(12) which generates control commands for the first electromotive adjustment drive (10) and for the second electromotive adjustment drive (11), which these starting from a pivoting and / or adjustment about the two hinge axes (08, 09) control such that pivoting and / or adjusting by at least one with at least one desired pivoting or

Adjusting axis identical imaginary axis (15, 16) is executed.

4.

Exterior rearview mirror assembly according to claim 3, characterized in that it is in the desired pivoting or Adjusting axis about a vertical or horizontal axis (15, 16) acts.

5.
Exterior rearview mirror assembly according to one of the preceding claims, characterized in that at least one of the two electromotive adjusting drives (10, 11) is provided for the motor vehicle side rigidly connected arrangement.

6.
An exterior rearview mirror arrangement according to one of the preceding claims, characterized in that at least one articulated connection (05, 06, 07) comprising at least one joint axis (08, 09) is provided for the arrangement of the mirror base (02) on the vehicle side.

7.
An exterior rearview mirror arrangement according to one of the preceding claims, characterized in that at least one articulated connection (05, 06, 07) comprising at least one joint axis (08, 09) is provided between the mirror base (02) and the mirror head (03).

8.
Exterior rearview mirror arrangement according to one of the preceding claims, characterized in that one of the two joint axes (08, 09) extends substantially horizontally in the case of a motor vehicle-side arrangement of the exterior rearview mirror arrangement (01).

9.

Exterior rearview mirror arrangement according to one of the preceding claims, characterized in that one of the two joint axes (08, 09) extends substantially vertically in the case of a motor vehicle-side arrangement of the exterior rearview mirror arrangement (01).

10.
An exterior rearview mirror assembly according to any one of the preceding claims, characterized in that the first hinge axis (08) and the second hinge axis (09) intersect each other.

11.
Exterior rearview mirror assembly according to one of claims 1 to 9, characterized in that the first hinge axis (08) and the second hinge axis (09) are skewed to each other.

12.
Exterior rearview mirror assembly according to one of the preceding claims, characterized in that the at least one articulated connection (05) is realized by a ball joint (13).

13.
Exterior rearview mirror assembly according to claim 12, characterized in that the ball joint (13) is provided for the motor vehicle-side arrangement of the mirror base (02).

14.
Exterior rearview mirror assembly according to claim 12, characterized in that the ball joint (13) for producing an articulated connection (05) between the mirror head (03) and mirror base (02) is provided.

15.
Exterior rearview mirror assembly according to one of the preceding claims, characterized in that the outer rearview mirror assembly (01) additionally: - at least one transmitting device, and / or - at least one Wiederholinkleuchte (14), and / or - a heated mirror glass (04), and / or - a Electrochromatically dimmable mirror glass (04), and / or - at least one visible from the vehicle interior through a side window visually arranged warning display module for a driving assistance device, and / or - at least one sensor for detecting driving and / or environmental conditions.

(19) Europäisches Patentamt / European Patent Office / Office européen des brevets

(11) **EP 2 492 145 A1**

(12) **EUROPÄISCHE PATENTANMELDUNG**

(43) Veröffentlichungstag:
29.08.2012 Patentblatt 2012/35

(51) Int Cl.:
B60R 1/072 (2006.01)

(21) Anmeldenummer: **11400016.9**

(22) Anmeldetag: **23.02.2011**

(84) Benannte Vertragsstaaten:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Benannte Erstreckungsstaaten:
BA ME

(71) Anmelder: **SMR Patents S.à.r.l.**
1653 Luxembourg (LU)

(72) Erfinder: **Schmierer, Arne**
73230 Kirchheim (DE)

(74) Vertreter: **Weber-Bruls, Dorothée et al**
Jones Day
Nextower
Thurn-und-Taxis-Platz 6
60313 Frankfurt am Main (DE)

(54) **Verstellbarer Aussenrückblickspiegel**

(57) Es wird ein Außenrückblickspiegel mit einem Spiegelkopf (10) und einem Spiegelfuß (2), die mit mindestens einem Gehäuseelement wie Spiegelrahmen (7), Gehäusekappe (6), Spiegelfußabdeckung (5) verkleidet sind beschreiben wobei das Spiegelglas (11) starr im Spiegelkopf (10) installiert ist. Weiterhin ist der Spiegelfuß (2) starr mit einem Spiegelträger (3') verbunden, der einen mindestens einen elektrischen Glasverstellantrieb (15) trägt, wobei der Glasverstellantrieb (15) mit dem mindestens einem Gehäuseelement verbindbar ist.

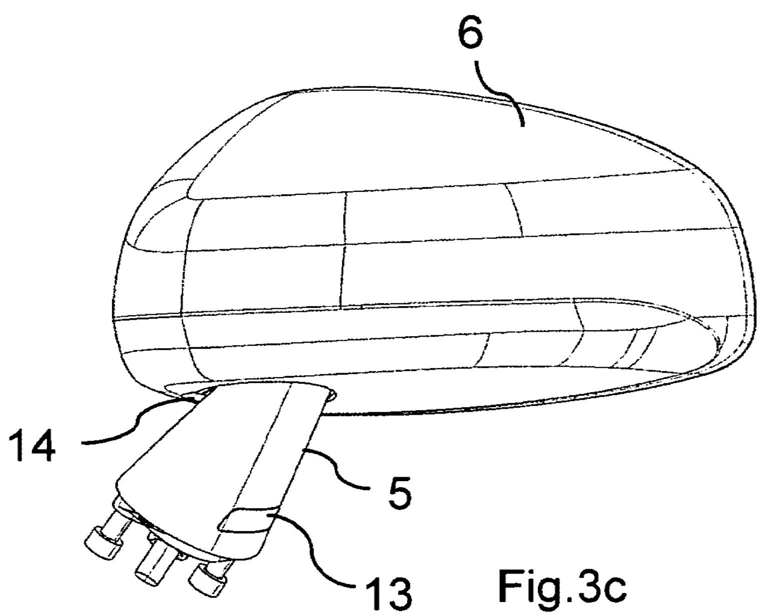


Fig.3c

EP 2 492 145 A1

Beschreibung

[0001] Die Erfindung bezieht sich auf einen Außenrückblickspiegel mit einer Spiegelglasverstellung für ein Kraftfahrzeug.

Stand der Technik

[0002] Außenrückblickspiegel an Fahrzeugen werden prinzipiell an zwei unterschiedlichen Anbauorten des Fahrzeuges angebracht. Ein Abbauort ist das Spiegeldreieck am Fahrzeug, das aus einer Seitenwand des Fahrzeugs nahe oder an der A-Säule besteht. Ein solcher Außenrückblickspiegel wird mit seinem Spiegelfuß, der sich im Allgemeinen zur Anbaufläche des Fahrzeugs flächig verbreitet, am Fahrzeug angeschraubt.

[0003] Ein weiterer Anbauort ist die Fahrzeugtür, wobei der Außenrückblickspiegel auf der Türbrüstung befestigt wird. Der Spiegelfuß des Türbrüstungsspiegels ist dabei zylindrisch aufgebaut und wird unter Verwendung von Verstärkungen an und innerhalb der Tür mit dieser verschraubt.

[0004] Die bekannten Außenspiegelanordnungen weisen gegen die Spiegelfüße drehbar gelagerte Spiegelköpfe auf, die im Fall einer Krafteinwirkung abklappen können. Zusätzlich zu dieser Sicherheitsfunktion des Abklappens werden zunehmend Abklappantriebe eingesetzt, um die Position des Spiegelkopfes in einen Parkstellung zu verdrehen. Dabei wird der Spiegelkopf soweit es die Karosserie des Fahrzeugs erlaubt an der Fahrzeug angeklappt.

[0005] Da der Sichtbereich des Spiegels auf alle Fahrerpositionen einstellbar sein muss, ist das im Spiegelkopf montierte Spiegelglas einstellbar gelagert. Über eine einfache mechanische Verstellung per Hand hinaus kann das Spiegelglas von Glasverstellern eingestellt werden. Dabei handelt sich entweder um zwei getrennte Motoren, die zwei Verstellantriebe antreiben oder um einen integrierten Glasversteller, der zwei Verstellelemente im 90° Winkel zueinander angeordnet, antreibt. Damit das Spiegelglas einstellbar ist, muss es gegenüber dem Gehäuse des Spiegelkopfes beweglich gelagert sein.

