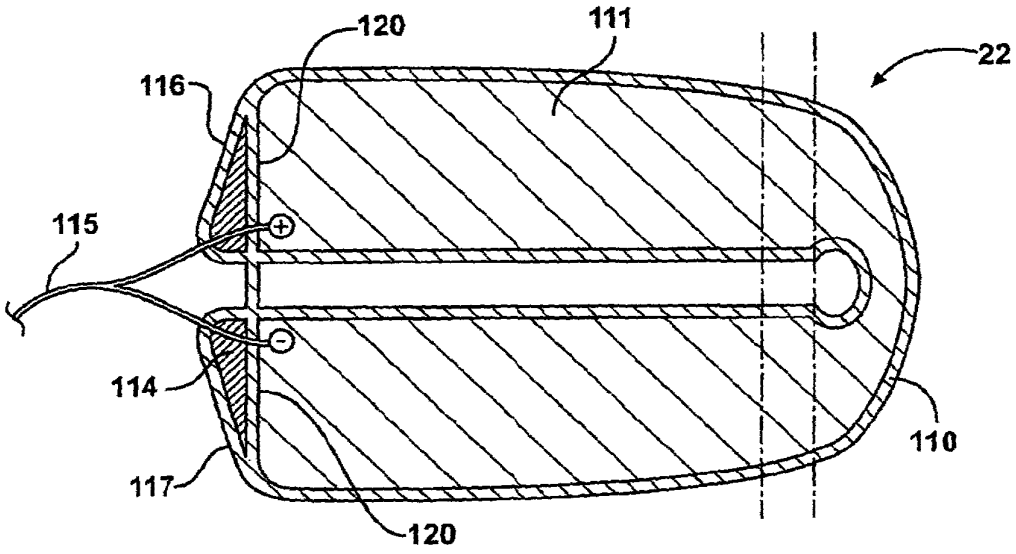


FIG. 9

FIG. 10

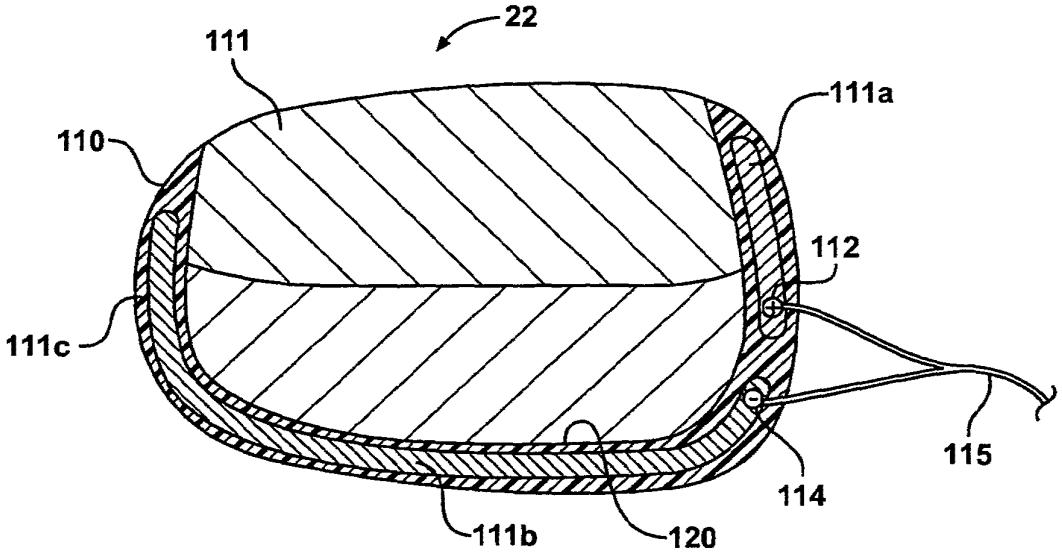
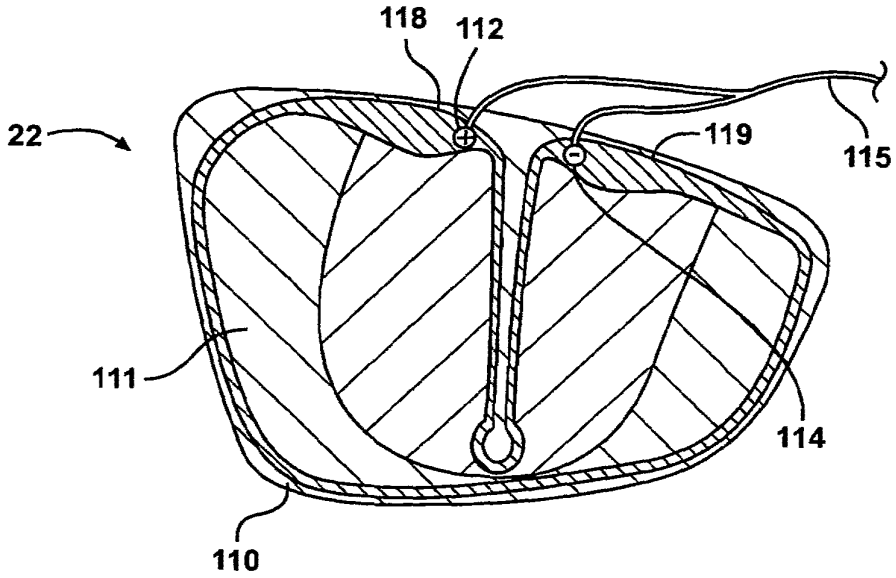


FIG. 11



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EUROPEAN SEARCH REPORT

Application Number
EP 08 15 5042

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Y	EP 1 186 473 A (MEKRA LANG GMBH & CO KG [DE]) 13 March 2002 (2002-03-13) * paragraphs [0018] - [0022]; figure 1 *	1,2,4-9	H05B3/84
A	US 2004/264011 A1 (LYNAM NIALL R [US]) 30 December 2004 (2004-12-30)	1	
Y	* paragraphs [0033], [0042], [0043] *	5,6	
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Y	* paragraphs [0008], [0020] - [0024], [0026] - [0028], [0031]; figures 1,2 *	7-9	

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B60R
H05B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	17 November 2008	Schombacher, Hanno

CATEGORY OF CITED DOCUMENTS

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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European Patent Office
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(11) EP 2 492 144 A1

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(54) Aussenrückblickspiegelanordnung für ein Kraftfahrzeug

(57) Es wird eine Außenrückblickspiegelanordnung (01) für ein Kraftfahrzeug mit einem zur kraftfahrzeugseitigen Anordnung vorgesehenen Spiegelfuß (02) und einem an diesem angeordneten Spiegelkopf (03) sowie einem im Spiegelkopf (03) untergebrachten, gegenüber diesem starr und unverstellbar fest angeordneten Spiegelglas (04) beschrieben zwischen Spiegelkopf (03) und kraftfahrzeugseitiger Anordnung des Spiegelfußes (02) ist mindestens eine gelenkige Verbindung (05, 06, 07) vorgesehen, welche insgesamt zwei Gelenkachsen (08, 09) umfasst, deren Richtungsvektoren voneinander unabhängig sind. Die beiden Gelenkachsen (08, 09) sind gemeinsam und/oder unabhängig voneinander:
- einer Vornahme eines Verschwenkens zumindest des Spiegelkopfs (03) aus einer Betriebsstellung in eine Anklappstellung und umgekehrt,
- einem Beiklappen zumindest des Spiegelkopfs (03) in und entgegen der Fahrtrichtung (F), sowie
- einer Einstellung einer individuellen Verstelllage zumindest des Spiegelglases (04) abhängig beispielsweise von Sitzposition und Körpergröße eines Fahrers des Kraftfahrzeugs
zugeordnet. Die Außenrückblickspiegelanordnung umfasst einen einer ersten Gelenkachse (08) der beiden Gelenkachsen (08, 09) zugeordneten ersten elektromotorischen Verstellantrieb (10) und einen einer zweiten Gelenkachse (09) der beiden Gelenkachsen (08, 09) zugeordneten zweiten elektromotorischen Verstellantrieb (11).

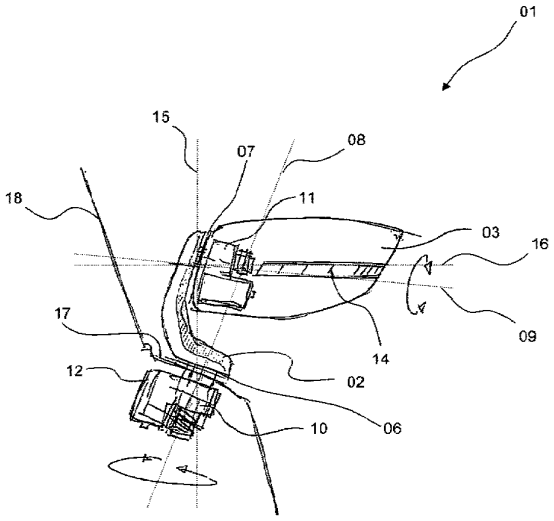

Fig. 1

EP 2 492 144 A1

Beschreibung

[0001] Die Erfindung betrifft eine Außenrückblickspiegelanordnung für ein Kraftfahrzeug gemäß dem Oberbegriff des Anspruchs 1.

[0002] Eine Außenrückblickspiegelanordnung für ein Kraftfahrzeug besteht im Wesentlichen aus einem zur kraftfahrzeugseitigen Anordnung vorgesehenen Spiegelfuß und einem an dem Spiegelfuß angeordneten, ein Spiegelglas beherbergenden Spiegelkopf.

[0003] Durch DE 1 755 577 B ist eine Außenrückblickspiegelanordnung für ein Kraftfahrzeug mit einem durch Befestigung an der Karosserie eines Kraftfahrzeugs zur kraftfahrzeugseitigen Anordnung vorgesehenen Spiegelfuß und einem daran angeordneten, das Spiegelglas tragenden Spiegelkopf bekannt. Das Spiegelglas ist unverstellbar fest vom Spiegelkopf beherbergt. Spiegelfuß und Spiegelkopf sind vermittels eines Kugelgelenks gelenkig miteinander verbunden, so dass der Spiegelkopf mit dem von und gegenüber diesem unbeweglich beherbergten Spiegelglas in einer gewünschten, vom Fahrer des Kraftfahrzeugs individuell einstellbaren, beispielsweise von Körpergröße und Sitzposition des Fahrers abhängigen Verstelllage gegenüber dem Spiegelfuß einstellbar ist. Darüber hinaus ist der vermittels des Kugelgelenks am Spiegelfuß gelenkig angeordnete Spiegelkopf gegenüber dem Spiegelfuß aus einer Betriebsstellung in eine Abklappstellung und umgekehrt verschwenkbar. Die Vornahme der Einstellung der individuellen Verstelllage ebenso wie die Vornahme des Verschwenkens des Spiegelkopfs aus der Betriebs- in die Anklappstellung und umgekehrt ist dabei von Hand vorgesehen, indem der Spiegelkopf von außerhalb des Kraftfahrzeugs oder vom Kraftfahrzeuginnenraum durch ein geöffnetes Seitenfenster hindurch gegriffen und in die gewünschte Position verbracht wird.

[0004] Durch DE 1 815 368 B ist eine Außenrückblickspiegelanordnung für ein Kraftfahrzeug mit einem Spiegelfuß und einem ein Spiegelglas tragenden Spiegelkopf bekannt. Bei diesem sind der Spiegelkopf und der Spiegelfuß starr und ungelenkig fest miteinander verbunden. Ebenso ist das Spiegelglas unverstellbar fest vom Spiegelkopf beherbergt. Um eine Einstellung einer individuellen Verstelllage vornehmen zu können, ist ein Kugelgelenk zur gelenkigen karosserieseitigen Anordnung des Spiegelfußes vorgesehen. Zur Vornahme einer Einstellung einer individuellen Verstelllage des Spiegelfußes mit dem an diesem starr angeordneten Spiegelkopf und dem von und gegenüber diesem unbeweglich beherbergten Spiegelglas ist ein vom Kraftfahrzeuginnenraum aus betätigbarer Verstellhebel vorgesehen, der vermittels eines Gestänges zur Übertragung der Bewegung des Verstellhebels auf den Spiegelfuß mit diesem verbunden ist.

[0005] Durch DE 41 41 657 A1 ist darüber hinaus eine Außenrückblickspiegelanordnung für ein Kraftfahrzeug bekannt, bei der ein das Spiegelglas fest und unverstellbar gegenüber diesem tragender Spiegelkopf vermittels eines Kugelgelenks gelenkig an einem Spiegelfuß befestigt ist. Eine spiegelkopfseitige Partie des Kugelgelenks wird von dem Spiegelkopf umfasst. Bei dieser Außenrückblickspiegelanordnung ist die Vornahme der Einstellung der individuellen Verstelllage ebenso wie die Vornahme des Verschwenkens des Spiegelkopfs aus der Betriebs- in die Anklappstellung und umgekehrt von Hand vorgesehen, indem der Spiegelkopf von außerhalb des Kraftfahrzeugs oder vom Kraftfahrzeuginnenraum durch ein geöffnetes Seitenfenster hindurch gegriffen und in die gewünschte Position verbracht wird.

[0006] Durch DE 196 01 429 C2 ist eine Außenrückblickspiegelanordnung für ein Kraftfahrzeug bekannt, bei der ein das Spiegelglas fest und unverstellbar gegenüber diesem tragender Spiegelkopf gelenkig an einem Spiegelfuß befestigt ist. Der Spiegelfuß ist als ein zur gelenkigen karosserieseitigen Anordnung um eine erste Gelenkachse vorgesehener Bügel ausgeführt. Um diese erste Gelenkachse kann der Spiegelfuß aus einer Betriebs- in eine Anklappstellung und umgekehrt verschwenkt werden. Am freien Ende des Bügels ist der Spiegelkopf, der im Wesentlichen nur aus dem Spiegelglas und einem Verbindungsmittel zur gelenkigen Befestigung am freien Ende des Bügels besteht, um eine zweite Gelenkachse gelenkig angeordnet. Das Verbindungsmittel ist so ausgeführt, dass der Spiegelkopf gegenüber dem Bügel um die zweite Gelenkachse verschwenkbar ist. Die erste und zweite Gelenkachse sind dabei weder parallel, noch schneiden sie sich. Zur Vornahme einer Einstellung einer individuellen Verstelllage des Spiegelglases kann der Spiegelfuß um die erste Gelenkachse gegenüber der Karosserie des Kraftfahrzeugs und der Spiegelkopf um die zweite Gelenkachse gegenüber dem Spiegelfuß verschwenkt werden. Auch hier erfolgt die Vornahme der Einstellung der individuellen Verstelllage ebenso wie die Vornahme des Verschwenkens des Spiegelkopfs aus der Betriebs- in die Anklappstellung und umgekehrt von Hand, indem der Spiegelkopf von außerhalb des Kraftfahrzeugs oder vom Kraftfahrzeuginnenraum durch ein geöffnetes Seitenfenster hindurch gegriffen und in die gewünschte Position verbracht wird.