[0006] Zum Verschwenken des Spiegelglases im Spiegelkopf muss ein Spalt zwischen den Bauteilen vorhanden sein. Dieser Spalt sorgt für eine erhöhte Geräuschentwicklung des Außenrückblickspiegels, und für Verwirbelungen der Luft mit eventuell auftretenden Verschmutzungen des Spiegels. Zudem muss im Design des Außenrückblickspiegels darauf geachtet werden, dass das Spiegelglas in einer extremen Verstellposition nicht übersteht oder die überstehenden Ränder keine scharfen Kanten und den Mindestradius aufweisen.

[0007] Es ist das Ziel der Erfindung einen Spiegel vorzusehen, der zur Einstellung des Sichtwinkels nicht das Spiegelglas gegen das Spiegelgehäuse verdreht, sondern durch Verdrehung des Spiegelkopfes gegen den Spiegelfuß sowohl die Einstellung des Spiegelglases als auch eine Abklappbewegung realisiert.

[0008] Das Prinzip des starren Spiegels in einem Gehäuse ist aus den Anfangszeiten des Automobils bekannt. Der Spiegelkopf saß dabei auf einem Kugelgelenk und wurde mit Hand in die richtige Position gedreht.

[0009] Die Erfindung stellt eine elektrische Antriebslösung des Problems dar, wobei gleichzeitig kommerziell erhältliche Glasverstellantriebe in einer erfinderischen Weise eingesetzt werden, um die gewünschte Bewegung zu erzielen. Vorteilhafterweise wird über die erfindungsgemäße Lösung ein Antrieb, nämlich der Abklappantrieb eingespart. Dadurch lässt sich der Spiegel kostengünstiger herstellen. Ein weiterer Vorteil ergibt sich aus den reduzierten aerodynamischen Forderungen, da keine Schlitze zwischen Spiegelglas und Gehäuse mehr vorhanden sind.
Durch die Verwendung von konventionellen Glasverstellantrieben wird der Antrieb des erfindungsgemäßen Spiegels stark vereinfacht.

[0010] Durch die Verwendung eines einstückigen Bauteils aus Spiegelfuß und Spiegelträger wird die Anzahl der Bauteile reduziert obwohl die Komfortlösung der elektrischen Verstellung erhalten bleibt.

Beschreibung der Erfindung

[0011] Mit den Figuren und der nachfolgenden Beschreibung wird der Gegenstand der Erfindung anhand von Beispielen eines Türbrüstungsspiegels näher erläutert.

Figur 1 zeigt einen Türbrüstungsspiegel im Stand der Technik
Figur 2 zeigt denselben Spiegel in einem Schnitt senkrecht zum ersten Schnitt
Figur 3 a bis b zeigt eine erste erfindungsgemäße Lösung
Figur 4, 5 und 6 zeigen eine Sicht auf eine erfindungsgemäße Lösung ohne Gehäuse
Figur 7 und 8 zeigen einen Spiegelfuß
Fig. 9 zeigt schematisch eine zweite erfindungsgemäße Lösung

[0012] Figur 1 zeigt ein Schnittbild durch die x-z Ebene in Fahrzeugkoordinaten, wobei x die Fahrzeuglängsachse darstellt. Der Außenrückblickspiegel 1 besteht aus einem Spiegelfuß 2, der mit einem Spiegelträger 3 drehbar verbunden ist. Der Spiegelkopf 10 ist dabei um die Achse 8 verschwenkbar, sodass der Spiegelkopf in einer Parkstellung in Richtung Fahrzeug angeklappt werden kann. In Fall von Figur 1 ist ein elektrischer Antrieb für die Abklappbewegung vorgesehen. Der Spiegelfuß 2 sowie der Spiegelträger 3 sind mit Kunststoffabdeckungen verkleidet. Im Bereich des Spiegelfußes verbirgt eine Spiegelfußabdeckung 5 den technischen Aufbau, der Spiegelträger 3 wird von einer Gehäusekappe 6 und einem Gehäuserahmen 7 verdeckt. Die mechanische Anbindung an die Fahrzeugaußenkontur 4 wird nicht näher beschrieben. Da der Längsschnitt der Figur 1 durch die Achse des Spiegelfuß verläuft, ist der Glasverstellantrieb nicht sichtbar.

[0013] In Figur 2 wird der Spiegelkopf aus Figur 1 in einem Schnitt entlang der y-Achse gezeigt. Links ist die Drehachse 8 zu erkennen, um die sich der Spiegelkopf 10 dreht. Der Spiegelträger 3 ist mit dem Gehäuserahmen 7 und der Gehäusekappe 6 starr verbunden und nimmt bei seiner Bewegung gegen den Spiegelfuß mit der Spiegelfußabdeckung diese Gehäuseelemente mit. Auf dem Spiegelträger wird ein kommerzieller Glasverstellantrieb 15 angebracht. Diese Antrieb beispielsweise ein Antrieb wie er aus der EP 2017127 bekannt ist, besitzen eine halbschalenförmiges Gehäuse und ein dazu verschenkbaren Drehteller 12, der im allgemeinen eine plane Anlagefläche zur Anbindung des Spiegelglases 11 aufweist..

Das Spiegelglas 11 wird in einer Glasträgerplatte 16 gefasst oder von einer solchen hinterlegt auf den Glasverstellantrieb installiert und kann so von zwei Verstellelemente des Glasverstellantriebs über den Drehteller 12 in die gewünschte Position verschwenkt werden. Die Installation des Glases auf der Glasträgerplatte 16 ist aus Gründen des Splitterschutzes angebracht.

[0014] In Figur 2 sind unterschiedlichen Positionen des Spiegelglases 11 skizziert. Das Spiegelglas bewegt sich relativ zum Gehäuserahmen 7und den gesamten Spiegelkopf 10, während der Spiegelkopf 10 mit Spiegelträger, Gehäuseelementen und Glasverstellantrieb 15 in seiner Position verbleibt. Zum Anklappen des Spiegelkopfs muss der getrennt installierte und an der Position im Spiegelfuß sitzende Abklappantrieb einsetzt werden.

[0015] Die Figuren 3 a bis c zeigen Ansichten der erfindungsgemäßen Lösung. Das Spiegelglas 11 ist ohne einen Spalt zwischen Glas und Gehäuse direkt im Spiegelkopf installiert. Das Spiegelglas 11 ist dabei nicht gegen die Gehäuseelemente schwenkbar. Das Spiegelglas 11 muss in dieser Ausführungsform nicht von einem Spiegelglasträger eingefasst oder unterlegt sein. Der Splitterschutzkann auch durch das einfache Aufbringen einer Klebefolie gewährleitet werden.

Der Spiegelkopf 10 sitzt auf einem Spiegelfuß 2 auf. Die Gehäuseabdeckungen der Spiegelkopfes sind entweder mehrteilig aufgebaut mit Gehäuserahmen 7 und Gehäusekappe 6 oder bestehen aus einem einzigen Bauteil. Der Spiegelfuß 2 ist mit einer Spiegelfußabdeckung 5 versehen. In einer Ausführungsform weist die Spiegelfußabdeckung 5 einen Aussparung 13 auf, in die die Lichtscheibe einer Beleuchtung, wie einer Umfeldleuchte, einer Positionsleuchte, einer Warnanzeige oder eines Blinkers integriert werden kann.

Die Gehäusekappe 6 weist einen Öffnung 14 auf, die für den Durchtritt des Spiegelfußes mit der Spiegelfußabdeckung 5 dient. Durch die erfindungsgemäße Bewegung muss die Öffnung 14 größer als der Durchmesser der Spiegelfußabdeckung 5 sein. Der Spiegelkopf 10 bewegt sich gegen den Spiegelfuß, so dass je nach Verstellwegen des Spiegelkopfes die Öffnung 14 angepasst sein muss. Da durch die Öffnung 14 Spritzwasser in den Spiegelkopf eindringen könnte ist in einer alternativen Ausführungsform vorgesehen, die Öffnung um die Spiegelfußabdeckung mit einer flexiblen Membran zu verschließen.

[0016] In Figur 4 und 5 wird der erfindungsgemäße Spiegelaufbau ohne Gehäuseabdeckungen dargestellt. Der Spiegelfuß 2 ist einstückig mit dem Spiegelträger 3' verbunden. Auf den Spiegelträger 3' ist der Glasverstellantrieb 15 fest installiert. Der Glasverstellantrieb 15 ist auch in diesem Beispiel ein kommerzieller Antrieb mit halbkugeligem Gehäuse und einem planen Drehteller 12.Dieser Drehteller 12 wird vom Antrieb gegen das halbkugelige Gehäuse verdreht. Auf dem Drehteller 12 wird ein Spiegelglasträger 16 montiert, der das Spiegelglas 11 trägt.

Der Spiegelglasträger 16 ist in der erfindungsgemäßen Lösung nicht nur einen flache Platte, sondern ist als Platte mit angeschlossener Halterung 18 gestaltet. Die Halterung 18 überwindet dabei den Abstand zwischen Drehteller 12 des Glasverstellantriebs und der Spiegelglasebene mit dem Spiegelglas 11.

[0017] In Figur 6 ist dargestellt, dass die Halterung 18 keinen parallelen Aufbau zwischen Drehteller 12 des Glasverstellantriebs und dem Spiegelglas 11 aufweist. Der Drehteller 12 ist gegen die Spiegeloberfläche um einen spitzen Winkel alpha geneigt. Dazu ist die Halterung als Hohlzylinder ausgelegt, dessen Endflächen unter unterschiedlichen Winkeln geschnitten sind.

[0018] Der Spiegelglasträger 16 besitzt entlang des äußeren Randes des Spiegelglases Klipsen 17. Diese Klipse 17 werden von Gegenstücken in der Gehäuseabdeckung 6 aufgenommen und dienen zur Verbindung mit den Gehäuseabdeckungselementen des Spiegelkopfes wie der Gehäusekappe 6 und/ oder dem Gehäuserahmen 7. Es kommt dabei nicht darauf an, ob die Gehäuseabdeckung ein- oder mehrteilig gestaltet ist.

Mit den Klipsen wird die Gehäuseabdeckung starr mit dem Spiegelglasträger 16 und dem Drehteller 12 des Glasverstellantriebs verbunden.

[0019] Wird der Glasverstellantrieb aktiviert und mindesten eines der Verstellelemente angesteuert, verdreht sich der Drehteller 12 des Glasverstellantriebs15 gegen sein halbkugelförmiges Gehäuse und den Spiegelträger 3'. Mit dem Drehteller 12 verdreht sich der gesamte Aufbau bestehend aus Spiegelglasträger 16, Spiegelglas 11 und Gehäuseabdeckung 6 gegen den Spiegelträger 3' und damit gegen den Spiegelfuß 2.

[0020] Figuren 7 und 8 zeigen den Spiegelfuß 2 mit Spiegelträger 3' als einteiliges Bauelement. In diesem Ausführungsbeispiel wird der Spiegelfuß 2 mit Spiegelträger 3' aus Metallguss einstückig hergestellt. Es ist aber auch möglich, andere Werkstoff wie faserverstärkter Kunststoff oder andere spezielle Kunststoffe zu verwenden. Der Spiegelträger und der Spiegelfuß können auch mehrstückig hergestellt und danach starr miteinander verbunden werden. So dient das Befestigungelement 2' zur mechanischen Anbindung an das Fahrzeug, ist aber im Gebrauchsfall starr mit dem Spiegelfuß 2 verbunden. Es kommt nur darauf an, dass zwischen Spiegelfuß 2 und Spiegelträger 3' keine Bewegung möglich ist.

[0021] Der Spiegelfuß 2 ist dabei als Hohlzylinder ausgebildet um die Durchführung einer elektrischen Verbindung zu ermöglichen. Der Spiegelfuß kann ein- oder mehrteilig gestaltet werden. In Figur 7 und 8 wird der Spiegelfuß 2 mehrteilig aufgebaut und weist eine Entrastungslinie 32 auf, die den Hohlzylinder 2 mit dem am Fahrzeug zu befestigten Befestigungselement 2' verbindet. Die Entrastungslinie 32 ist dabei für den Notfall vorgesehen und ermöglicht es, dass der Spiegel im Falle eines Aufpralls an dieser Stelle abbricht. Es versteht sich, dass der Spiegelfußaufbau im Gebrauchsfall als starr betrachtet wird und die Entrastungslinie nicht als Bewegungsmöglichkeit für den Gebrauch gesehen wird.

[0022] Der Spiegelfuß 2 mündet in den Spiegelträger 3', der beispielhaft als dreieckige Platte 30 gestaltete wurde. Die Trägerplatte 30 besitzt Stege 31, die als Schraubdome zur Befestigung des Glasverstellantriebs vorgesehen sind. Um das halbkugelfömige Gehäuse des Glasverstellantriebs aufnehmen zu können, besitzt die Trägerplatte 30 eine mittige Ausnehmung 33. Das halbkugelfömige Gehäuse des Glasverstellantriebs sitzt dann in dieser Ausnehmung 33 und erstreckt sich in den Raum 34 zwischen den Stegen 31.
Zur starren Befestigung des Glasverstellantriebs kann aber auch jede andere Methode wie Verklipsen, Verpressen, Verschweissen usw. gewählt werden.

[0023] Das Verstellen des Spiegelglases durch Verstellen des gesamten Spiegelkopfes gegen den Spiegelfuß und der Spiegelfußabdeckung findet statt, indem die beiden Motoren des Glasverstellantriebs Verstellelement unterschiedlich weit auslenken und so den Drehteller 12 mit dem Spiegelträger 16 und dem Spiegelglas 11 bewegen.

[0024] In Figur 4 sind die Drehachsen des Glasverstellantriebs mit A und B eingezeichnet. Eine Bewegung um die B-Achse regelt die Position ungefähr um die Horizontale, einen Bewegung um die A-Achse bewegt den Spiegelkopf nahe der Vertikalen zum oder vom Fahrzeug weg. Diese Bewegung wird in einem bevorzugten Ausführungsbeispiel asymmetrisch ausgeführt. Da die kommerziellen Glasverstellantriebe in der Auslenkung limitiert sind und es der Wunsch ist , den Spiegelkopf in einer Parkstellung näher an die Fahrzeugaußenkontur anzulegen, ist die Spiegelglasträgerplatte 16 nach Figur 6 mit dem Winkel alpha angekeilt. Dadurch wird die äußere Kante des Spiegelkopfes um einen größeren Winkel verschwenkbar als es im Verstellweg des Glasverstellantriebs bei parallelem Aufbau möglich wäre.

[0025] Fig. 9 zeigt einen alternativen Aufbau der Spiegeleinstellung. Der Glasverstellantrieb 15 wird dabei mit seiner Oberfläche 12 so eingebaut, dass die Oberfläche 12 in Richtung Gehäusekappe 6 zeigt. Der Drehteller 12 des Glasverstellantriebs 15 greift dabei entweder direkt oder über eine Verbindungsplatte1 7 an die Gehäusekappe an, die starr mit dem Spiegelglas 11 verbunden ist.

[0026] Die elektrische Anbindung der Außenrückblickspiegels erfolgt über den hohlen Spiegelfuß 2. Die elektrischen Leitungen für den Glasverstellantrieb werden durchgeführt und direkt mit dem Antrieb verbunden. Wenn ein heizbares Spiegelglas eingesetzt ist, wird die Kontaktierung des Spiegelglases entweder über den Glasverstellmotor 15 direkt erreicht oder es werden in der Ausführungsform nach Figur 9 getrennte Kontakte mit einer eigenen elektrischen Zuleitung verlegt.

[0027] Die Erfindung ist nicht auf einen Türbrüstungsspiegel beschränkt, auch ein Außenrückblickspiegel , der am Spiegeldreieck des Fahrzeugs angebracht ist, kann mit der erfindungsgemäßen Lösung ausgestattet sein. Allerdings ist für die Abklappfunktion der Bewegungswinkel der Außenrückblickspiegelspitze größer als im Falle einer Türbrüstungsmontage.
Daher wird für den Einsatz in einem Außenrückblickspiegel am Spiegeldreieck der Verstellweg eines Verstellelements deutlich größer um die Auslenkung zu erzielen, die man für das Anklappen an das Fahrzeug benötigt.
In einem solchen Anwendungsfall wäre der Einsatz von konventionellen Glasverstellantrieben nicht sinnvoll, sondern man müsste getrennten Antrieb für die beiden Verstellachsen vorsehen, wobei die Verstellwege der Verstellelemente deutlich größer sind.