[0007] Nachteilig an diesen bekannten Außenrückblickspiegelanordnungen ist, dass sie weder den heutigen Ansprüchen an Komfort, noch den heutigen Sicherheitsanforderungen entsprechen. Bezüglich der heutigen Ansprüche an Komfort sei auf die Vornahme der Einstellung der individuellen Verstelllage sowie die Vornahme des Verschwenkens aus der Betriebs- in die Anklappstellung und umgekehrt verwiesen, die heutzutage nicht mehr von Hand akzeptabel ist. Im Hinblick auf Komfort sei darüber hinaus auf eine Umfeldbeleuchtung verwiesen, welche zumindest bei geöffneter Fahrzeugtür eine Beleuchtung des Bodens neben dem Kraftfahrzeug bei Dunkelheit vorsieht, die heutzutage gerne durch Unterbringung von Ausstiegsleuchten im Spiegelkopf verwirklicht wird. Die heutigen Sicherheitsanforderungen von Außenrückblickspiegelanordnungen sehen beispielsweise vor, dass ein vermittels einer Außenrück-

blickspiegelanordnung einsehbarer Bereichs der Fahrzeugumgebung frei von einer Beeinträchtigung durch Vibrationen des Spiegelglases sein muss, sei es hervorgerufen durch Fahrtwind, Fahrbahnunebenheiten oder Antriebsstrang, und dass ein ausreichender Schutz anderer Verkehrsteilnehmer gewährleistet sein muss, insbesondere durch ein zuverlässiges Beiklappen des Spiegelkopfs sowohl in als auch entgegen der Fahrtrichtung bei Einwirkung einer äußeren Kraft auf den Spiegelkopf. Dabei dürfen die starr am Kraftfahrzeug verbleibenden Teile durch gesetzliche Anforderungen vorgegebene zulässige Mindestkantenradien nicht unterschreiten. Die Weiterentwicklung der gesetzlichen Anforderungen betrifft außerdem auch Sichtbarkeitsanforderungen für Lichtfunktionen von Kraftfahrzeugen, beispielsweise einer Wiederholblinklichtfunktion, die zum Teil nur durch Unterbringung beispielsweise von Wiederholblinkleuchten im Außenrückblickspiegel erfüllt werden können. Um den heutigen Ansprüchen nachzukommen, sind moderne Außenrückblickspiegelanordnungen für Kraftfahrzeuge bekannt, die aus einem zur kraftfahrzeugseitigen Anordnung vorgesehenen Spiegelfuß und einem an diesem um eine Gelenkachse verschwenkbar angeordneten Spiegelkopf mit einem gegenüber dem Spiegelkopf um zwei Schwenkachsen verstellbar angeordneten Spiegelglas bestehen.

[0008] Der Spiegelfuß einer solchen Außenrückblickspiegelanordnung umfasst einen Ständer, der mit seinem ersten Ende zur kraftfahrzeugseitigen Befestigung und an seinem zweiten Ende zur gelenkigen Verbindung mit dem Spiegelkopf vorgesehen ist. Der Ständer kann mittels einer Spiegelfußabdeckung verkleidet sein.

[0009] Der Spiegelkopf umfasst ein Außenrückblickspiegelgehäuse, welches unter anderem einen dem Spiegelfuß zugeordneten und mit diesem gelenkig verbundenen Grundträger beherbergt, einen solchen umfasst, oder von einem solchen umfasst wird

Ständer und Grundträger bilden die tragenden Teile der

[0010] Außenrückblickspiegelanordnung. Sie können als Druckgussteile beispielsweise aus demselben Werkstoff hergestellt sein.

[0011] Der Spiegelkopf ist gegenüber dem Spiegelfuß um die Gelenkachse aus einer Betriebsstellung in eine Anklappstellung und umgekehrt verschwenkbar. Das Verschwenken des Spiegelkopfs gegenüber dem Spiegelfuß aus der Betriebsstellung in die Anklappstellung und umgekehrt um die Gelenkachse kann je nach Ausstattung eines Kraftfahrzeugs handbetrieben oder elektromotorisch betrieben erfolgen.

[0012] Unabhängig davon, ob ein handbetriebenes oder ein elektromotorisch betriebenes Verschwenken vorgesehen ist, muss ein Beiklappen des Spiegelkopfs bei äußerer Krafteinwirkung sichergestellt werden. Das Beiklappen muss hierbei sowohl in, als auch entgegen der Fahrtrichtung des Kraftfahrzeugs sichergestellt sein. Zu einer äußeren Krafteinwirkung kann es beispielsweise durch einen Kontakt mit einem anderen Verkehrsteilnehmer oder mit einem Objekt kommen.

[0013] Durch EP 1 755 923 B1 ist ein Verschwenkantrieb für eine Außenrückblickspiegelanordnung eines Kraftfahrzeugs bekannt. Der Verschwenkantrieb umfasst ein erstes Teil, der um eine Gelenkachse verschwenkbar mit einem zweiten Teil verbunden ist. Der Verschwenkantrieb umfasst darüber hinaus einen elektrischen Antrieb zum elektromotorisch betätigten Verschwenken der Teile relativ zueinander. Der Verschwenkantrieb umfasst außerdem eine Kupplung zwischen dem ersten und dem zweiten Teil. Bei äußerer Krafteinwirkung hebt die Kupplung eine zum elektromotorisch betätigten Verschwenken der beiden Teile relativ zueinander erforderliche drehmomentschlüssige Kopplung des elektrischen Antriebs mit den beiden Teilen auf, so dass die beiden Teile handbetrieben verschwenkt werden können. Bei erneutem elektromotorischen Antrieb stellt die Kupplung die drehmomentschlüssige Kopplung wieder her, so dass die beiden Teile wieder elektromotorisch betrieben verschwenkt werden können. Die Kupplung stellt so ein Beiklappen eines Spiegelkopfs in und entgegen der Fahrtrichtung eines Kraftfahrzeugs durch äußere Krafteinwirkung sicher, ohne den elektrischen Antrieb zu beschädigen. Jeweils eines der beiden Teile des Verschwenkantriebs kann mit dem Spiegelkopf einer Außenrückblickspiegelanordnung, vorzugsweise mit dessen Grundträger, das andere mit dem Spiegelfuß einer Außenrückblickspiegelanordnung, vorzugsweise mit dessen Ständer, verbunden werden. Die Gelenkachse des Verschwenkantriebs entspricht dabei der Gelenkachse der gelenkigen Verbindung zwischen Spiegelkopf und Spiegelfuß.

[0014] Das Außenrückblickspiegelgehäuse weist auf seiner in Betriebsstellung der Fahrtrichtung des Kraftfahrzeugs abgewandten Rückseite eine Öffnung auf, durch welche hindurch das Spiegelglas sichtbar ist und in welcher das Spiegelglas gegenüber dem Spiegelkopf um die beiden Schwenkachsen verstellbar angeordnet ist. Um eine Verstellbarkeit des Spiegelglases zu gewährleisten, ist allseitig zwischen Spiegelglas und den die Öffnung umgebenden Wandungen des Außenrückblickspiegelgehäuses ein Abstand eingehalten, so dass sich um das Spiegelglas umlaufend ein Spalt zu den die Öffnung umgebenden Wandungen des Außenrückblickspiegelgehäuses ergibt.

[0015] Auf dem Grundträger kann eine beispielsweise elektromotorisch betätigbare Verstellanordnung für ein Spiegelglas angeordnet sein. Die Verstellanordnung wirkt auf eine um die zwei verschiedenen und nicht parallel zueinander verlaufenden, beispielsweise einander schneidenden oder windschief zueinander angeordneten Schwenkachsen gegenüber dem Spiegelkopf verstellbar am Grundträger angeordnete Trägerplatte ein, auf der das Spiegelglas befestigt ist. Beispielsweise kann das Spiegelglas mittels einer Rast- und/oder Klebeverbindung auf der Trägerplatte montiert sein. Die Trägerplatte kann an der Verstellanordnung und/oder an dem

Grundträger geführt und/oder gelagert sein. Der Begriff Trägerplatte bezeichnet hierbei einen Träger, der zumindest eine eben oder gewölbt ausgeführte, geschlossene oder gitterförmig unterbrochene, z.B. wabenförmige Trägerfläche aufweist, die geeignet ist, um darauf ein Spiegelglas beispielsweise mittels einer Klebeverbindung oder durch Einklipsen z.B. hinter am Umfang der Trägerfläche hervorstehende und vom Umfang aus gesehen nach Innen zur Mitte der Trägerfläche hin kragende Rastmittel zu befestigen.

[0016] Durch Verstellen des auf der Trägerplatte angeordneten Spiegelglases um die beiden Schwenkachsen gegenüber dem Spiegelkopf kann eine Einstellung der individuellen Verstelllage vorgenommen werden. Ist eine elektromotorisch betätigbare Verstellanordnung vorgesehen, sind die Verstellanordnung und die Trägerplatte häufig zu einem elektromotorischen Verstellantrieb zusammengefasst, welcher zumindest die Trägerplatte, Verbindungsmittel zur Befestigung am Grundträger, Führungsmittel zur Führung der Trägerplatte um die zwei Schwenkachsen, sowie zwei elektromotorische Antriebe, jeweils einen je Schwenkachse, einschließlich auf die Trägerplatte einwirkende, die Bewegungen der elektromotorischen Antriebe in Stellbewegungen für die Trägerplatte umwandelnde und auf die Trägerplatte übertragende Stellmittel umfasst.

[0017] Die Vornahme der Einstellung der individuellen Verstelllage vermittels einer elektromotorisch betätigbaren Verstellanordnung kann dabei manuell durch Tätigwerden des Fahrers des Kraftfahrzeugs vorgenommen werden, beispielsweise durch Betätigung von im Fahrzeuginnenraum untergebrachten Schaltern, Tastern, Reglern, oder automatisch, beispielsweise durch Erfassung von Sitzposition und/oder Größe und/oder Blickrichtung des Fahrers vermittels geeigneter Sensoren und Umwandlung der Sensorsignale in Steuerbefehle für die elektromotorisch betätigbare Verstellanordnung.

[0018] Vorteile der beschriebenen modernen Außenrückblickspiegelanordnungen sind neben einer Erfüllung der Ansprüche an Komfort und Sicherheitsanforderungen, dass sie eine Beherbergung zusätzlicher elektrischer Komponenten erlauben. So können beispielsweise im Spiegelkopf zumindest zum Teil vom Außenrückblickspiegelgehäuse beherbergt einzeln oder in Kombination miteinander eine Wiederholblinkleuchte, ein beheizbares Spiegelglas, ein elektrochromatisch abblendbares Spiegelglas, ein Erfassungs- und/oder Warnanzeigemodul für eine Fahrassistenzvorrichtung, wie etwa eine Totwinkelüberwachung, eine Spurverlasswarnung, eine Annäherungsüberwachung, oder dergleichen, oder eine Kombination hiervon untergebracht sein. Alternativ oder zusätzlich kann der Spiegelkopf wenigstens einen Sensor zur Erfassung von Fahr- und/oder Umgebungszuständen, wie beispielsweise Temperatur, Helligkeit, Verschmutzungsgrad, Beleuchtungssituation aufweisen, beispielsweise um das Spiegelglas automatisch zu beheizen und/oder z.B. elektrochromatisch abzublenden. Eine teilweise Unterbringung der genannten elektrischer Komponenten ist auch im Spiegelfuß, beispielsweise zumindest zum Teil von einer Spiegelfußabdekkung beherbergt, möglich.

[0019] Nachteilig an diesen modernen Außenrückblickspiegelanordnungen ist jedoch deren hoher konstruktiver Aufwand. Dieser ist bedingt durch Verwirklichung:

- eines Verschwenkens des Spiegelkopfs gegenüber dem Spiegelfuß aus der Betriebsstellung in die Anklappstellung und umgekehrt um die Gelenkachse, und
- eines Beiklappens zumindest des Spiegelkopfs bei äußerer Krafteinwirkung sowohl in, als auch entgegen der Fahrtrichtung des Kraftfahrzeugs, und
- eines Verstellens des Spiegelglases gegenüber dem Spiegelkopf um die zwei Schwenkachsen zur Vornahme einer Einstellung einer individuellen Verstelllage des Spiegelglases.

[0020] Dieser konstruktive Aufwand potenziert sich durch Verwirklichung einer elektromotorisch betätigbaren Vornahme zumindest des Verschwenkens des Spiegelkopfs gegenüber dem Spiegelfuß aus der Betriebsstellung in die Anklappstellung und umgekehrt um die Gelenkachse und/oder der Einstellung einer individuellen Verstelllage des Spiegelglases um die zwei Schwenkachsen.

[0021] Darüber hinaus erlauben die modernen Außenrückblickspiegelanordnungen eine nur sehr eingeschränkte Varianz im Hinblick auf Gestaltung bzw. Design.

Eine Aufgabe der Erfindung ist die Entwicklung einer

[0022] Außenrückblickspiegelanordnung für ein Kraftfahrzeug, welche den heutigen Ansprüchen an Komfort und Sicherheitsanforderungen gerecht wird, und welche einen überschaubaren konstruktiven Aufwand aufweist.

[0023] Die Aufgabe wird gelöst mit den Merkmalen des unabhängigen Anspruchs.

[0024] Demnach sieht die Erfindung eine Außenrückblickspiegelanordnung mit einem zur kraftfahrzeugseitigen Anordnung vorgesehenen Spiegelfuß und einem an diesem angeordneten Spiegelkopf sowie einem im Spiegelkopf untergebrachten, gegenüber diesem starr und unverstellbar fest angeordneten Spiegelglas vor.

[0025] Mindestens eine gelenkige Verbindung ist zwischen Spiegelkopf und kraftfahrzeugseitiger Anordnung des Spiegelfußes vorgesehen. Die mindestens eine gelenkige Verbindung umfasst insgesamt zwei Gelenkachsen, deren Richtungsvektoren voneinander unabhängig sind.

[0026] Demnach sind eine erste Gelenkachse und eine zweite Gelenkachse zwischen Spiegelkopf und kraftfahrzeugseitiger Anordnung vorgesehen. Die Richtungsvektoren, welche die Lagen der Gelenkachsen im Raum definieren, sind voneinander unabhängig.

[0027] Die erste und die zweite Gelenkachse sind gemeinsam oder unabhängig voneinander:

- einer Vornahme eines Verschwenkens zumindest des Spiegelkopfs aus einer Betriebsstellung in eine Anklappstellung und umgekehrt,
- einem Beiklappen zumindest des Spiegelkopfs in und entgegen der Fahrtrichtung, sowie
- einer Einstellung einer individuellen Verstelllage zumindest des Spiegelglases abhängig beispielsweise von Sitzposition und Körpergröße eines Fahrers des Kraftfahrzeugs

zugeordnet.

[0028] Ein erster elektromotorischer Verstellantrieb ist der ersten Gelenkachse zugeordnet. Ein zweiter elektromotorischer Verstellantrieb ist der zweiten Gelenkachse zugeordnet.

[0029] Die beiden elektromotorischen Verstellantriebe sind vorzugsweise unabhängig voneinander ansteuerbar.

[0030] Verlaufen beispielsweise weder die erste, noch die zweite Gelenkachse parallel zu einer gewünschten Verschwenk- bzw. Verstellachse kann eine Steuervorrichtung vorgesehen sein, die Steuerbefehle für den ersten elektromotorischen Verstellantrieb und für den zweiten elektromotorischen Verstellantrieb erzeugt, welche diese ausgehend von einem Verschwenken und/oder Verstellen um die zwei Gelenkachsen derart steuern, dass ein Verschwenken und/oder Verstellen um mindestens eine mit wenigstens einer gewünschten Verschwenk- bzw. Verstellachse identische imaginäre Achse ausgeführt wird. Mit anderen Worten veranlassen die Steuerbefehle den ersten elektromotorischen Verstellantrieb und den zweiten elektromotorischen Verstellantrieb zu Stellbewegungen, welche ein Verschwenken und/oder Verstellen zumindest des Spiegelkopfs mit dem Spiegelglas um die mit der gewünschten Verschwenk- bzw. Verstellachse identische imaginäre Achse bewirken.