Legende:

[0028]

1 Außenrückblickspiegel
2 Spiegelfuß
3 Spiegelträger
3' fest verbundener Spiegelträger
4 Fahrzeugaußenkontur
5 Spiegelfußabdeckung
6 Gehäusekappe
7 Gehäuserahmen
8 Achse
10 Spiegelkopf
11 Spiegelglas
12 Drehteller
13 Aussparung
14 Öffnung
15 Glasverstellantrieb
16 Spiegelglasträger
17 Klips
18 Halterung
30 Trägerplatte
31 Stege
32 Entrastungslinie
33 Ausnehmung
34 Aufnahmeraum

Patentansprüche

1. Außenrückblickspiegel mit einem Spiegelkopf (10)

und einem Spiegelfuß (2), die mit mindestens einem Gehäuseelement wie Gehäuserahmen (7), Gehäusekappe (6), Spiegelfußabdeckung (5) verkleidet sind, und einem Spiegelglas (11), das starr relativ zum Spiegelkopf (10) installiert ist, **dadurch gekennzeichnet, dass** der Spiegelfuß (2) starr mit einem Spiegelträger (3') verbunden ist, der mindesten einen elektrischen Glasverstellantrieb (15) trägt, wobei der mindestens eine Glasverstellantrieb (15) mit dem mindestens einem Gehäuseelement verbindbar ist.

2. Außenrückblickspiegel nach Anspruch 1 **dadurch gekennzeichnet, dass** der Spiegelfuß (2) und der Spiegelträger (3') einstückig ausgebildet sind.

3. Außenrückblickspiegel nach Anspruch 1 1 **dadurch gekennzeichnet, dass** der Spiegelfuß (2) eine Entrastungslinie (32) aufweist.

4. Außenrückblickspiegel nach Anspruch 1 **dadurch gekennzeichnet, dass** der Spiegelfuß (2) mehrstückig ausgebildet ist und die Bauteile für den normalen Gebrauch starr verbunden sind.

5. Außenrückblickspiegel nach Anspruch 1 **dadurch gekennzeichnet, dass** der Spiegelfuß (2) eine Spiegelfußabdeckung mit einer Aussparung (13) für einen Leuchte aufweist.

6. Außenrückblickspiegel nach Anspruch 1 **dadurch gekennzeichnet, dass** der Spiegelträger (3') eine Ausnehmung (33) zur Aufnahme des Glasverstellantriebs aufweist.

7. Außenrückblickspiegel nach Anspruch 1 **dadurch gekennzeichnet, dass** der Spiegelträger (3') Vorrichtungen (31) zur Befestigung des Glasverstellantriebs aufweist.

8. Außenrückblickspiegel nach Anspruch 1 **dadurch gekennzeichnet, dass** der Spiegelglasträger (16) eine Halterung (18) aufweist, die einen Winkel Alpha zwischen den Glasverstellantrieb (15) und dem Spiegelglas (11) erzeugt.

9. Außenrückblickspiegel nach Anspruch 1 **dadurch gekennzeichnet, dass** der Glasverstellantrieb (15) zwei senkrecht zueinander stehende Achsen (A, B) aufweist, die horizontal und vertikal ausgerichtet sind.

10. Außenrückblickspiegel nach Anspruch 1 **dadurch gekennzeichnet, dass** der Glasverstellantrieb (15) zwei senkrecht zueinander stehende Achsen (A,B) aufweist, die von der Horizontalen und Vertikalen abweichen.

11. Außenrückblickspiegel nach Anspruch 1 **dadurch gekennzeichnet, dass** der Glasverstellantrieb (15) zwei nicht senkrecht zueinander stehende Achsen (A, B) aufweist.

12. Außenrückblickspiegel nach Anspruch 1 **dadurch gekennzeichnet, dass** der Spiegelglasträger (16) Vorrichtungen (17) zur starren Befestigung mindestens eines Gehäuseelements (6,7) des Spiegelkopfes aufweist.

13. Außenrückblickspiegel nach Anspruch 1 **dadurch gekennzeichnet, dass** der Drehteller (12) des Glasverstellantriebs Vorrichtungen (17) zur starren Befestigung mindestens eines Gehäuseelements (6,7) des Spiegelkopfes aufweist.