[0031] Bei einer gewünschten Verschwenk- bzw. Verstellachse kann es sich beispielsweise um eine vertikal oder horizontal verlaufende Achse handeln. Es hat sich herausgestellt, dass beispielsweise die manuelle Vornahme einer Einstellung einer individuellen Verstelllage eines Spiegelglases einfacher und schneller ausführbar ist, wenn die Achsen, um die eine Verstellung vorgenommen wird, im Wesentlichen horizontal und vertikal verlaufen.

[0032] Alternativ oder zusätzlich kann eine der beiden Gelenkachsen bei kraftfahrzeugseitiger Anordnung der Außenrückblickspiegelanordnung im Wesentlichen annähernd horizontal verlaufen und/oder eine der beiden Gelenkachsen bei kraftfahrzeugseitiger Anordnung der Außenrückblickspiegelanordnung im Wesentlichen annähernd vertikal verlaufen. Demgegenüber kann ein Verschwenken aus einer Betriebs- in eine Anklappstellung und umgekehrt und/oder ein Beiklappen sowohl in, als auch entgegen der Fahrtrichtung des Kraftfahrzeugs auch um eine von der Vertikalen oder Horizontalen verschiedenen Verschwenkachse vorteilhaft sein, beispielsweise wenn hierdurch zumindest der Spiegelkopf beigeklappt oder in Anklappstellung kraftfahrzeugseitig weniger absteht. Hierdurch wird die Verletzungsgefahr anderer Verkehrsteilnehmer verringert. Die Außenrückblickspiegelanordnung mit ihrer mindestens einen gelenkigen Verbindung und ihren insgesamt zwei Gelenkachsen kann ein Verschwenken aus einer Betriebs- in eine Anklappstellung und umgekehrt und/oder ein Beiklappen sowohl in, als auch entgegen der Fahrtrichtung des Kraftfahrzeugs um eine beliebige Verschwenkachse erlauben.

[0033] Beispielsweise kann zumindest der Spiegelkopf durch manuelle Betätigung einer im Fahrzeuginnenraum angeordneten Bedieneinrichtung vorzugsweise um einen definierten Schwenkwinkel aus einer Betriebsstellung um eine z.B. im Wesentlichen vertikal verlaufende Verschwenkachse in eine Abklappstellung und umgekehrt elektromotorisch verschwenkt werden, beispielsweise um bei abgestelltem Kraftfahrzeug eine Gefährdung anderer Verkehrsteilnehmer durch die ansonsten weit abstehende Außenrückblickspiegelanordnung zu vermeiden.

[0034] Beispielsweise kann zumindest der Spiegelkopf durch manuelle Betätigung einer im Fahrzeuginnenraum angeordneten Bedieneinrichtung vorzugsweise um jeweils einen definierten Schwenkwinkel um zwei einander beispielsweise in einem rechten Winkel schneidende Verstellachsen elektromotorisch verstellt werden, beispielsweise um eine von Sitzposition und Körpergröße abhängige Einstellung einer individuellen Verstelllage des Spiegelglases vorzunehmen.

[0035] Bei der Bedieneinrichtung kann es sich um einen oder mehrere Taster, Schalter, Regler handeln.

[0036] Alternativ zu einer manuellen Betätigung einer Bedieneinrichtung kann eine automatische elektromotorisch betätigte Vornahme einer von Sitzposition und Körpergröße abhängigen Einstellung einer individuellen Verstelllage des Spiegelglases vorgesehen sein. Hierzu kann eine Erfassung von Sitzposition und/oder Größe und/oder Blickrichtung des Fahrers vermittels eines oder mehrerer geeigneter Sensoren und Umwandlung der Sensorsignale in Steuerbefehle für die elektromotorischen Verstellantriebe vorgesehen sein.

[0037] Wenigstens einer der beiden elektromotorischen Verstellantriebe ist vorzugsweise zur kraftfahrzeugseitig starr verbundenen Anordnung vorgesehen. Ein kraftfahrzeugseitig starr angeordneter elektromotorischer Verstellantrieb ist beispielsweise nicht in einem gegenüber dem Spiegelfuß gelenkig angeordneten Spiegelkopf und nicht in einem kraftfahrzeugseitig gelenkig angeordneten Spiegelfuß untergebracht. Sich hierdurch ergebende Vorteile sind ein im Vergleich zum Stand der Technik deutlich und auch gegenüber den bisherigen Ausgestaltungen nochmals verringertes Gewicht der kraftfahrzeugseitig gelenkig angeordneten Teile der Au-

ßenrückblickspiegelanordnung. Hierdurch wird die Widerstandsfähigkeit der Außenrückblickspiegelanordnung gegenüber Vibrationen im Vergleich zum Stand der Technik nochmals wesentlich erhöht. Damit wird eine höchstmögliches Maß für die Güte des vermittels der Außenrückblickspiegelanordnung einsehbaren Bereichs der Fahrzeugumgebung frei von einer Beeinträchtigung durch Vibrationen des Spiegelglases, sei es hervorgerufen durch Fahrtwind, Fahrbahnunebenheiten oder Antriebsstrang erhalten und so die Verkehrssicherheit durch Verwendung der beschriebenen Außenrückblickspiegelanordnung nochmals erhöht.

[0038] Mindestens eine wenigstens eine Gelenkachse umfassende gelenkige Verbindung kann zur kraftfahrzeugseitigen Anordnung des Spiegelfußes vorgesehen sein. Je nachdem, ob die zur kraftfahrzeugseitigen Anordnung vorgesehene gelenkige Verbindung eine oder beide der insgesamt zwei Gelenkachsen umfasst, ist dadurch die erste Gelenkachse und/oder die zweite Gelenkachse kraftfahrzeugseitig vorgesehen bzw. kraftfahrzeugseitig festgelegt. Mindestens eine wenigstens eine Gelenkachse umfassende gelenkige Verbindung kann zur Anordnung zwischen Spiegelfuß und Spiegelkopf vorgesehen sein. Je nachdem, ob die zur Anordnung zwischen Spiegelfuß und Spiegelkopf vorgesehene gelenkige Verbindung eine oder beide der insgesamt zwei Gelenkachsen umfasst, ist dadurch die erste Gelenkachse und/oder die zweite Gelenkachse zwischen Spiegelfuß und Spiegelkopf vorgesehen bzw. festgelegt.

[0039] Dadurch können:

- die erste Gelenkachse kraftfahrzeugseitig vorgesehen bzw. kraftfahrzeugseitig festgelegt, und/oder
- die zweite Gelenkachse kraftfahrzeugseitig vorgesehen bzw.
  kraftfahrzeugseitig festgelegt, und/oder
- die erste Gelenkachse zwischen Spiegelfuß und Spiegelkopf vorgesehen bzw.
  festgelegt, und/oder
- die zweite Gelenkachse zwischen Spiegelfuß und Spiegelkopf vorgesehen bzw. festgelegt sein.

[0040] Ist mindestens eine gelenkige Verbindung zwischen Spiegelfuß und kraftfahrzeugseitiger Anordnung vorgesehen, so kann das Verschwenken bzw. Verstellen des Spiegelkopfs und des Spiegelfußes gemeinsam um die mindestens eine von dieser gelenkigen Verbindung umfasste Gelenkachse erfolgen.

[0041] Ist mindestens eine gelenkige Verbindung zwischen Spiegelkopf und Spiegelfuß vorgesehen, so kann das Verschwenken bzw. Verstellen des Spiegelkopfs gegenüber dem Spiegelfuß um die mindestens eine von dieser gelenkigen Verbindung umfasste Gelenkachse erfolgen.

[0042] Die erste Gelenkachse und die zweite Gelenkachse können einander schneiden. Besonders bevorzugt können sich die erste Gelenkachse und die zweite Gelenkachse in einem rechten Winkel schneiden.

[0043] Die erste Gelenkachse und die zweite Gelenkachse können windschief zueinander verlaufen.

[0044] Die mindestens eine gelenkige Verbindung kann durch ein Kugelgelenk verwirklicht sein. Dadurch können die erste Gelenkachse und die zweite Gelenkachse von einem Kugelgelenk gemeinsam umfasst sein.

[0045] Das Kugelgelenk kann zur kraftfahrzeugseitigen Anordnung des Spiegelfußes vorgesehen sein.

[0046] Das Kugelgelenk kann zur gelenkigen Verbindung zwischen Spiegelkopf und Spiegelfuß vorgesehen sein.

[0047] Zusätzlich zu den beiden elektromotorischen Verstellantrieben kann die Außenrückblickspiegelanordnung einzeln oder in Kombination miteinander beispielsweise:

- mindestens eine Sendeeinrichtung beispielsweise zur Fernbetätigung eines elektrischen Torantriebs, beispielsweise eines Hof- und/oder Garagentors, und/oder zur Fahrzeug-zu-Fahrzeug Kommunikation, und/oder
- wenigstens eine Wiederholblinkleuchte, und/oder
- ein beheizbares Spiegelglas, und/oder
- ein elektrochromatisch abblendbares Spiegelglas, und/oder
- zumindest ein Erfassungsmodul für eine Fahrassistenzvorrichtung, wie etwa eine Totwinkelüberwachung, eine Spurverlasswarnung, eine Annäherungsüberwachung oder dergleichen, und/oder
- mindestens ein vom Fahrzeuginnenraum durch ein Seitenfenster hindurch sichtbar angeordnetes Warnanzeigemodul für eine Fahrassistenzvorrichtung, wie etwa eine Totwinkelüberwachung, eine Spurverlasswarnung, eine Annäherungsüberwachung oder dergleichen, und/oder
- wenigstens einen Sensor zur Erfassung von Fahr- und/oder Umgebungszuständen, wie beispielsweise Temperatur, Helligkeit, Verschmutzungsgrad, Beleuchtungssituation, beispielsweise um das Spiegelglas automatisch zu beheizen und/oder z.B. elektrochromatisch abzublenden,

  als zusätzliche zumindest zum Teil von der Außenrückblickspiegelanordnung beherbergte elektrische Komponenten aufweisen. Die Aufzählung ist hierbei nicht als abschließend aufzufassen.

[0048] Vorteile der Erfindung gegenüber dem Stand der Technik ergeben sich unter anderem durch eine Verringerung des hohen konstruktiven Aufwands zur Verwirklichung einer elektromotorisch betätigten Vornahme des Verschwenkens aus einer Betriebs- in eine Anklappstellung und umgekehrt bei gleichzeitiger Sicherstellung eines Beiklappens in und entgegen der Fahrtrichtung sowie einer elektromotorisch betätigten Vornahme der individuellen Einstellung der Verstelllage des Spiegelglases, beispielsweise abhängig von Größe und Sitzposition des Fahrers des Kraftfahrzeugs. Die Verringerung des konstruktiven Aufwands ist unter anderem einhergehend

mit einer Verringerung der zum Verschwenken, Beiklappen und zur Einstellung einer individuellen Verstelllage erforderlichen Achsen und mit der dadurch im Vergleich zum Stand der Technik verringerten Anzahl an benötigten elektromotorischen Verstellantrieben bzw.

Stellgliedern. Darüber hinaus kann die erfindungsgemäße

[0049] Außenrückblickspiegelanordnung bei gleichzeitig verringertem konstruktiven Aufwand eine oder mehrere elektrische Komponenten beherbergen, welche einzeln für sich oder gemeinsam Ansprüche an Komfort und Sicherheitsanforderungen erfüllen können.

[0050] Weitere Vorteile gegenüber dem Stand der Technik ergeben sich beispielsweise durch eine besonders hohe Varianz im Hinblick auf mögliche Ausführungen, Gestaltung bzw. Design.

[0051] Weitere Merkmale der Erfindung ergeben sich aus den Ansprüchen, der Beschreibung und den Zeichnungen.

[0052] Ausführungsbeispiele der Erfindung sind nachfolgend anhand der Zeichnung näher erläutert. Darin bezeichnen gleiche Bezugszeichen gleiche oder gleich wirkende Elemente. Der Übersicht halber sind nur Bezugszeichen in den einzelnen Zeichnungen dargestellt, die für die Beschreibung der jeweiligen Zeichnung erforderlich sind. Die Größenverhältnisse der einzelnen Elemente zueinander entsprechen dabei nicht immer den realen Größenverhältnissen, da einige Formen vereinfacht und andere Formen zur besseren Veranschaulichung vergrößert im Verhältnis zu anderen Elementen dargestellt sind. Es zeigen in schematischer Darstellung:

Fig. 1 ein erstes Ausführungsbeispiel einer Außenrückblickspiegelanordnung für ein Kraftfahrzeug in teilweise geschnittener Vorderansicht.

Fig. 2 die Außenrückblickspiegelanordnung aus Fig. 1 in teilweise geschnittener Seitenansicht.

Fig. 3 ein zweites Ausführungsbeispiel einer Außenrückblickspiegelanordnung für ein Kraftfahrzeug in teilweise geschnittener Vorderansicht.

Fig. 4 die Außenrückblickspiegelanordnung aus Fig. 3 in teilweise geschnittener Seitenansicht.

Fig. 5 ein drittes Ausführungsbeispiel einer Außenrückblickspiegelanordnung für ein Kraftfahrzeug in teilweise geschnittener Vorderansicht.

Fig. 6 ein viertes Ausführungsbeispiel einer Außenrückblickspiegelanordnung für ein Kraftfahrzeug in teilweise geschnittener Vorderansicht.

Fig. 7 ein fünftes Ausführungsbeispiel einer Außenrückblickspiegelanordnung für ein Kraftfahrzeug in teilweise geschnittener Vorderansicht.

Fig. 8 ein sechstes Ausführungsbeispiel einer Außenrückblickspiegelanordnung für ein Kraftfahrzeug in teilweise geschnittener Vorderansicht.

Fig. 9 ein siebtes Ausführungsbeispiel einer Außenrückblickspiegelanordnung für ein Kraftfahrzeug in einer Rückansicht.

Eine in den Fig. 1 bis Fig. 9 ganz oder in Teilen dargestellte

[0053] Außenrückblickspiegelanordnung 01 für ein Kraftfahrzeug besteht im Wesentlichen aus einem zur kraftfahrzeugseitigen Anordnung vorgesehenen Spiegelfuß 02 und einem an diesem angeordneten Spiegelkopf 03 sowie einem im Spiegelkopf 03 untergebrachten, gegenüber diesem starr und unverstellbar fest angeordneten Spiegelglas 04. Mindestens eine gelenkige Verbindung 05 (Fig. 7, Fig. 8, Fig. 9), 06, 07 (Fig. 1, Fig. 3, Fig. 5, Fig. 6) ist zwischen Spiegelkopf 03 und kraftfahrzeugseitiger Anordnung des Spiegelfußes 02 vorgesehen.

[0054] Die mindestens eine gelenkige Verbindung 05, 06, 07 umfasst insgesamt zwei Gelenkachsen 08, 09, deren Richtungsvektoren, welche die Lagen der beiden Gelenkachsen im Raum definieren, voneinander unabhängig sind.

[0055] Die beiden Gelenkachsen 08, 09 sind jeweils gemeinsam und/oder unabhängig voneinander:

- einer Vornahme eines Verschwenkens zumindest des Spiegelkopfs 03 aus einer Betriebsstellung in eine Anklappstellung und umgekehrt,
- einem Beiklappen zumindest des Spiegelkopfs 03 in und entgegen der in den Fig. 1 und Fig. 4 durch den Pfeil F angedeuteten Fahrtrichtung, sowie
- einer Einstellung einer individuellen Verstelllage zumindest des Spiegelglases 04 abhängig beispielsweise von Sitzposition und Körpergröße eines Fahrers des Kraftfahrzeugs zugeordnet.

[0056] Einer ersten Gelenkachse 08 der beiden Gelenkachsen 08, 09 ist ein erster elektromotorischer Verstellantrieb 10 zugeordnet. Einer zweiten Gelenkachse 09 der beiden Gelenkachsen 08, 09 ist ein zweiter elektromotorischer Verstellantrieb 11 zugeordnet.

[0057] Die Außenrückblickspiegelanordnung 01 weist unter dem Begriff Spiegelglas 04 zusammengefasst mindestens eine reflektierende bzw. verspiegelte Fläche auf, welche von einem Fahrer des Kraftfahrzeugs vom Fahrzeuginnenraum beispielsweise durch ein Seitenfenster hindurch einsehbar ist und Einblick in einen oder mehrere Bereiche einer Fahrzeugumgebung gewährt, in welche dieser bei auf den Fahrbahnverlauf gerichtetem Blickfeld von dessen Sitzplatz aus sonst keine Einsicht hätte.

[0058] Beispielsweise zur Vermeidung einer Blendung durch rückwärtige Lichtquellen kann eine elektrochromatische Abblendung des Spiegelglases 04 vorgesehen sein. Hierfür kann das Spiegelglas 04 als ein elektrochromatisch abblendbares Spiegelglas ausgeführt sein.

[0059] Die erste Gelenkachse 08 und die zweite Gelenkachse 09 können einander wie in den Fig. 5 bis Fig. 9 dargestellt schneiden. Besonders bevorzugt schneiden sich die erste Gelenkachse 08 und die zweite Gelenkachse 09 dabei in einem rechten Winkel, wie bei den in den Fig. 7 bis Fig. 9 dargestellten

[0060] Außenrückblickspiegelanordnungen 01 vorgesehen.

[0061] Alternativ können die erste Gelenkachse 08 und die zweite Gelenkachse 09 wie in den Fig. 1 bis Fig. 4 dargestellt windschief zueinander verlaufen.

Eine der beiden Gelenkachsen 08, 09 kann wie in den Fig. 3, Fig. 4, Fig. 7 und Fig. 8 dargestellt bei kraftfahrzeugseitiger Anordnung der

[0062] Außenrückblickspiegelanordnung 01 im Wesentlichen annähernd vertikal verlaufen.

[0063] Alternativ oder zusätzlich kann eine der beiden Gelenkachsen 08, 09 wie in den Fig. 3, Fig. 4, Fig. 7 und Fig. 8 dargestellt bei kraftfahrzeugseitiger Anordnung der Außenrückblickspiegelanordnung 01 im Wesentlichen annähernd horizontal verlaufen.

[0064] Ebenfalls ist es möglich, dass sich wie in den Fig. 1, Fig. 5 und Fig. 6 beispielsweise die Lage der zweiten Gelenkachse 09 im Raum bei einem Verschwenken bzw. Verstellen um die erste Gelenkachse 08 verändert.

[0065] Um den verschiedenen möglichen Lagen der Gelenkachsen 08, 09 gerecht zu werden, sind die beiden elektromotorischen Verstellantriebe 10, 11 vorzugsweise unabhängig voneinander ansteuerbar.

[0066] Gegebenenfalls kann eine Steuervorrichtung 12 (Fig. 1, Fig. 3, Fig. 7) vorgesehen sein, die Steuerbefehle für den ersten elektromotorischen Verstellantrieb 10 und für den zweiten elektromotorischen Verstellantrieb 11 erzeugt, welche diese ausgehend von einem Verschwenken und/oder Verstellen um die zwei Gelenkachsen 08, 09 derart steuern, dass ein Verschwenken und/oder Verstellen um mindestens eine mit wenigstens einer gewünschten Verschwenk- bzw. Verstellachse identische, beispielsweise horizontal oder vertikal verlaufende imaginäre Achse 15, 16 (Fig. 1) ausgeführt wird.

[0067] Bei den in den Fig. 1, Fig. 2, Fig. 3, Fig. 4, Fig. 5 und Fig. 6 dargestellten Außenrückblickspiegelanordnungen 01 ist die die erste Gelenkachse 08 umfassende gelenkige Verbindung 06 zur kraftfahrzeugseitigen Anordnung des Spiegelfußes 02 vorgesehen. Darüber hinaus ist bei diesen Außenrückblickspiegelanordnungen 01 die die zweite Gelenkachse 09 umfassende gelenkige Verbindung 07 zwischen Spiegelfuß 02 und Spiegelkopf 03 vorgesehen.

[0068] Bei den in den Fig. 8 und Fig. 9 dargestellten Außenrückblickspiegelanordnungen 01 ist die sowohl die erste Gelenkachse 08, als auch die zweite Gelenkachse 09 umfassende gelenkige Verbindung 05 zur kraftfahrzeugseitigen Anordnung des Spiegelfußes 02 vorgesehen.

Demgegenüber ist bei der in Fig. 7 dargestellten

[0069] Außenrückblickspiegelanordnung 01 die sowohl die erste Gelenkachse 08, als auch die zweite Gelenkachse 09 umfassende gelenkige Verbindung 05 zwischen Spiegelfuß 02 und Spiegelkopf 03 vorgesehen.

[0070] Je nach Ausgestaltung der Außenrückblickspiegelanordnung 01 kann wenigstens einer der beiden elektromotorischen Verstellantriebe 10, 11 kraftfahrzeugseitig starr verbundenen angeordnet sein. Bei den in den Fig. 1, Fig. 3, Fig. Fig. 5 und Fig. 6 dargestellten Außenrückblickspiegelanordnungen 01 handelt es sich hierbei um den der ersten Gelenkachse 08 zugeordneten ersten elektrischen Verstellantrieb 10.

[0071] Die mindestens eine gelenkige Verbindung 05 kann wie in den Fig. 7, Fig. 8 und Fig. 9 dargestellt durch ein Kugelgelenk 13 verwirklicht sein. Dies hat den Vorteil, dass beide Gelenkachsen 08, 09 von der gelenkigen Verbindung 05 umfasst sind bzw. durch diese gebildet sind. Ein weiterer Vorteil ergibt sich dadurch, dass sowohl der der ersten Gelenkachse 08 zugeordnete erste elektromotorische Verstellantrieb 10, als auch der der zweiten Gelenkachse 09 zugeordnete zweite elektromotorische Verstellantrieb 10 kraftfahrzeugseitig starr verbundenen angeordnet sein kann, wie in Fig. 8 dargestellt.

[0072] Das Kugelgelenk 13 kann wie in den Fig. 8 und 9 zur kraftfahrzeugseitigen Anordnung des Spiegelfußes 02 vorgesehen sein, oder wie in Fig. 7 dargestellt zur Herstellung der gelenkigen Verbindung 05 zwischen Spiegelkopf 03 und Spiegelfuß 02. In Fig. 7 ist dabei der Spiegelfuß 02 kraftfahrzeugseitig starr angeordnet bzw. zur starren kraftfahrzeugseitigen Anordnung vorgesehen.

[0073] Die Außenrückblickspiegelanordnung 01 kann wie in den Fig. 1, Fig. 2, Fig. 3, Fig. 5 und Fig. 6 dargestellt eine Wiederholblinkleuchte 14 beispielsweise im Spiegelkopf 03 beherbergen.

[0074] Die Außenrückblickspiegelanordnungen 01 können je nach Ausgestaltung bevorzugt zur kraftfahrzeugseitigen Anordnung an einer Türbrüstung 17 (Fig. 1 bis Fig. 4 und Fig. 7 bis Fig. 9) aufstehend oder beispielsweise von einer im Wesentlichen vertikalen Fahrzeugoberfläche 18 (Fig. 5 und Fig. 6) abstehend vorgesehen sein.

[0075] Die Außenrückblickspiegelanordnungen 01 können eine stehende oder hängende Anordnung des Spiegelkopfs 03 am Spiegelfuß vorsehen.

[0076] Eine besondere Ausgestaltungsmöglichkeit zeigt die in Fig. 9 dargestellte Außenrückblickspiegelanordnung. Bei dieser kann der Spiegelkopf 03 vollständig vom Spiegelglas 04 umfasst sein, ein Teil des Spiegelglases 04 sein, oder dieses umfassen.

[0077] Die Erfindung ist insbesondere im Bereich der

Herstellung von Außenrückblickspiegelanordnungen für Kraftfahrzeuge gewerblich anwendbar.

Bezugszeichenliste

[0078]

01 Außenrückblickspiegelanordnung

02 Spiegelfuß

03 Spiegelkopf

04 Spiegelglas

05 gelenkige Verbindung

06 gelenkige Verbindung

07 gelenkige Verbindung

08 erste Gelenkachse

09 zweite Gelenkachse

10 erster elektromotorischer Verstellantrieb

11 zweiter elektromotorischer Verstellantrieb

12 Steuervorrichtung

13 Kugelgelenk

14 Wiederholblinkleuchte

15 imaginäre Achse

16 imaginäre Achse

17 Türbrüstung

18 Fahrzeugoberfläche

F Fahrtrichtung

Patentansprüche

1. Außenrückblickspiegelanordnung (01) für ein Kraftfahrzeug mit einem zur kraftfahrzeugseitigen Anordnung vorgesehenen Spiegelfuß (02) und einem an diesem angeordneten Spiegelkopf (03) sowie einem im Spiegelkopf (03) untergebrachten, gegenüber diesem starr und unverstellbar fest angeordneten Spiegelglas (04), wobei mindestens eine gelenkige Verbindung (05, 06, 07) zwischen Spiegelkopf (03) und kraftfahrzeugseitiger Anordnung des Spiegelfußes (02) vorgesehen ist, welche insgesamt zwei Gelenkachsen (08, 09) umfasst, deren Richtungsvektoren voneinander unabhängig sind, und wobei die beiden Gelenkachsen (08, 09) gemeinsam und/oder unabhängig voneinander:

- einer Vornahme eines Verschwenkens zumindest des Spiegelkopfs (03) aus einer Betriebsstellung in eine Anklappstellung und umgekehrt,
- einem Beiklappen zumindest des Spiegelkopfs (03) in und entgegen der Fahrtrichtung (F), sowie
- einer Einstellung einer individuellen Verstelllage zumindest des Spiegelglases (04) abhängig beispielsweise von Sitzposition und Körpergröße eines Fahrers des Kraftfahrzeugs

zugeordnet sind,
gekennzeichnet durch
einen einer ersten Gelenkachse (08) der beiden Gelenkachsen (08, 09) zugeordneten ersten elektromotorischen Verstellantrieb (10) und einen einer zweiten Gelenkachse (09) der beiden Gelenkachsen (08, 09) zugeordneten zweiten elektromotorischen Verstellantrieb (11).

2. Außenrückblickspiegelanordnung nach Anspruch 1, **dadurch gekennzeichnet,**
dass die beiden elektromotorischen Verstellantriebe (10, 11) unabhängig voneinander ansteuerbar sind.

3. Außenrückblickspiegelanordnung nach Anspruch 1 oder 2,
gekennzeichnet durch
eine Steuervorrichtung (12), die Steuerbefehle für den ersten elektromotorischen Verstellantrieb (10) und für den zweiten elektromotorischen Verstellantrieb (11) erzeugt, welche diese ausgehend von einem Verschwenken und/oder Verstellen um die zwei Gelenkachsen (08, 09) derart steuern, dass ein Verschwenken und/oder Verstellen um mindestens eine mit wenigstens einer gewünschten Verschwenk- bzw. Verstellachse identische imaginäre Achse (15, 16) ausgeführt wird.

4. Außenrückblickspiegelanordnung nach Anspruch 3, **dadurch gekennzeichnet,**
dass es sich bei der gewünschten Verschwenk- bzw. Verstellachse um eine vertikal oder horizontal verlaufende Achse (15, 16) handelt.

5. Außenrückblickspiegelanordnung nach einem der vorhergehenden Ansprüche,
dadurch gekennzeichnet,
dass wenigstens einer der beiden elektromotorischen Verstellantriebe (10, 11) zur kraftfahrzeugseitig starr verbundenen Anordnung vorgesehen ist.

6. Außenrückblickspiegelanordnung nach einem der

vorhergehenden Ansprüche,
dadurch gekennzeichnet,
dass mindestens eine wenigstens eine Gelenkachse (08, 09) umfassende gelenkige Verbindung (05, 06, 07) zur kraftfahrzeugseitigen Anordnung des Spiegelfußes (02) vorgesehen ist.

7. Außenrückblickspiegelanordnung nach einem der vorhergehenden Ansprüche,
dadurch gekennzeichnet,
dass mindestens eine wenigstens eine Gelenkachse (08, 09) umfassende gelenkige Verbindung (05, 06, 07) zwischen Spiegelfuß (02) und Spiegelkopf (03) vorgesehen ist.

8. Außenrückblickspiegelanordnung nach einem der vorhergehenden Ansprüche,
dadurch gekennzeichnet,
dass eine der beiden Gelenkachsen (08, 09) bei kraftfahrzeugseitiger Anordnung der Außenrückblickspiegelanordnung (01) im Wesentlichen horizontal verläuft.

9. Außenrückblickspiegelanordnung nach einem der vorhergehenden Ansprüche,
dadurch gekennzeichnet,
dass eine der beiden Gelenkachsen (08, 09) bei kraftfahrzeugseitiger Anordnung der Außenrückblickspiegelanordnung (01) im Wesentlichen vertikal verläuft.

10. Außenrückblickspiegelanordnung nach einem der vorhergehenden Ansprüche,
dadurch gekennzeichnet,
dass die erste Gelenkachse (08) und die zweite Gelenkachse (09) einander schneiden.

11. Außenrückblickspiegelanordnung nach einem der Ansprüche 1 bis 9, **dadurch gekennzeichnet,**
dass die erste Gelenkachse (08) und die zweite Gelenkachse (09) windschief zueinander verlaufen.

12. Außenrückblickspiegelanordnung nach einem der vorhergehenden Ansprüche,
dadurch gekennzeichnet,
dass die mindestens eine gelenkige Verbindung (05) durch ein Kugelgelenk (13) verwirklicht ist.

13. Außenrückblickspiegelanordnung nach Anspruch 12,
dadurch gekennzeichnet,
dass das Kugelgelenk (13) zur kraftfahrzeugseitigen Anordnung des Spiegelfußes (02) vorgesehen ist.

14. Außenrückblickspiegelanordnung nach Anspruch 12,
dadurch gekennzeichnet,
dass das Kugelgelenk (13) zur Herstellung einer gelenkigen Verbindung (05) zwischen Spiegelkopf (03) und Spiegelfuß (02) vorgesehen ist.

15. Außenrückblickspiegelanordnung nach einem der vorhergehenden Ansprüche,
dadurch gekennzeichnet,
dass die Außenrückblickspiegelanordnung (01) zusätzlich:

- mindestens eine Sendeeinrichtung, und/oder
- wenigstens eine Wiederholblinkleuchte (14), und/oder
- ein beheizbares Spiegelglas (04), und/oder
- ein elektrochromatisch abblendbares Spiegelglas (04), und/oder
- zumindest ein Erfassungsmodul für eine Fahrassistenzvorrichtung, und/oder
- mindestens ein vom Fahrzeuginnenraum durch ein Seitenfenster hindurch sichtbar angeordnetes Warnanzeigemodul für eine Fahrassistenzvorrichtung, und/oder
- wenigstens einen Sensor zur Erfassung von Fahr- und/oder Umgebungszuständen

umfasst.