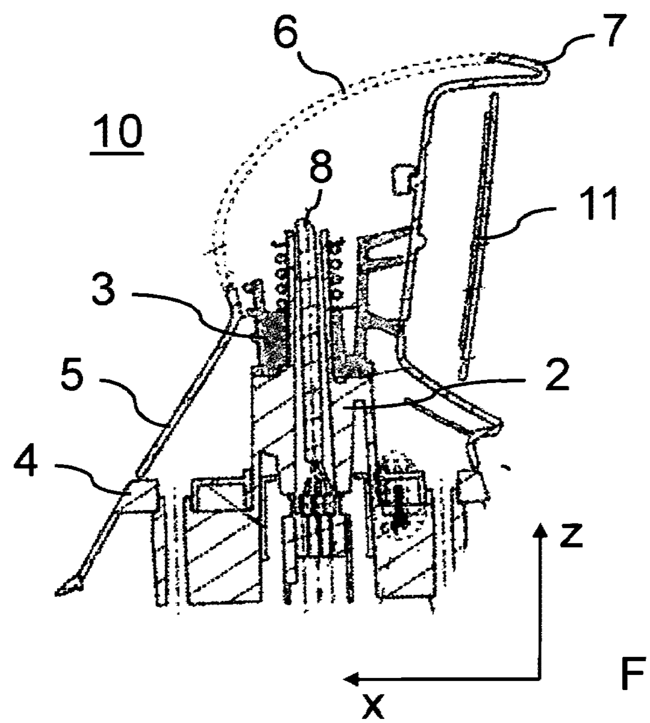


Fig.1

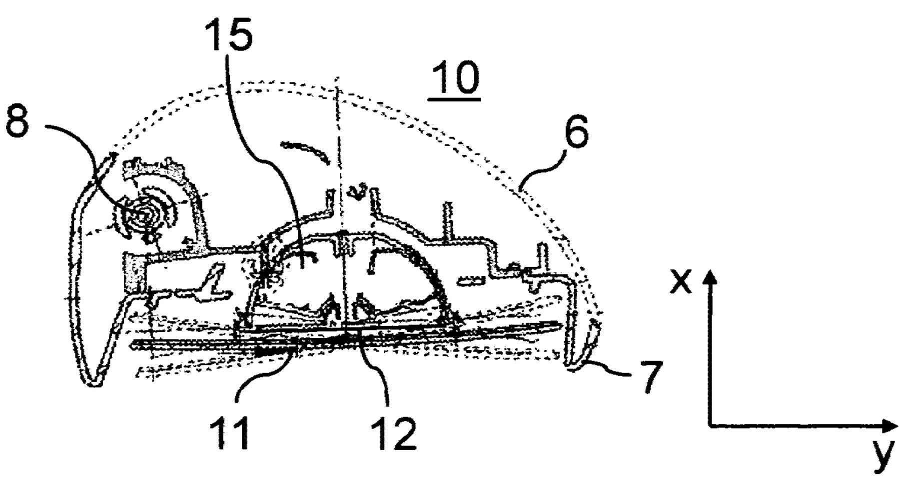


Fig. 2

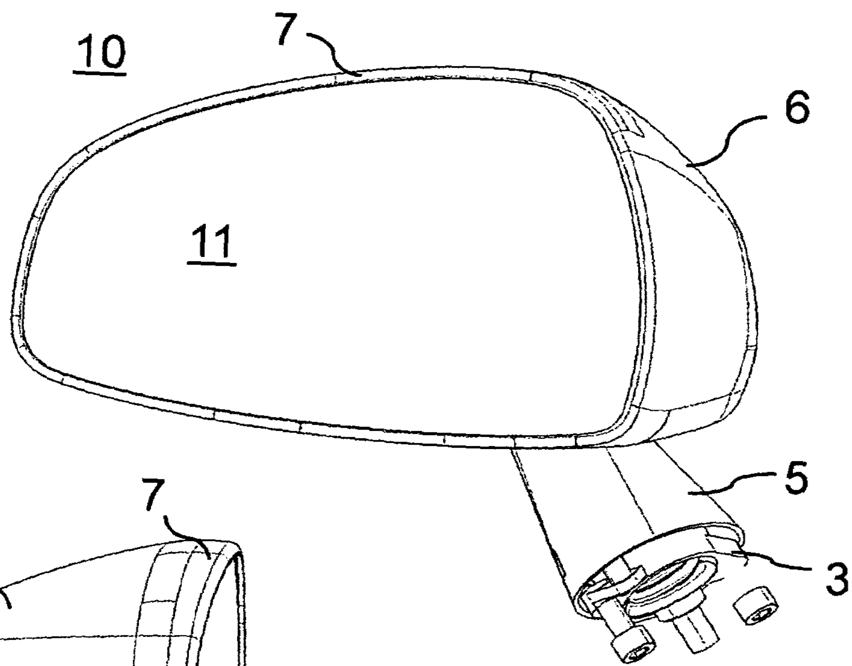


Fig.3a

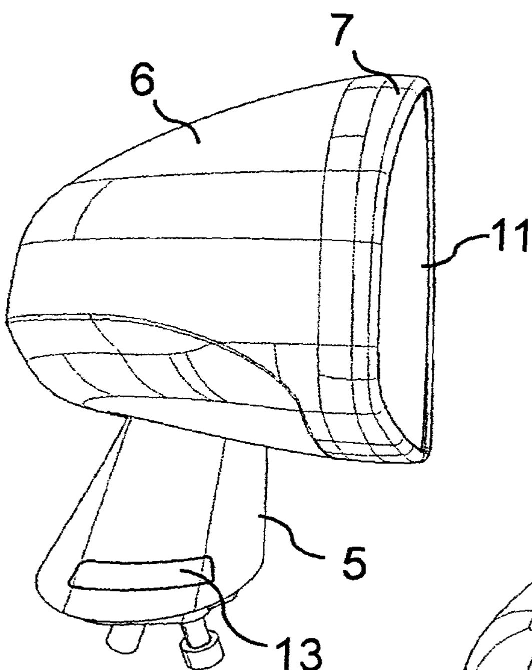


Fig.3b

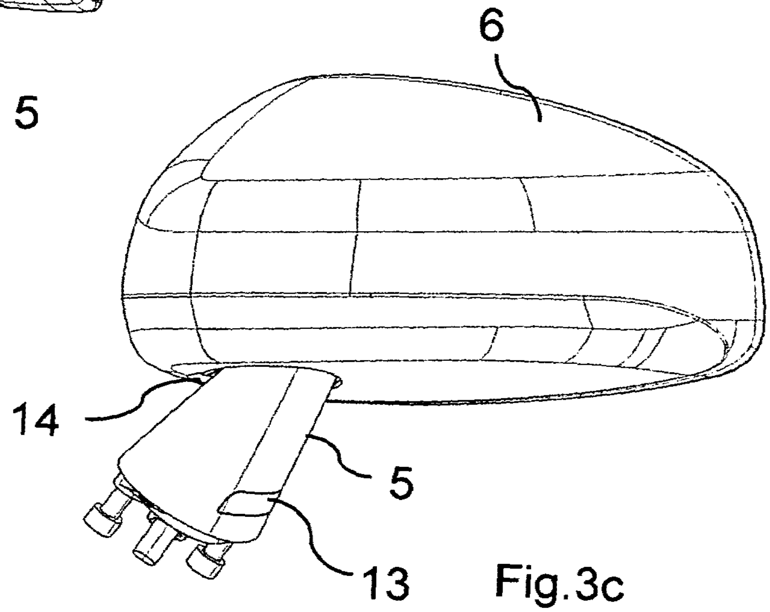


Fig.3c

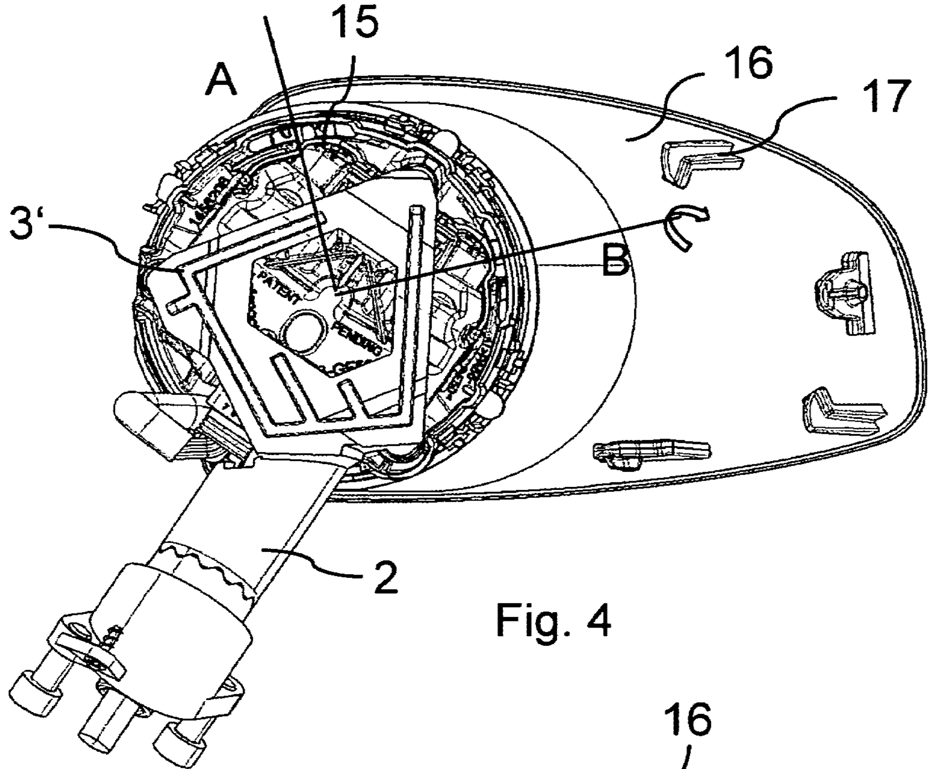


Fig. 4

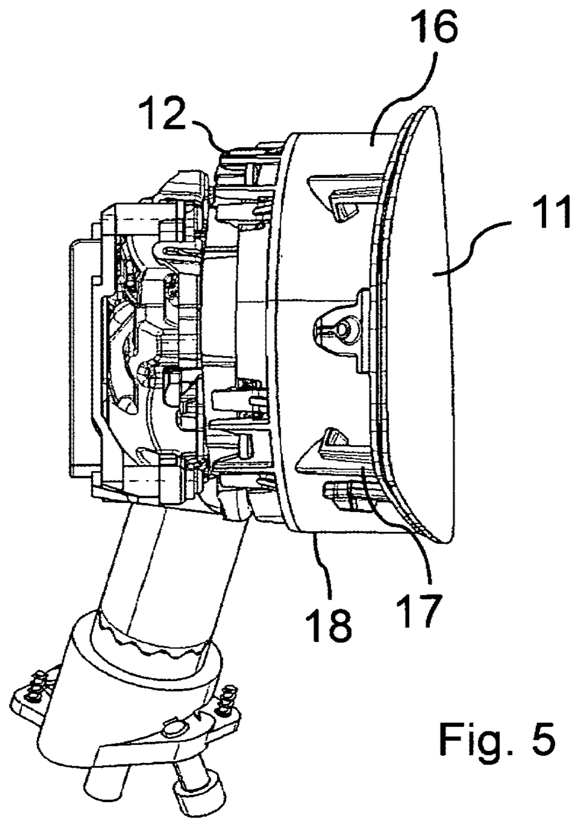


Fig. 5

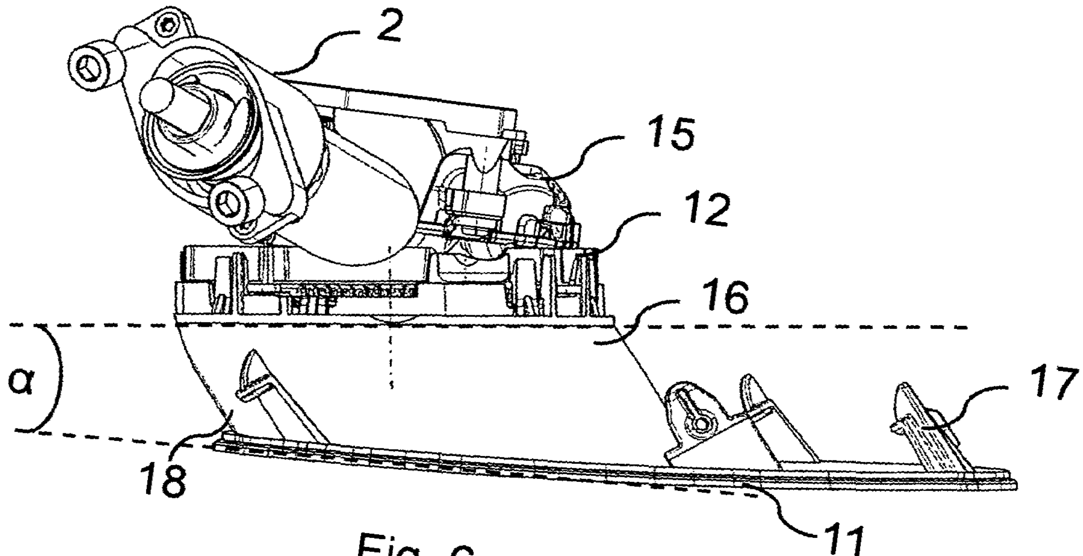


Fig. 6

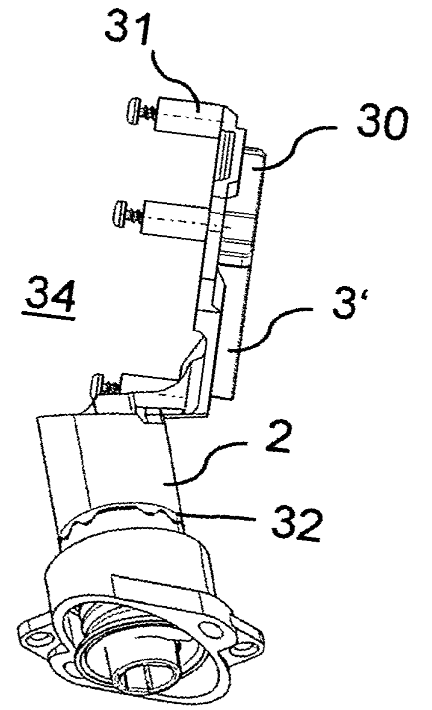


Fig. 7

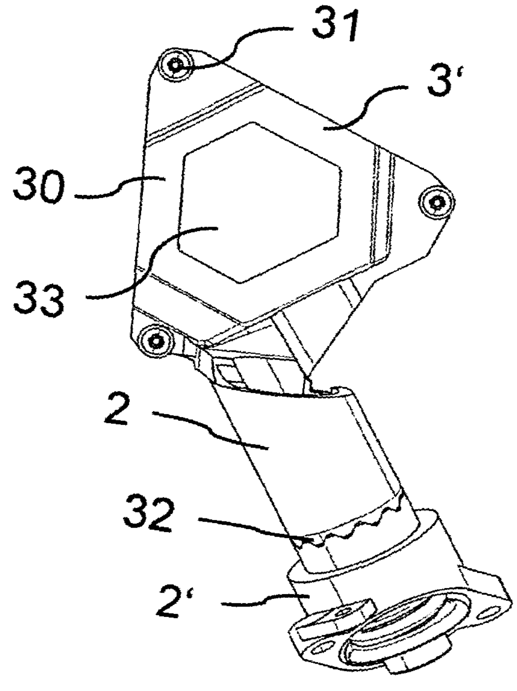


Fig. 8

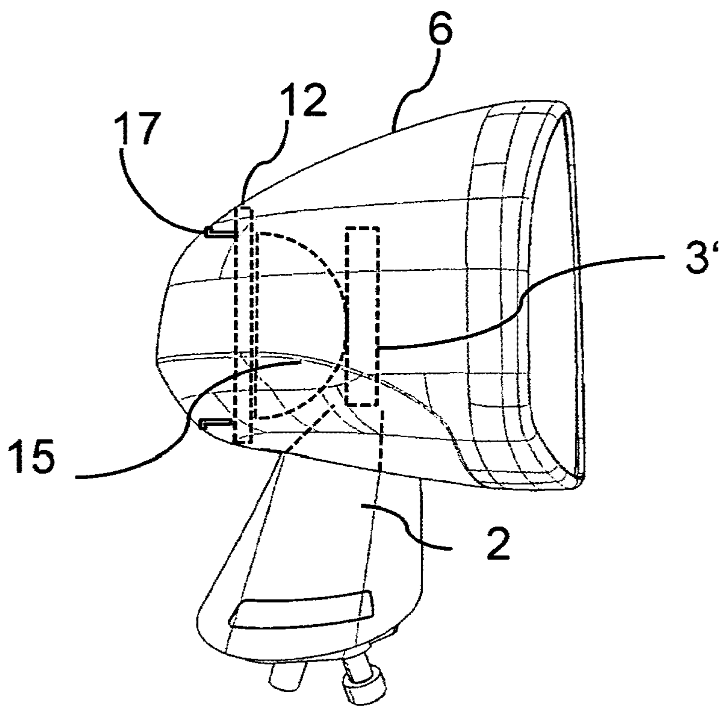


Fig. 9

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPÄISCHER RECHERCHENBERICHT

Nummer der Anmeldung
EP 11 40 0016

EINSCHLÄGIGE DOKUMENTE			
Kategorie	Kennzeichnung des Dokuments mit Angabe, soweit erforderlich, der maßgeblichen Teile	Betrifft Anspruch	KLASSIFIKATION DER ANMELDUNG (IPC)
X	EP 2 165 886 A1 (SMR PATENTS SARL [LU]) 24. März 2010 (2010-03-24) * Absatz [0016] - Absatz [0023]; Abbildungen 1-16 * -----	1,4,6-11	INV. B60R1/072
A	US 5 473 476 A (FUJITA MASAKI [JP]) 5. Dezember 1995 (1995-12-05) * Spalte 2, Zeile 10 - Zeile 62; Abbildungen 1, 2 * -----	1	