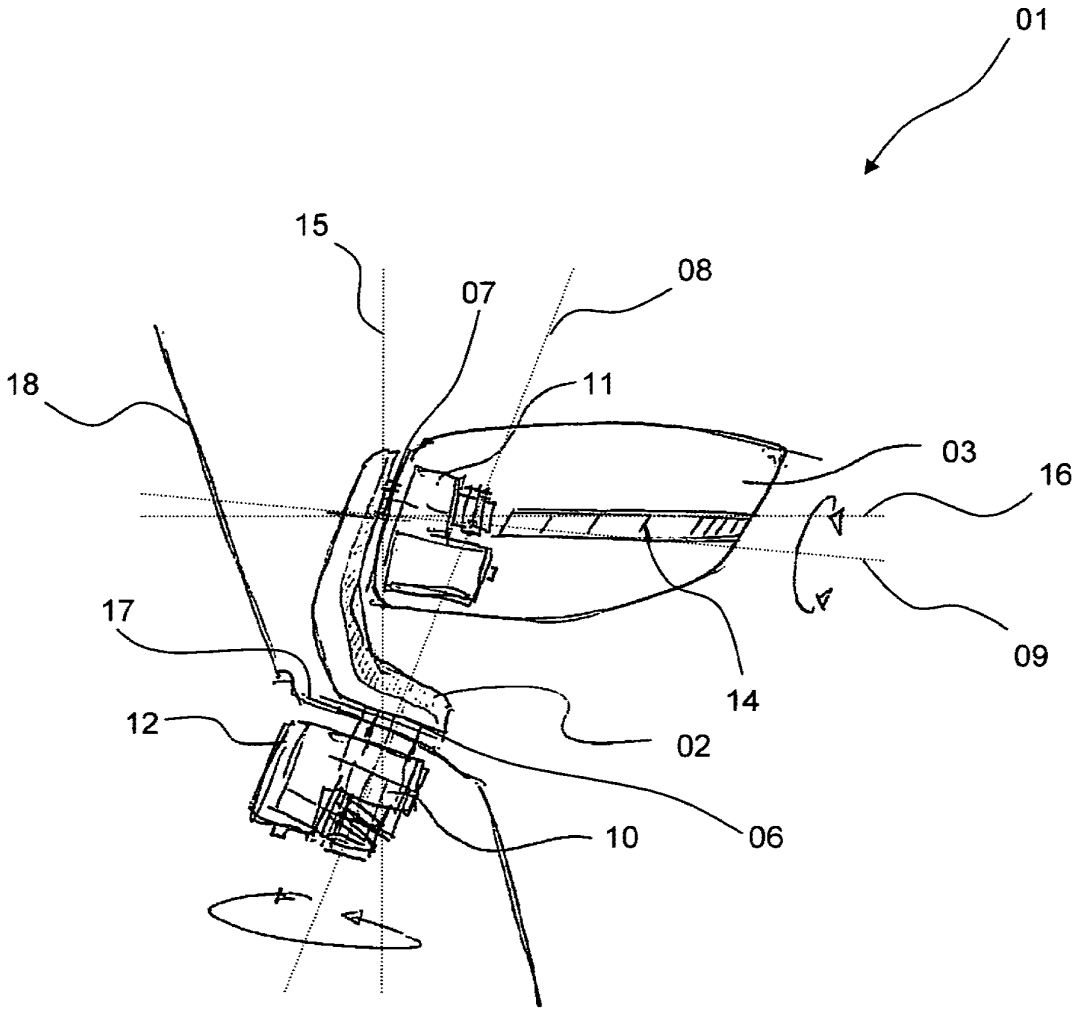

Fig. 1

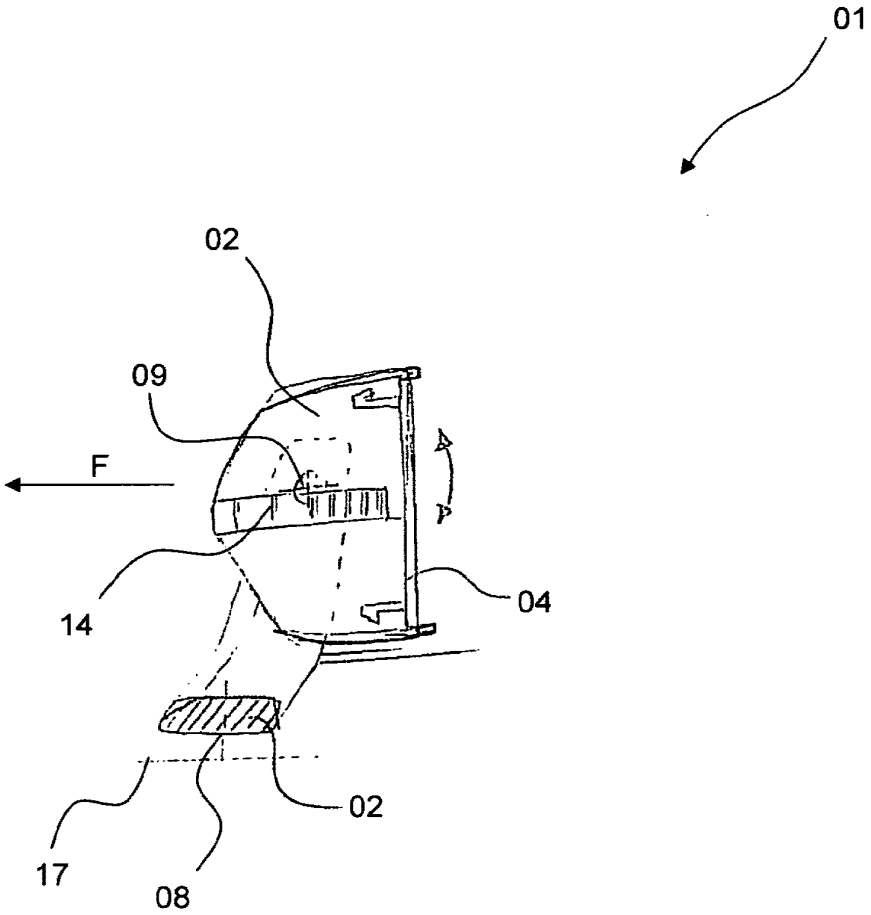

Fig. 2

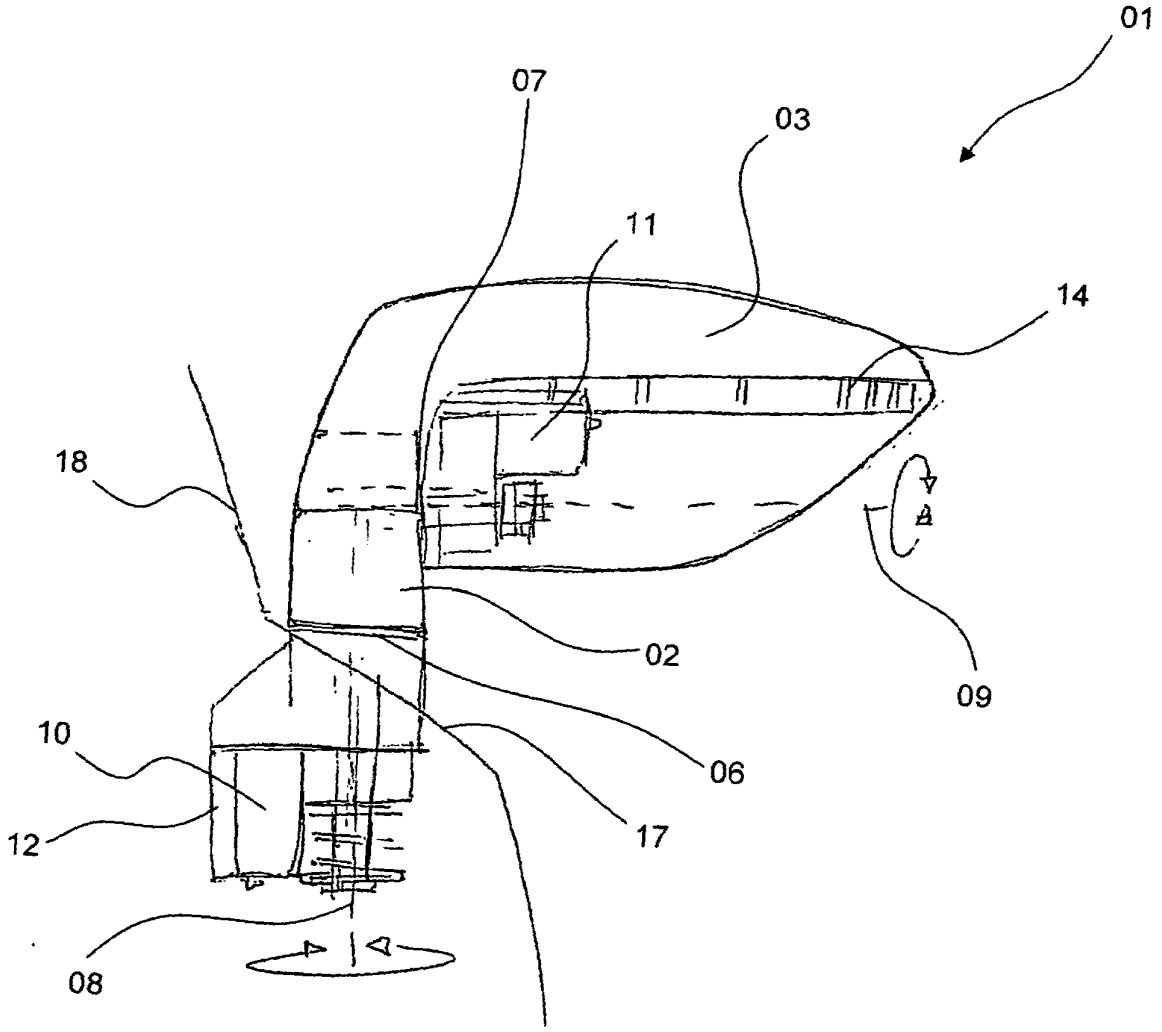

Fig. 3

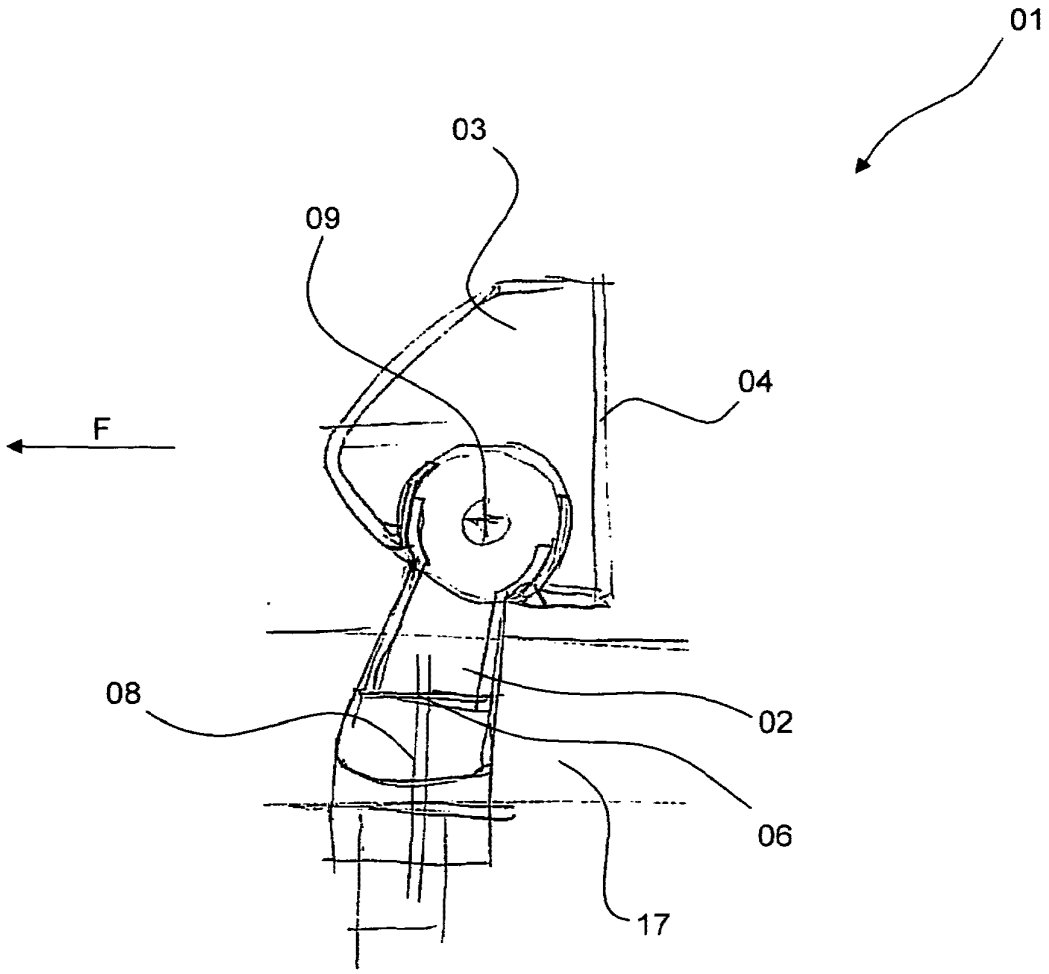

Fig. 4

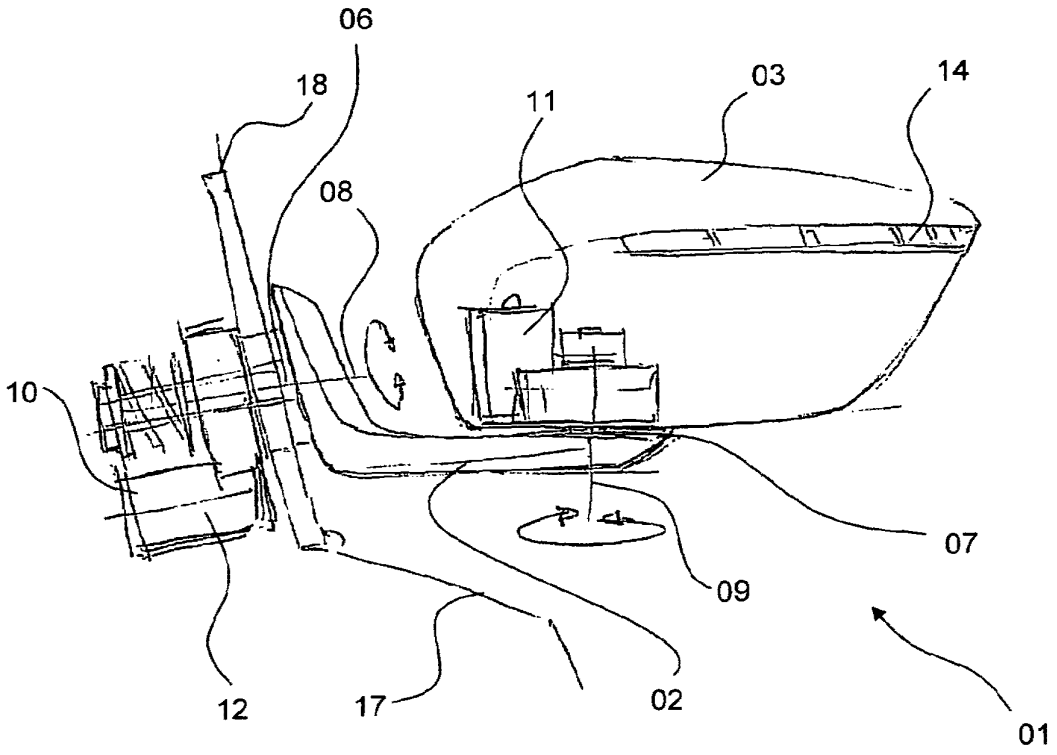

Fig. 5

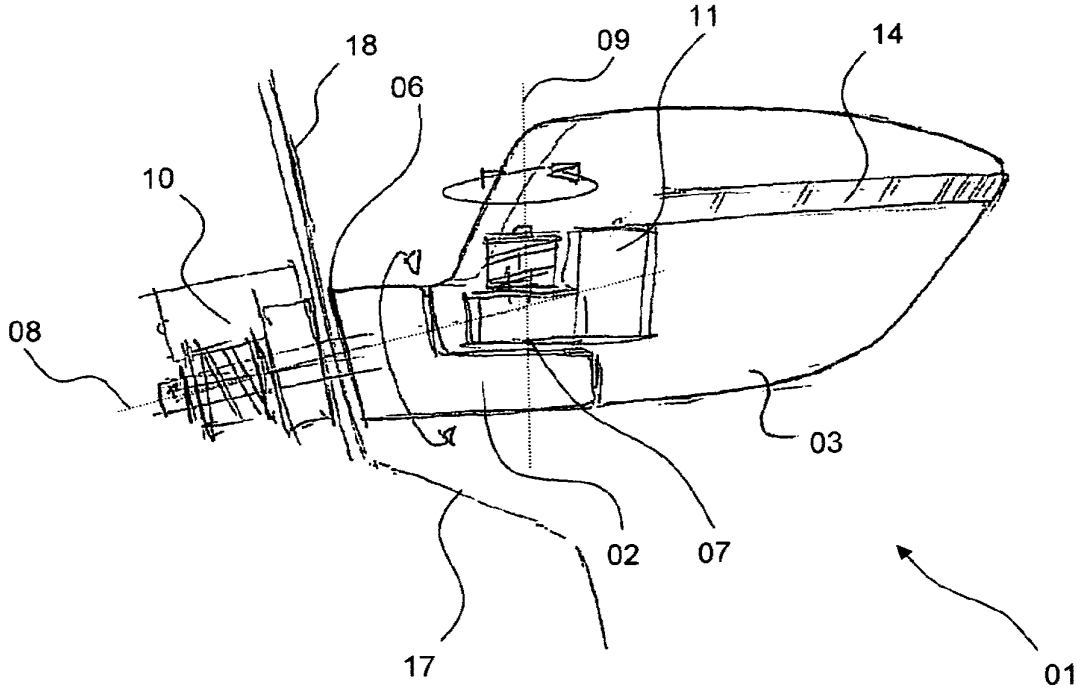

Fig. 6

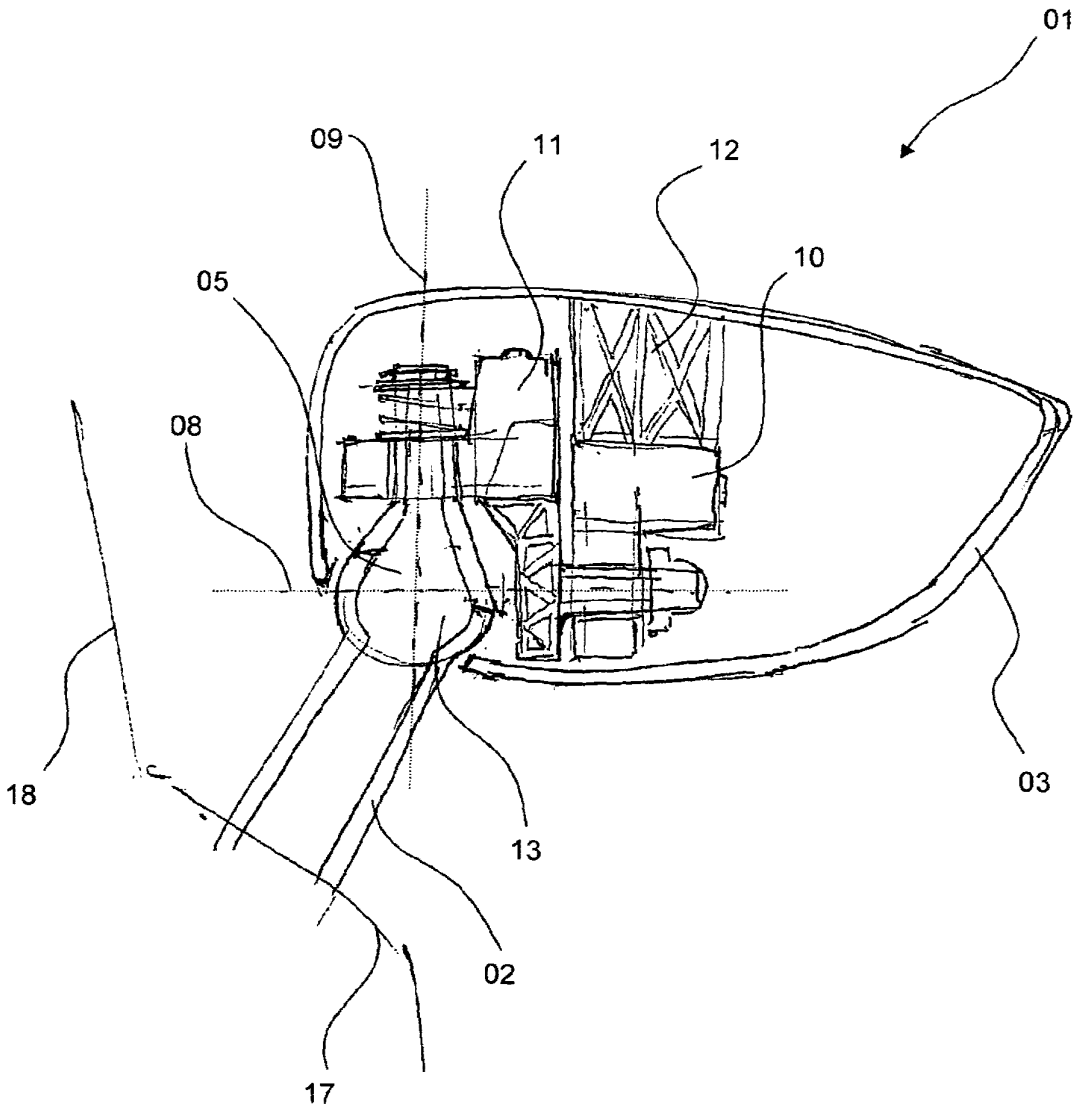

Fig. 7

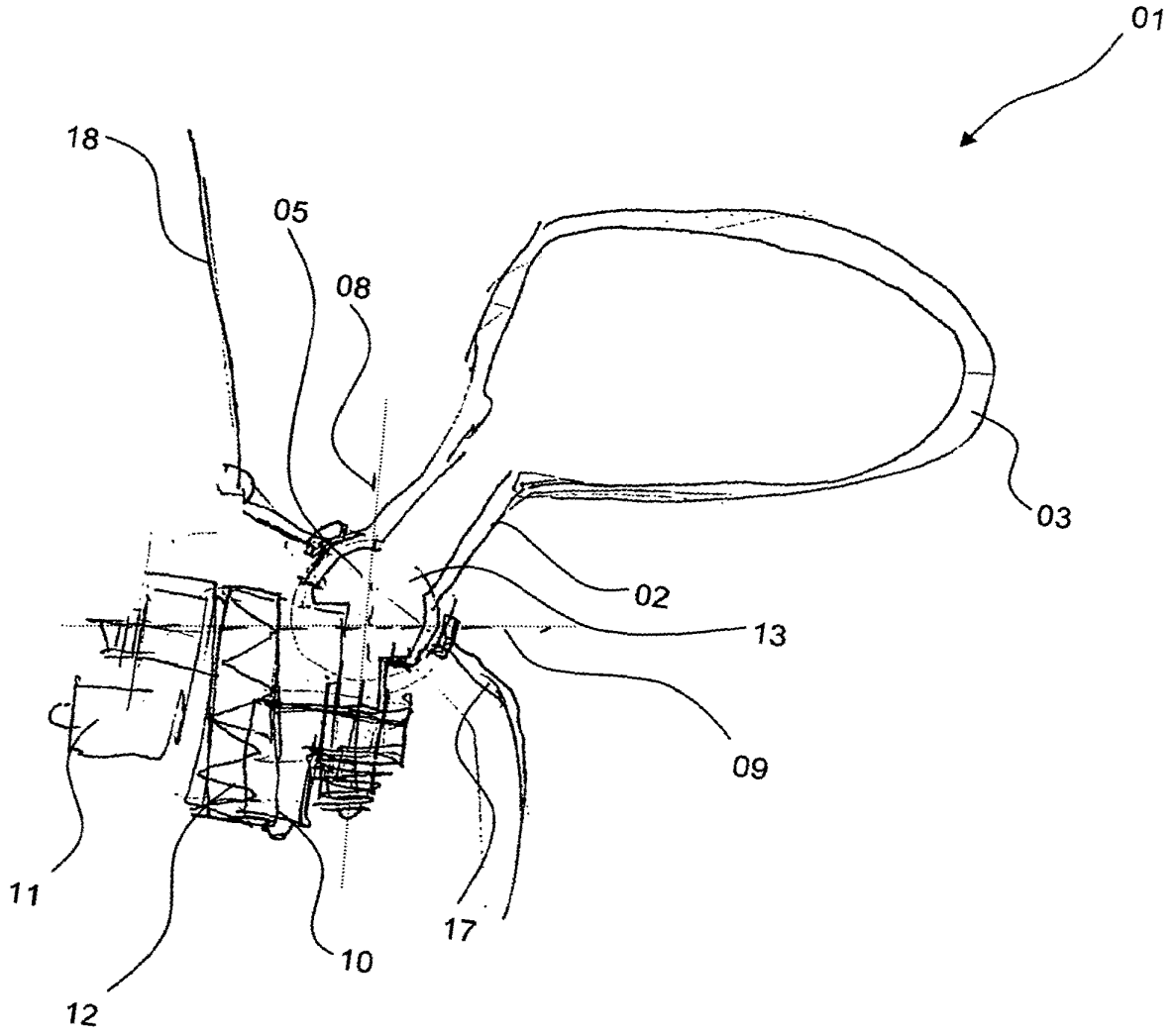

Fig. 8

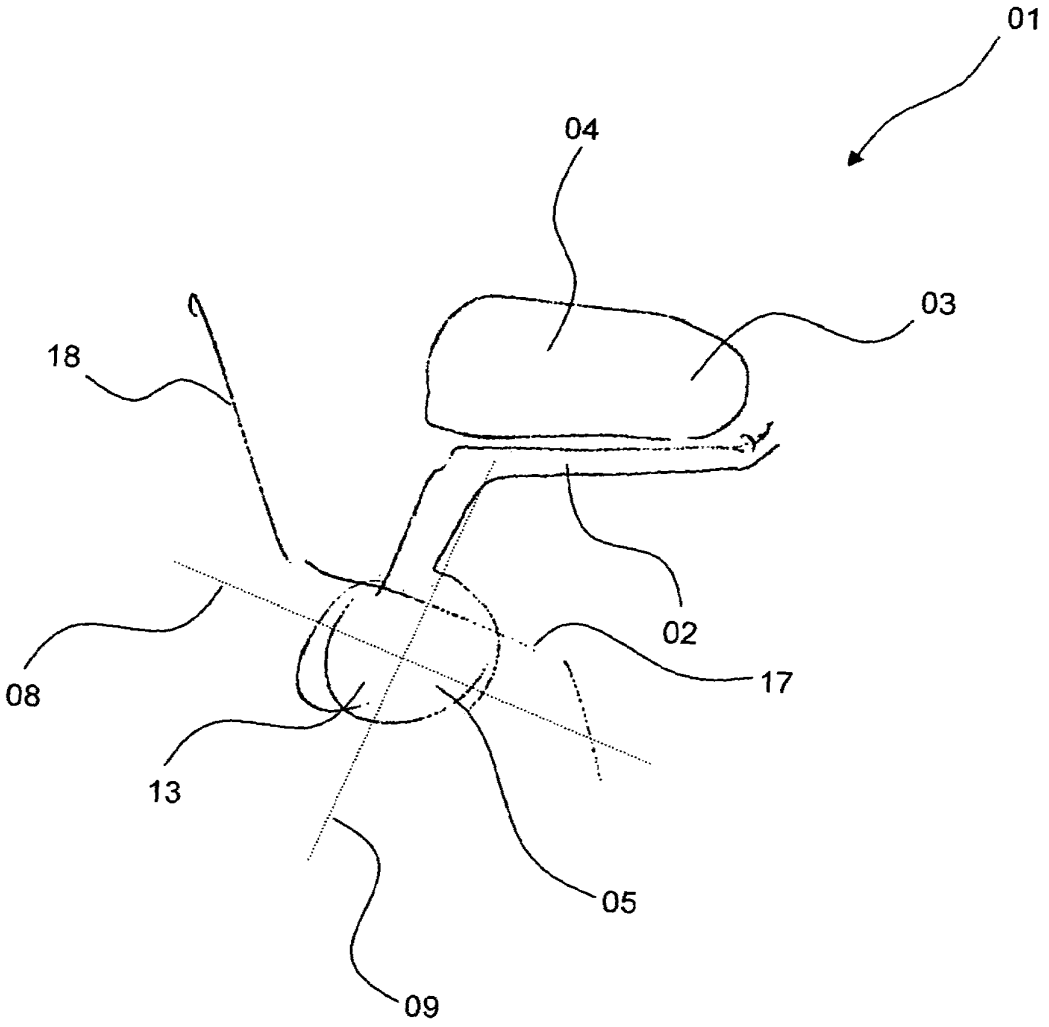

Fig. 9

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EUROPÄISCHER RECHERCHENBERICHT

Nummer der Anmeldung
EP 11 40 0017

EINSCHLÄGIGE DOKUMENTE

Kategorie	Kennzeichnung des Dokuments mit Angabe, soweit erforderlich, der maßgeblichen Teile	Betrifft Anspruch	KLASSIFIKATION DER ANMELDUNG (IPC)
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X	DE 15 30 861 A1 (MAIER IMANUEL) 12. Juni 1969 (1969-06-12) * Seite 1, Absatz 2; Abbildungen 1-4 * -----	1-10	
A	DE 195 38 770 A1 (REITTER & SCHEFENACKER GMBH [DE] SMR PATENTS SARL [LU]) 24. April 1997 (1997-04-24) * Zusammenfassung * -----	1,15	

RECHERCHIERTE SACHGEBIETE (IPC)

B60R

Der vorliegende Recherchenbericht wurde für alle Patentansprüche erstellt

Recherchenort	Abschlußdatum der Recherche	Prüfer
Berlin	23. August 2011	Scheuer, Jürgen

KATEGORIE DER GENANNTEN DOKUMENTE

X : von besonderer Bedeutung allein betrachtet
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1 EPO FORM 1503 03.82 (P04C03)

ANHANG ZUM EUROPÄISCHEN RECHERCHENBERICHT ÜBER DIE EUROPÄISCHE PATENTANMELDUNG NR. EP 11 40 0017

In diesem Anhang sind die Mitglieder der Patentfamilien der im obengenannten europäischen Recherchenbericht angeführten Patentdokumente angegeben.
Die Angaben über die Familienmitglieder entsprechen dem Stand der Datei des Europäischen Patentamts am
Diese Angaben dienen nur zur Unterrichtung und erfolgen ohne Gewähr.

23-08-2011

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Für nähere Einzelheiten zu diesem Anhang : siehe Amtsblatt des Europäischen Patentamts, Nr.12/82

IN DER BESCHREIBUNG AUFGEFÜHRTE DOKUMENTE

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In der Beschreibung aufgeführte Patentdokumente

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- DE 1815368 B **[0004]**
- DE 4141657 A1 **[0005]**
- DE 19601429 C2 **[0006]**
- EP 1755923 B1 **[0013]**

Notice

DESCRIPTION EP2492144

[0001]
The invention relates to an exterior rearview mirror assembly for a motor vehicle according to the preamble of claim 1.

[0002]
An exterior rear view mirror arrangement for a motor vehicle essentially consists of a mirror foot provided for the motor vehicle-side arrangement and a mirror head arranged on the mirror base and accommodating a mirror glass.

[0003]

DE 1 755 577 B discloses an exterior rear view mirror arrangement for a motor vehicle with a mirror foot provided by attachment to the bodywork of a motor vehicle to the vehicle-side arrangement and a mirror head supporting the mirror glass.

The mirror glass is immovably firmly housed by the mirror head. Mirror base and mirror head are connected by means of a ball joint hinged together so that the mirror head with the immovably accommodated by and against this mirror glass in a desired, individually adjustable by the driver of the motor vehicle, for example, height and sitting position of the driver dependent adjustment position relative to the mirror is adjustable. In addition, by means of the ball joint on the mirror base articulated mirror head relative to the mirror from an operating position into a Abklappstellung

and vice versa pivoted. Making the setting of the individual adjustment position as well as the pivoting of the mirror head from the operating to the Anklappstellung and vice versa is provided by hand by the mirror head from outside the motor vehicle or the vehicle interior through an open side window and gripped through into the desired Position is spent.

[0004]

DE 1 815 368 B discloses an exterior rearview mirror arrangement for a motor vehicle having a mirror base and a mirror head carrying a mirror glass. In this, the mirror head and the mirror are rigid and ungleichenkig firmly connected. Likewise, the mirror glass is immovably firmly housed by the mirror head. In order to make an adjustment of an individual adjustment position, a ball joint is provided for the articulated body-side arrangement of the mirror base. To effect adjustment of an individual adjustment position of the mirror base with the mirror head arranged rigidly thereon and the mirror glass immovably accommodated therefrom, an adjustment lever operable from the motor vehicle interior is provided, which is connected to the mirror base by means of a linkage for transmitting the movement of the adjustment lever is.

[0005]

By DE 41 41 657 A1 beyond an exterior rearview mirror assembly for a motor vehicle is known in which a mirror glass fixed and immovable relative to this supporting mirror head by means of a ball joint is hinged to a mirror base. A mirror head side portion of the ball joint is encompassed by the mirror head. In this exterior rearview mirror assembly, the adjustment of the individual adjustment position as well as the provision of the pivoting of the mirror head from the operating to the Anklappstellung and vice versa by hand provided by the mirror head from outside the motor vehicle or from the motor vehicle interior through an open side window and gripped through the desired position is spent.

[0006]

By DE 196 01 429 C2 an exterior rearview mirror assembly for a motor vehicle is known in which a mirror glass fixed and immovable relative to this supporting mirror head is hinged to a mirror base. The mirror base is designed as a bracket provided for the articulated body-side arrangement about a first hinge axis. To this first hinge axis of the mirror can be pivoted from an operating in an Anklappstellung and vice versa. At the free end of the bracket of the mirror head, which consists

essentially only of the mirror glass and a connecting means for hinged attachment to the free end of the bracket, articulated about a second hinge axis. The connecting means is designed so that the mirror head is pivotable relative to the bracket about the second hinge axis. The first and second hinge axis are neither parallel nor intersect. To effect an adjustment of an individual adjustment position of the mirror glass, the mirror base can be pivoted about the first joint axis relative to the body of the motor vehicle and the mirror head about the second joint axis relative to the mirror base.

Again, the adjustment of the individual adjustment position is carried out as well as the pivoting of the mirror head from the operating to the Anklappstellung and vice versa by hand by the mirror head from outside the motor vehicle or from the motor vehicle interior through an open side window gripped through and into the desired Position is spent.

[0007]

A disadvantage of these known exterior rearview mirror assemblies is that they meet neither today's demands for comfort, nor the current safety requirements. With regard to today's comfort requirements, reference is made to making the adjustment of the individual adjustment position and the pivoting from the operating to the Anklappstellung and vice versa, which is no longer acceptable by hand today. With regard to comfort, moreover, reference is made to an ambient lighting which, at least when the vehicle door is open, provides illumination of the floor next to the motor vehicle in the dark, which today is readily realized by accommodating exit lights in the mirror head. For example, today's safety requirements of exterior rearview mirror assemblies require that an area of the vehicle environment accessible by an exterior rearview mirror assembly must be free of vibration from the mirror glass, whether due to wind, road bumps, or driveline, and sufficient protection of other road users must be ensured; in particular by a reliable whipping of the mirror head both in and against the direction of travel when an external force acts on the mirror head.

In this case, the parts remaining rigidly on the motor vehicle must not fall below the minimum permissible radii specified by legal requirements. The further development of the legal requirements also relates to visibility requirements for lighting functions of motor vehicles, such as a Wiederholblinklichtfunktion that can be met in part only by housing, for example, repeating indicators in the exterior rearview mirror. In order to meet today's requirements, modern exterior rearview mirror assemblies for motor vehicles are known, which consist of a motor vehicle-side arrangement provided Spiegelfuß and pivotable about a hinge axis on this mirror head with a relative to the mirror head about two pivot axes adjustable arranged mirror glass.

[0008]

The mirror base of such an exterior rearview mirror assembly includes a stator provided with its first end for mounting on the vehicle side and at its second end for pivotal connection with the mirror head. The stand can be covered by means of a Spiegelfußabdeckung.

[0009]
The mirror head comprises an exterior rearview mirror housing which, inter alia, accommodates, comprises, or is encompassed by a base carrier assigned to the mirror base and articulated thereto

Stand and base support form the supporting parts of the

[0010]

Exterior rearview mirror assembly.

They can be produced as die-cast parts, for example, from the same material.

[0011]

The mirror head is pivotable relative to the mirror base about the hinge axis from an operating position into an Anklappstellung and vice versa. The pivoting of the mirror head relative to the mirror base from the operating position into the Anklappstellung and vice versa about the hinge axis can be done manually operated or electric motor depending on the equipment of a motor vehicle.

[0012]

Regardless of whether a hand-operated or an electric motor-driven pivoting is provided, a

wobbling of the mirror head must be ensured by external force. The whipping must be ensured both in and against the direction of travel of the motor vehicle. An external force can occur, for example, through contact with another road user or with an object.

[0013]

EP 1 755 923 B1 discloses a pivoting drive for an exterior rear view mirror arrangement of a motor vehicle. The pivoting drive comprises a first part, which is connected pivotably about a hinge axis with a second part. The pivot drive also includes an electric drive for electromotively operated pivoting of the parts relative to each other. The pivot drive also includes a coupling between the first and the second part. In the case of an external force action, the clutch releases a torque-locked coupling of the electric drive with the two parts, which is required relative to one another for the electromotive pivoting of the two parts, so that the two parts can be pivoted manually. When renewed electric motor drive, the coupling restores the torque-locking coupling, so that the two parts can be pivoted again operated by an electric motor. The clutch thus ensures a whipping of a mirror head in and against the direction of travel of a motor vehicle by external force safely without damaging the electric drive.

In each case one of the two parts of the pivoting drive can be connected to the mirror head of an exterior rearview mirror assembly, preferably with its base support, the other with the mirror of an exterior rearview mirror assembly, preferably with its stand. The hinge axis of the pivot drive corresponds to the hinge axis of the articulated connection between mirror head and mirror base.

[0014]

The outer rearview mirror housing has on its rear side facing away in the operating position of the direction of travel of the motor vehicle on an opening through which the mirror glass is visible and in which the mirror glass relative to the mirror head about the two pivot axes is arranged adjustable. In order to ensure an adjustability of the mirror glass, a distance is maintained on all sides between the mirror glass and the walls surrounding the opening of the exterior rearview mirror housing, so that there is a gap around the mirror glass surrounding the opening surrounding walls of the exterior rearview mirror housing.

[0015]

On the base support can be arranged, for example, an electric motor actuated adjustment arrangement for a mirror glass. The adjusting arrangement acts on a support plate arranged so as to be displaceable on the base support in a manner displaceable relative to the mirror head about the two different and not mutually parallel, for example intersecting or skewed pivot axes, on which the mirror glass is fastened. For example, the mirror glass can be mounted on the carrier plate by means of a latching and / or adhesive connection. The carrier plate can be guided and / or mounted on the adjusting arrangement and / or on the base carrier. The term carrier plate here denotes a carrier, the at least one flat or curved executed, closed or grid-shaped broken, z. B. honeycomb-shaped support surface which is suitable for a mirror glass, for example by means of an adhesive bond or by clipping z. B. behind the circumference of the support surface protruding and seen from the periphery to fasten inside to the center of the support surface cantilevered latching means.

[0016]

By adjusting the arranged on the support plate mirror glass to the two pivot axes relative to the mirror head, an adjustment of the individual adjustment position can be made. If an adjusting arrangement that can be actuated by an electric motor is provided, the adjusting arrangement and the carrier plate are frequently combined to form an electromotive adjusting drive, which comprises at least the carrier plate, connecting means for attachment to the base carrier, guide means for guiding the carrier plate about the two pivot axes, and two electromotive drives, one per pivot axis Including acting on the support plate, the movements of the electric motor drives in adjusting movements for the support plate converting and transmitting to the support plate actuating means comprises.

[0017]
The adjustment of the individual adjustment position by means of an electromotive actuatable adjustment arrangement can be carried out manually by action of the driver of the motor vehicle, for example by operating housed in the vehicle interior switches, buttons, controllers, or automatically, for example by detecting seat position and / or size and / or viewing direction of the driver by means of suitable sensors and conversion of the sensor signals into control commands for the electromotive actuatable adjusting arrangement.

[0018]

Advantages of the described modern exterior rearview mirror assemblies, in addition to meeting the comfort and safety requirements, are that they allow accommodation of additional electrical components.

Thus, for example, in the mirror head housed at least in part from the exterior rearview mirror housing individually or in combination a repeating flashing light, a heated mirror glass, an electrochromatically dimmable mirror glass, a detection and / or warning display module for a driving assistance device, such as blind spot monitoring, lane departure warning, proximity monitoring, or the like, or a combination thereof. Alternatively or additionally, the mirror head may have at least one sensor for detecting driving and / or environmental conditions, such as temperature, brightness, degree of contamination, lighting situation, for example, to automatically heat the mirror glass and / or z. B. abzusublenden electrochromatic. Partial accommodation of said electrical components is also possible in the mirror base, for example accommodated at least in part by a mirror base cover.

[0019]

However, a disadvantage of these modern exterior rearview mirror arrangements is their high design complexity. This is due to realization: a pivoting of the mirror head relative to the mirror from the operating position in the Anklappstellung and vice versa about the hinge axis, and a lapping of at least the mirror head with external force in both, and against the direction of travel of the motor vehicle, and adjusting the mirror glass relative to the mirror head about the two pivot axes for effecting an adjustment of an individual adjustment position of the mirror glass.

[0020]
This constructive effort is increased by realizing an electromotive actuation of at least the pivoting of the mirror head relative to the mirror base from the operating position into the Anklappstellung and vice versa about the hinge axis and / or the setting of an individual adjustment of the mirror glass to the two pivot axes.

[0021]

In addition, the modern exterior rearview mirror arrangements allow only very limited variance in terms of design or

Design.

An object of the invention is the development of a

[0022]
Exterior rearview mirror assembly for a motor vehicle, which meets today's demands on comfort and safety requirements, and which has a manageable design effort.

[0023]
The object is solved with the features of the independent claim.

[0024]
Accordingly, the invention provides an exterior rearview mirror assembly with a provided for the vehicle-side arrangement mirror base and arranged on this mirror head and a mirror head accommodated, opposite this rigid and immovable fixedly arranged mirror glass.

[0025]

At least one articulated connection is provided between the mirror head and the vehicle-side arrangement of the mirror base.

The at least one articulated connection comprises a total of two joint axes whose directional vectors are independent of each other.

[0026]

Accordingly, a first hinge axis and a second hinge axis between the mirror head and the vehicle-side arrangement are provided.

The direction vectors which define the positions of the joint axes in space are independent of each

other.

[0027]
The first and the second hinge axis are common or independent of each other: an undertaking of pivoting at least the mirror head from an operating position into an Anklappstellung and vice versa, a whipping of at least the mirror head in and against the direction of travel, as well as an adjustment of an individual adjustment of at least the mirror glass depending, for example assigned by sitting position and height of a driver of the motor vehicle.

[0028]

A first electromotive adjusting drive is assigned to the first joint axis.

A second electromotive adjustment is assigned to the second hinge axis.

[0029]
The two electromotive adjusting drives are preferably independently controllable.

[0030]

For example, neither the first, nor the second hinge axis parallel to a desired pivoting or

Adjustment axis may be provided a control device which generates control commands for the first electric motor adjustment and for the second electric motor adjustment, which control them starting from a pivoting and / or adjusting about the two hinge axes such that pivoting and / or adjusting by at least one with at least one desired pivoting or

Adjusting axis identical imaginary axis is executed. In other words, the control commands cause the first electric motor adjustment and the second electric motor adjustment to adjusting movements, which pivoting and / or adjusting at least the mirror head with the mirror glass to those with the desired pivoting or Adjusting axis identical imaginary axis cause.

[0031]

In a desired pivoting or Adjustment axis may be, for example, a vertical or horizontal axis. It has been found that, for example, manual adjustment of an adjustment of an individual adjustment position of a mirror glass can be carried out more easily and quickly if the axes about which an adjustment is made are substantially horizontal and vertical.

[0032]

Alternatively or additionally, one of the two axes of articulation in the case of a motor vehicle-side arrangement of the exterior rearview mirror arrangement can essentially run approximately horizontally and / or one of the two articulation axes can run substantially approximately vertically in the case of a motor vehicle-side arrangement of the exterior rearview mirror arrangement. In contrast, a pivoting from an operating position to an Anklappstellung and vice versa and / or a wobble in both, and against the direction of travel of the motor vehicle also be advantageous to a different from the vertical or horizontal pivot axis, for example, if at least the mirror head folded in or Anklappstellung motor vehicle side protrudes less. This reduces the risk of injury to other road users. The exterior rearview mirror assembly with its at least one articulated connection and its total of two joint axes can pivot about a pivoting from a Betriebs- in an Anklappstellung and vice versa and / or a possible both in and against the direction of travel of the motor vehicle to any pivot axis.

[0033]

For example, at least the mirror head by manual actuation of an operating device arranged in the vehicle interior preferably by a defined pivot angle from an operating position to a z. B. pivoting substantially vertically pivoting axis in a Abklappstellung and vice versa by electric motor, for example, to avoid a danger to other road users by the otherwise far-projecting exterior rearview mirror assembly when the vehicle is parked.