A	US 2001/015862 A1 (LYNAM NIALL R [US] ET AL) 23. August 2001 (2001-08-23) * Absatz [0027] - Absatz [0042]; Abbildung 7 * -----	1	
A	EP 1 300 289 A2 (ICHIKOH INDUSTRIES LTD [JP]) 9. April 2003 (2003-04-09) * Absatz [0012] - Absatz [0015]; Abbildungen 1, 2 * -----	1	
			RECHERCHIERTE SACHGEBIETE (IPC)
			B60R

Der vorliegende Recherchenbericht wurde für alle Patentansprüche erstellt

1

Recherchenort	Abschlußdatum der Recherche	Prüfer
Berlin	27. Juni 2011	Ekblom, Henrik

KATEGORIE DER GENANNTEN DOKUMENTE

X : von besonderer Bedeutung allein betrachtet
Y : von besonderer Bedeutung in Verbindung mit einer anderen Veröffentlichung derselben Kategorie
A : technologischer Hintergrund
O : nichtschriftliche Offenbarung
P : Zwischenliteratur

T : der Erfindung zugrunde liegende Theorien oder Grundsätze
E : älteres Patentdokument, das jedoch erst am oder nach dem Anmeldedatum veröffentlicht worden ist
D : in der Anmeldung angeführtes Dokument
L : aus anderen Gründen angeführtes Dokument

& : Mitglied der gleichen Patentfamilie, übereinstimmendes Dokument

EPO FORM 1503 03.82 (P04C03)

ANHANG ZUM EUROPÄISCHEN RECHERCHENBERICHT ÜBER DIE EUROPÄISCHE PATENTANMELDUNG NR.

EP 11 40 0016

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.

27-06-2011

Im Recherchenbericht angeführtes Patentdokument	Datum der Veröffentlichung	Mitglied(er) der Patentfamilie	Datum der Veröffentlichung
EP 2165886 A1	24-03-2010	US 2010067131 A1	18-03-2010
US 5473476 A	05-12-1995	JP H0467545 U	16-06-1992
US 2001015862 A1	23-08-2001	KEINE	
EP 1300289 A2	09-04-2003	CN 1410296 A	16-04-2003
		DE 60202335 D1	27-01-2005
		DE 60202335 T2	14-04-2005
		KR 20030028714 A	10-04-2003
		US 2003086189 A1	08-05-2003

Für nähere Einzelheiten zu diesem Anhang : siehe Amtsblatt des Europäischen Patentamts, Nr.12/82

IN DER BESCHREIBUNG AUFGEFÜHRTE DOKUMENTE

Diese Liste der vom Anmelder aufgeführten Dokumente wurde ausschließlich zur Information des Lesers aufgenommen und ist nicht Bestandteil des europäischen Patentdokumentes. Sie wurde mit größter Sorgfalt zusammengestellt; das EPA übernimmt jedoch keinerlei Haftung für etwaige Fehler oder Auslassungen.

In der Beschreibung aufgeführte Patentdokumente

- EP 2017127 A **[0013]**

Patent Translate

Powered by EPO and Google

Notice

This translation is machine-generated. It cannot be guaranteed that it is intelligible, accurate, complete, reliable or fit for specific purposes. Critical decisions, such as commercially relevant or financial decisions, should not be based on machine-translation output.

DESCRIPTION EP2492145

[0001]

The invention relates to an exterior rearview mirror with a mirror glass adjustment for a motor vehicle.

State of the art

[0002]

Exterior rearview mirrors on vehicles are principally mounted on two different mounting locations of the vehicle. A mining location is the mirror triangle on the vehicle, which consists of a side wall of the vehicle near or at the A-pillar. Such an exterior rearview mirror is bolted to the vehicle with its mirror base, which generally spreads flat to the acreage of the vehicle.

[0003]

Another mounting location is the vehicle door, with the exterior rearview mirror is mounted on the door sill. The mirror base of the door sill mirror is cylindrical and is screwed using reinforcements on and inside the door with this.

[0004]

The known exterior mirror arrangements have mirror heads rotatably mounted on the mirror feet, which can fold down in the event of a force. In addition to this safety function of folding down increasingly Abklappantriebe be used to rotate the position of the mirror head in a parking position. In this case, the mirror head is as far as the body of the vehicle allowed folded on the vehicle.

[0005]

Since the field of vision of the mirror must be adjustable to all driver positions, the mirror glass mounted in the mirror head is mounted adjustable. In addition to a simple mechanical adjustment by hand, the mirror glass can be adjusted by Glasverstellern. These are either two separate motors that drive two adjusting drives or an integrated glass stage, which drives two adjusting elements at 90 ° to each other. For the mirror glass to be adjustable, it must be movably mounted relative to the housing of the mirror head.

[0006]

To pivot the mirror glass in the mirror head, there must be a gap between the components. This gap provides for increased noise of the exterior rearview mirror, and for turbulence of the air with any possible contamination of the mirror. In addition, care must be taken in the design of the exterior rearview mirror that the mirror glass does not protrude in an extreme adjustment position or the protruding edges have no sharp edges and the minimum radius.

[0007]
It is the object of the invention to provide a mirror which does not rotate the mirror glass against the mirror housing for adjusting the viewing angle, but realizes both the adjustment of the mirror glass and a Abklappbewegung by rotation of the mirror head against the mirror base.

[0008]

The principle of the rigid mirror in a housing is known from the early days of the automobile.

The mirror head sat on a ball joint and was turned by hand in the correct position.

[0009]

The invention provides an electric drive solution to the problem, while using commercially available glass pitch drives in an inventive manner to achieve the desired movement. Advantageously, a drive, namely the Abklappantrieb saved on the inventive solution. As a result, the mirror can be produced more cheaply. Another advantage results from the reduced aerodynamic requirements, since there are no more slots between mirror glass and housing. The use of conventional glass adjustment drives the drive of the mirror according to the invention is greatly simplified.

[0010]
The use of a one-piece mirror and mirror mount component reduces the number of components, while maintaining the convenience of electrical adjustment.

Description of the invention

[0011]

With the figures and the following description of the subject invention will be explained in more detail with reference to examples of a door sill mirror.

FIG. 2 shows the same mirror in a section perpendicular to the first section FIG. 3 a to b shows a first solution according to the invention FIG. 4, 5 and 6 show a view of a solution according to the invention without housing FIG. 7 and FIG show a mirror foot Fig. 9 shows schematically a second solution according to the invention

[0012]

FIG. 1 shows a sectional view through the x-z plane in vehicle coordinates, where x represents the vehicle longitudinal axis. The exterior rearview mirror 1 consists of a mirror 2, which is rotatably connected to a mirror support 3. The mirror head 10 is pivotable about the axis 8, so that the mirror head can be folded in a parking position in the direction of the vehicle. In the case of Figure 1, an electric drive for the Abklappbewegung is provided. The mirror 2 and the mirror support 3 are covered with plastic covers. In the area of the mirror base, a mirror base cover 5 hides the technical structure, the mirror support 3 is covered by a housing cap 6 and a housing frame 7. The mechanical connection to the vehicle outer contour 4 will not be described in detail. Since the longitudinal section of Figure 1 passes through the axis of the mirror, the Glasverstellantrieb is not visible.

[0013]

In Figure 2, the mirror head of Figure 1 is shown in a section along the y-axis. On the left, the axis of rotation 8 can be seen, around which the mirror head 10 rotates. The mirror support 3 is rigidly connected to the housing frame 7 and the housing cap 6 and takes in its movement against the mirror base with the Spiegelfußabdeckung these housing elements. On the mirror support a commercial Glasverstellantrieb 15 is attached. This drive, for example, a drive as it is known from EP 2017127, have a half-shell-shaped housing and a verschenkbaren turntable 12, which generally has a planar contact surface for connecting the mirror glass 11. The mirror glass 11 is taken in a glass carrier plate 16 or deposited by such deposited on the Glasverstellantrieb and can be pivoted by two adjusting the Glasverstellantriebs about the turntable 12 in the desired position. The installation of the glass on the glass carrier plate 16 is mounted for reasons of splinter protection.

[0014]

In Figure 2 different positions of the mirror glass 11 are outlined. The mirror glass moves relative to the housing frame 7 and the entire mirror head 10, while the mirror head 10 with mirror support, housing elements and Glasverstellantrieb 15 remains in its position. To fold the mirror head the separately installed and sitting in the position in the mirror foot folding drive must be used.

[0015]

FIGS. 3 a to c show views of the solution according to the invention. The mirror glass 11 is installed directly in the mirror head without a gap between the glass and the housing. The mirror glass 11 is not pivotable against the housing elements. The mirror glass 11 need not be enclosed or underlaid by a mirror glass substrate in this embodiment. The splinter protection can also be ensured by the simple application of an adhesive film. The mirror head 10 is seated on a mirror 2. The housing covers the mirror head are either multi-part constructed with housing frame 7 and housing cap 6 or consist of a single component. The mirror 2 is provided with a mirror base cover 5. In one embodiment, the mirror base cover 5 has a recess 13, in which the lens of a lighting, such as an ambient light, a position light, a warning light or a turn signal can be integrated. The housing cap 6 has an opening 14, which serves for the passage of the mirror base with the mirror base cover 5.

Due to the movement according to the invention, the opening 14 must be larger than the diameter of the mirror base cover 5. The mirror head 10 moves against the mirror, so that depending on the adjustment of the mirror head, the opening 14 must be adjusted. Since spray water could penetrate into the mirror head through the opening 14, it is provided in an alternative embodiment to close the opening around the mirror base cover with a flexible membrane.

[0016]

In Figures 4 and 5, the mirror assembly according to the invention is shown without housing covers. The mirror 2 is integrally connected to the mirror support 3 '. On the mirror support 3 'of Glasverstellantrieb 15 is permanently installed. The Glasverstellantrieb 15 is also in this example, a commercial drive with hemispherical housing and a flat turntable 12th This turntable 12 is rotated by the drive against the hemispherical housing. On the turntable 12, a mirror glass support 16 is mounted, which carries the mirror glass 11. The mirror glass support 16 is not only a flat plate in the inventive solution, but is designed as a plate with attached bracket 18. The holder 18 thereby overcomes the distance between the turntable 12 of the glass adjustment drive and the mirror glass plane with the mirror glass 11.