[0034]

For example, at least the mirror head may be adjusted by motor actuation of a control device arranged in the vehicle interior preferably by a defined pivot angle about two mutually intersecting, for example, at a right angle adjusting axes, for example, to make a dependent of seating position

and body size setting an individual adjustment of the mirror glass.

[0035]
The operating device may be one or more buttons, switches, regulators.

[0036]

As an alternative to a manual actuation of an operating device, an automatic electromotive actuation of a setting of an individual adjustment position of the mirror glass, which is dependent on seat position and body size, can be provided.

For this purpose, a detection of the driver's seat position and / or size and / or viewing direction can be provided by means of one or more suitable sensors and conversion of the sensor signals into control commands for the electromotive adjusting drives.

[0037]

At least one of the two electromotive adjusting drives is preferably provided for the motor vehicle side rigidly connected arrangement.

An electromotive adjusting drive rigidly arranged on the motor vehicle, for example, is not accommodated in a mirror head arranged in an articulated manner in relation to the mirror foot and not in a mirror-mounted, mirror-mounted motor vehicle side. As a result, the resulting advantages are significantly reduced compared to the prior art and also compared to the previous embodiments, the weight of the parts of the exterior rear view mirror arrangement, which are articulated on the motor vehicle side, are reduced. As a result, the resistance of the exterior rearview mirror assembly to vibrations is significantly increased compared to the prior art again. Thus, the highest possible measure of the quality of the means of the exterior rearview mirror arrangement visible range of the vehicle environment is free of interference from vibrations of the mirror glass, caused by wind, road bumps or powertrain and thus increases road safety by using the exterior rearview mirror assembly described again.

[0038]

At least one at least one hinge axis comprehensive articulated connection may be provided for the motor vehicle side arrangement of the mirror base. Depending on whether the articulated connection provided for the motor vehicle-side arrangement comprises one or both of the total of two joint axes, the first joint axis and / or the second joint axis is thereby provided on the motor vehicle side or on the motor vehicle side. At least one hinged connection comprising at least one articulation axis can be provided for the arrangement between the mirror base and the mirror head. Depending on whether the articulated connection provided for the arrangement between mirror base and mirror head comprises one or both of the total of two joint axes, the first joint axis and / or the second joint axis is thereby provided or fixed between mirror base and mirror head.

[0039]
Thus, the first joint axis can be provided on the motor vehicle side or fixed on the motor vehicle side, and / or the second joint axis can be provided on the motor vehicle side or on the vehicle side, and / or the first joint axis can be provided or fixed between the mirror base and the mirror head, and / or the second joint axis between the mirror base and Mirror head provided or fixed.

[0040]

If at least one articulated connection between the mirror base and the vehicle-side arrangement is provided, the pivoting or

Adjustment of the mirror head and the mirror base together about the at least one articulated by this articulated joint axis done.

[0041]

Is at least one articulated connection between the mirror head and mirror provided so the pivoting or Adjusting the mirror head relative to the mirror base around the at least one of this articulated compound covered hinge axis done.

[0042]

The first hinge axis and the second hinge axis can intersect each other. Particularly preferably, the first hinge axis and the second hinge axis can intersect at a right angle.

[0043]
The first hinge axis and the second hinge axis can be skewed to each other.

[0044]

The at least one articulated connection can be realized by a ball joint.

As a result, the first joint axis and the second joint axis can be jointly covered by a ball joint.

[0045]
The ball joint may be provided for the motor vehicle-side arrangement of the mirror base.

[0046]
The ball joint may be provided for articulated connection between mirror head and mirror base.

[0047]

In addition to the two electromotive adjustment drives, the exterior rearview mirror assembly can individually or in combination with each other, for example: at least one transmitting device, for example for remote operation of an electric door drive, such as a court and / or garage door, and / or for vehicle-to-vehicle communication, and / or at least a repeating flashing light, and / or a heatable mirror glass, and / or an electrochromatically dimmable mirror glass, and / or at least one detection module for a driving assistance device, such as blind spot monitoring, lane departure warning, proximity monitoring or the like, and / or at least one of the vehicle interior by a Side window through visibly arranged warning display module for a driving assistance device, such as a blind spot monitoring, a lane departure warning, a proximity monitor or the like, and / or at least one sensor for detecting vo n driving and / or environmental conditions, such as temperature, brightness, degree of pollution, lighting situation, for example, to automatically heat the mirror glass and / or z.

B. abzusublenden electrochromic, as additional at least partially housed by the exterior rearview mirror assembly housed electrical components.

The list should not be considered as conclusive.

[0048]

Advantages of the invention over the prior art, inter alia, result from a reduction of the high constructive effort to realize an electromotive actuation of pivoting from an operating position to an Anklappstellung and vice versa while ensuring a lapping in and against the direction of travel and an electric motor operated Making the individual adjustment of the adjustment of the mirror glass, for example, depending on the size and seating position of the driver of the motor vehicle. The reduction of the constructive effort is, among other things, accompanied by a reduction in the required for pivoting, whipping and setting an individual adjustment axes and the resulting reduced compared to the prior art number of electromotive adjusting drives or

Actuators. In addition, the inventive

[0049]
Exterior rearview mirror assembly accommodate at the same time reduced design complexity one or more electrical components, which can meet individually or collectively claims to comfort and safety requirements.

[0050]

Further advantages over the prior art, for example, by a particularly high variance in terms of possible designs, design or

Design.

[0051]
Further features of the invention will become apparent from the claims, the description and the drawings.

[0052]

Embodiments of the invention are explained below with reference to the drawing.

Therein, like reference characters designate like or equivalent elements. For clarity, only reference numerals in the individual drawings are shown, which are required for the description of the respective drawing. The proportions of the individual elements to one another do not always correspond to the actual size ratios, since some shapes are simplified and other shapes are enlarged in relation to other elements for better illustration. 1 shows a first exemplary embodiment of an exterior rearview mirror arrangement for a motor vehicle in a partially sectioned front view. Fig. 2: the exterior rearview mirror assembly of FIG. 1 in a partially sectioned side view. 3 shows a second embodiment of an exterior rearview mirror assembly for a motor vehicle in a partially sectioned front view. Fig. 4: the outer rearview mirror assembly of FIG. 3 in a partially sectioned side view.

5 shows a third embodiment of an exterior rearview mirror assembly for a motor vehicle in a partially sectioned front view. 6 shows a fourth embodiment of an exterior rearview mirror assembly for a motor vehicle in a partially sectioned front view. 7 shows a fifth exemplary embodiment of an exterior rear view mirror arrangement for a motor vehicle in a partially sectioned front view. 8 shows a sixth exemplary embodiment of an exterior rearview mirror arrangement for a motor vehicle in a partially sectioned front view. 9 shows a seventh exemplary embodiment of an exterior rearview mirror assembly for a motor vehicle in a rear view.

One in Figs. 1 to 9 shown in whole or in part

[0053]

Exterior rearview mirror arrangement 01 for a motor vehicle essentially consists of a mirror foot 02 provided for the motor vehicle side arrangement and a mirror head 03 arranged on the latter, and a mirror glass 04 accommodated in the mirror head 03 and rigidly and immovably fixedly arranged

thereon. At least one articulated connection 05 (Fig. 7 , Fig. 8 , Fig. 9), 06, 07 (FIG. 1 , Fig. 3 , Fig. 5, Fig. 6) is provided between the mirror head 03 and the vehicle-side arrangement of the mirror 02.

[0054]
The at least one articulated connection 05, 06, 07 comprises a total of two joint axes 08, 09, whose direction vectors, which define the positions of the two joint axes in space, are independent of each other.

[0055]
The two joint axes 08, 09 are in each case jointly and / or independently of one another: a pivoting of at least the mirror head 03 from an operating position into a folded-on position and vice versa, a wobbling of at least the mirror head 03 in and opposite to that shown in FIGS. 4 indicated by the arrow F direction of travel, as well as an adjustment of an individual adjustment of at least the mirror glass 04 depending for example, assigned to seat position and height of a driver of the motor vehicle.

[0056]

A first articulated axis 08 of the two articulated axes 08, 09 is assigned a first electromotive adjusting drive 10.

A second articulated axis 09 of the two articulated axes 08, 09 is assigned a second electromotive adjusting drive 11.

[0057]
The exterior rearview mirror assembly 01 has the term mirror glass 04 summarized at least one reflective or mirrored surface, which is visible from a driver of the motor vehicle from the vehicle interior, for example, through a side window and provides insight into one or more areas of a vehicle environment, in which this at Otherwise, there would be no insight into the line of sight directed from the seat.

[0058]

For example, to avoid glare from rear light sources, an electro-chromatic dimming of the mirror glass 04 may be provided.

For this purpose, the mirror glass 04 can be designed as an electrochromatically dimmable mirror glass.

[0059]

The first hinge axis 08 and the second hinge axis 09 may intersect each other as shown in FIGS. 5 to 9.

Particularly preferably, the first joint axis 08 and the second joint axis 09 intersect at a right angle, as in the case of those shown in FIGS. 7 to 9

[0060]
Exterior rearview mirror assemblies 01 are provided.

[0061]
Alternatively, the first joint axis 08 and the second joint axis 09 can be skewed relative to one another as shown in FIGS. 1 to 4.

One of the two joint axes 08, 09 can, as shown in FIGS. 3, 4, 7 and 8, be shown in the case of a motor vehicle-side arrangement

[0062]
Exterior rearview mirror assembly 01 extend substantially approximately vertically.

[0063]

Alternatively or additionally, one of the two joint axes 08, 09 as shown in FIGS.

3 , Fig.

4 , Fig. 7 and Fig. 8 shown in the vehicle-side arrangement of the exterior rearview mirror assembly 01 are substantially approximately horizontally.

[0064]

It is also possible that, as shown in FIGS.

1 5, and FIG. 6, for example, the position of the second hinge axis 09 in space in a pivoting or Adjusting the first joint axis 08 changed.

[0065]
In order to meet the various possible positions of the joint axes 08, 09, the two electromotive adjusting drives 10, 11 are preferably independently controllable.

[0066]

Optionally, a control device 12 (Fig.

1 , Fig. 3 7), which generates control commands for the first electromotive adjustment drive 10 and for the second electromotive adjustment drive 11, which control these starting from a pivoting and / or adjustment about the two articulation axes 08, 09 in such a way that pivoting and / or or adjusting by at least one with at least one desired pivoting or Adjusting axis identical, for example, horizontally or vertically extending imaginary axis 15, 16 (Fig. 1) is performed.

[0067]

In the in Figs. 1 , Fig. 2 , Fig. 3 , Fig. 4 , Outer rear view mirror arrangements 01 shown in FIG. 5

and FIG. 6, the articulated connection 06, which encompasses the first joint axle 08, is provided for the motor vehicle-side arrangement of the mirror base 02. In addition, in these exterior rearview mirror arrangements 01, the articulated joint 07 comprising the second joint axis 09 is provided between the mirror base 02 and the mirror head 03.

[0068]
In the outer rear view mirror arrangements 01 shown in FIGS. 8 and 9, the articulated connection 05 encompassing both the first articulation axis 08 and the second articulation axis 09 is provided for the arrangement of the mirror base 02 on the vehicle side.

In contrast, in the illustrated in Fig. 7

[0069]
Exterior rearview mirror assembly 01, both the first hinge axis 08, and the second hinge axis 09 comprehensive articulated connection 05 between the mirror 02 and the mirror head 03 is provided.

[0070]

Depending on the configuration of the exterior rearview mirror assembly 01, at least one of the two electromotive adjusting drives 10, 11 can be arranged rigidly connected to the motor vehicle.

In the in Figs.

1 , Fig. 3 , Fig. The outer rearview mirror arrangements 01 shown in FIGS. 5 and 6 are here the first electric adjusting drive 10 assigned to the first articulated axle 08.

[0071]

The at least one articulated connection 05 can, as shown in FIGS. 7 , Fig. 8 and Fig. 9 represented by a ball joint 13 be realized. This has the advantage that both joint axes 08, 09 are encompassed by the articulated connection 05 or are formed by them. A further advantage results

from the fact that both the first electromotive adjusting drive 10 associated with the first articulated axle 08 and the second electromotive adjusting drive 10 associated with the second articulated axle 09 can be arranged rigidly connected to the motor vehicle, as shown in FIG. 8.

[0072]

The ball joint 13 may be provided as shown in FIGS. 8 and 9 for the motor vehicle-side arrangement of the mirror base 02, or as shown in Fig. 7 for producing the articulated connection 05 between mirror head 03 and mirror 02. In FIG. 7, the mirror base 02 is rigidly arranged on the motor vehicle side or provided for a rigid arrangement on the vehicle side.

[0073]

The exterior rearview mirror assembly 01, as shown in FIGS. 1 , Fig. 2 , Fig. 3 , Fig. 5 and Fig. 6 shown a repeating flashing light 14, for example, in the mirror head 03 accommodate.

[0074]
Depending on the design, the exterior rearview mirror arrangements 01 can preferably be mounted on a door sill 17 (FIGS. 1 to 4 and 7 to 9), preferably for vehicle-side arrangement, or, for example, from a substantially vertical vehicle surface 18 (FIGS. 5 and 6)) may be provided projecting.

[0075]
The exterior rearview mirror assemblies 01 can provide a standing or suspended arrangement of the mirror head 03 on the mirror base.

[0076]

A particular embodiment possibility is shown in Fig. 9 outer rearview mirror assembly.

In this case, the mirror head 03 can be completely surrounded by the mirror glass 04, be a part of the mirror glass 04, or include this.

[0077]
The invention is particularly applicable in the field of manufacturing exterior rearview mirror assemblies for motor vehicles.

LIST OF REFERENCE NUMBERS

[0078]
01 : Exterior rear view mirror assembly 02: mirror base 03: mirror head 04: mirror glass 05: articulated connection 06: articulated connection 07: articulated connection 08: first articulation axis 09: second articulation axis 10: first electromotive adjustment drive 11: second electromotive adjustment drive 12: control device 13: ball joint 14: repeating direction indicator 15: imaginary axis 16: imaginary axis 17: door sill 18: vehicle surface F: direction of travel

Notice

CLAIMS EP2492144

1.
Exterior rearview mirror assembly (01) for a motor vehicle with a provided for the motor vehicle side mirror mount (02) and arranged on this mirror head (03) and in the mirror head (03) accommodated, opposite this rigid and immovable fixedly arranged mirror glass (04), wherein at least one articulated connection (05, 06, 07) between the mirror head (03) and the vehicle-side arrangement of the mirror base (02) is provided, which comprises a total of two joint axes (08, 09) whose direction vectors are independent of each other, and wherein the two joint axes (08, 09) together and / or independently of each other: - a pivoting at least of the mirror head (03) from an operating position into an Anklappstellung and vice versa, - a whipping of at least the mirror head (03) in and against the direction of travel (F), and - a Setting an individual adjustment position of at least the mirror glass (04) depending example are assigned to the seat position and body size of a driver of the motor vehicle, characterized by a first electromotive adjusting drive (10) associated with a first articulated axle (08) of the two articulated axles (08, 09) and a second articulated axle (09) of the two articulated axles (08, 09) associated second electric motor adjustment (11).

2.
Exterior rearview mirror assembly according to claim 1, characterized in that the two electromotive adjusting drives (10, 11) are independently controllable.

3.

An exterior rearview mirror assembly according to claim 1 or 2, characterized by a control device