[0017]

In Figure 6 it is shown that the holder 18 has no parallel structure between the turntable 12 of the Glasverstellantriebs and the mirror glass 11. The turntable 12 is inclined against the mirror surface by an acute angle alpha. For this purpose, the holder is designed as a hollow cylinder whose end faces are cut at different angles.

[0018]

The mirror glass carrier 16 has clips 17 along the outer edge of the mirror glass. These clips 17 are received by counterparts in the housing cover 6 and serve for connection to the housing cover elements of the mirror head as the housing cap 6 and / or the housing frame. 7 It does not matter whether the housing cover is designed in one or more parts. With the clips, the housing cover is rigidly connected to the mirror glass carrier 16 and the turntable 12 of Glasverstellantriebs.

[0019]

If the Glasverstellantrieb is activated and controlled at least one of the adjusting elements, the turntable 12 of Glasverstellantriebs15 rotates against its hemispherical housing and the mirror support 3 '. With the turntable 12, the entire structure consisting of mirror glass carrier 16, mirror glass 11 and housing cover 6 is rotated against the mirror support 3 'and thus against the mirror 2.

[0020]

Figures 7 and 8 show the mirror 2 with mirror support 3 'as a one-piece device. In this embodiment, the mirror base 2 is made in one piece with mirror support 3 'made of cast metal. But it is also possible to use other material such as fiber-reinforced plastic or other special plastics. The mirror support and the mirror can also be made in several pieces and then rigidly connected together. Thus, the fastening element 2 'for mechanical connection to the vehicle, but is in use rigidly connected to the mirror 2. It is only important that between mirror 2 and mirror support 3 'no movement is possible.

[0021]

The mirror 2 is designed as a hollow cylinder to allow the implementation of an electrical connection. The mirror base can be designed in one or more parts. In Figure 7 and 8, the mirror 2 is constructed in several parts and has a Entastungslinie 32, which connects the hollow cylinder 2 with the fastening element 2 'to be fastened to the vehicle. The Entastungslinie 32 is provided for emergency and allows the mirror breaks off in the event of an impact at this point. It is understood that the Spiegelfußaufbau is considered in the case of use as rigid and the Entastungslinie is not seen as a possibility of movement for use.

[0022]

The mirror 2 opens into the mirror support 3 ', which was designed as a triangular plate 30 by way of example. The support plate 30 has webs 31, which are provided as Schraubdome for fixing the Glasverstellantriebs. In order to accommodate the halbkugelfömige housing of Glasverstellantriebs, the support plate 30 has a central recess 33rd The halbkugelfömige housing of Glasverstellantriebs then sits in this recess 33 and extends into the space 34 between the webs 31st For rigid attachment of Glasverstellantriebs but also any other method such as Verklipsen, pressing, welding, etc. can be selected.

[0023]
The adjustment of the mirror glass by adjusting the entire mirror head against the mirror base and the Spiegelfußabdeckung takes place by the two motors of Glasverstellantriebs adjusting cause different levels and so move the turntable 12 with the mirror support 16 and the mirror glass 11.

[0024]

In Figure 4, the axes of rotation of Glasverstellantriebs with A and B are located.

Movement about the B axis controls the position approximately around the horizontal, moving around the A axis moves the mirror head near the vertical to or from the vehicle. This movement is carried out asymmetrically in a preferred embodiment. Since the commercial Glasverstellantriebe are limited in the deflection and it is the desire to put the mirror head in a parking position closer to the vehicle outer contour, the mirror glass support plate 16 is keyed according to Figure 6 with the angle alpha. As a result, the outer edge of the mirror head is pivotable by a larger angle than would be possible in the adjustment of the Glasverstellantriebs parallel construction.

[0025]

Fig. 9 shows an alternative construction of the mirror adjustment. The Glasverstellantrieb 15 is thereby incorporated with its surface 12 so that the surface 12 in the direction of the housing cap 6 shows. The turntable 12 of the Glasverstellantriebs 15 engages either directly or via a connecting plate 17 to the housing cap, which is rigidly connected to the mirror glass 11.

[0026]

The electrical connection of the exterior rearview mirror via the hollow mirror 2. The electrical cables for the Glasverstellantrieb be performed and connected directly to the drive. If a heatable mirror glass is used, the contacting of the mirror glass is achieved either directly via the glass variable displacement motor 15 or in the embodiment of Figure 9 separate contacts are laid with its own electrical supply line.

[0027]

The invention is not limited to a door sill mirror, also an exterior rearview mirror, which is mounted on the mirror triangle of the vehicle, can be equipped with the inventive solution. However, for the folding function of the movement angle of the exterior rearview mirror tip is greater than in the case of a Türbrüstungsmontage. Therefore, for use in an exterior rearview mirror on the mirror triangle, the adjustment of an adjustment significantly larger to achieve the deflection that you need for folding on the vehicle. In such an application, the use of conventional Glasverstellantrieben would not make sense, but you would have to provide separate drive for the two adjustment axes, the adjustment of the adjustment are significantly larger.

Legend:

[0028]
1 Exterior rearview mirror 2 Mirror base 3 Mirror support 3 'firmly connected mirror support 4 Vehicle outer contour 5 Mirror foot cover 6 Housing cap 7 housing frame 8 axis 10 mirror head 11 mirror glass 12 turntable 13 recess 14 opening 15 glass adjustment drive 16 mirror glass carrier 17 clips 18 holder 30 carrier plate 31 webs 32 Unclamping line 33 recess 34 receiving space

CLAIMS EP2492145

1.
An exterior rearview mirror with a mirror head (10) and a mirror base (2), which are covered with at least one housing element such as housing frame (7), housing cap (6), mirror base cover (5), and a mirror glass (11) which is rigid relative to the mirror head (10) is installed, characterized in that the mirror base (2) is rigidly connected to a mirror support (3 ') carrying at least one electric Glasverstellantrieb (15), wherein the at least one Glasverstellantrieb (15) is connectable to the at least one housing element ,

2.
Exterior rearview mirror according to claim 1, characterized in that the mirror base (2) and the mirror support (3 ') are integrally formed.

3.
Exterior rearview mirror according to claim 1 1 characterized in that the mirror base (2) has a Entastungslinie (32).

4.
Exterior rearview mirror according to claim 1, characterized in that the mirror base (2) is formed in several pieces and the components are rigidly connected for normal use.

5.

Exterior rearview mirror according to claim 1, characterized in that the mirror base (2) has a mirror base cover with a recess (13) for a lamp.

6.
External rearview mirror according to claim 1, characterized in that the mirror support (3 ') has a recess (33) for receiving the Glasverstellantriebs.

7.
Exterior rearview mirror according to claim 1, characterized in that the mirror support (3 ') has devices (31) for fixing the Glasverstellantriebs.

8.
Exterior rearview mirror according to claim 1, characterized in that the mirror glass carrier (16) has a holder (18) which generates an angle alpha between the glass adjustment drive (15) and the mirror glass (11).

9.
Exterior rearview mirror according to claim 1, characterized in that the Glasverstellantrieb (15) has two mutually perpendicular axes (A, B), which are aligned horizontally and vertically.

10.
Exterior rearview mirror according to claim 1, characterized in that the Glasverstellantrieb (15) has two mutually perpendicular axes (A, B) which deviate from the horizontal and vertical.

11.
External rearview mirror according to claim 1, characterized in that the Glasverstellantrieb (15) has two non-mutually perpendicular axes (A, B).

12.
An exterior rearview mirror according to claim 1, characterized in that the mirror glass carrier (16) has devices (17) for the rigid attachment of at least one housing element (6, 7) of the mirror head.

13.

Exterior rearview mirror according to claim 1, characterized in that the turntable (12) of the Glasverstellantriebs devices (17) for rigid attachment of at least one housing element (6,7) of the mirror head.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
28 October 2010 (28.10.2010)

PCT

(10) International Publication Number
WO 2010/124064 A1

(51) International Patent Classification:
G02B 5/08 (2006.01)

(21) International Application Number:
PCT/US2010/032017

(22) International Filing Date:
22 April 2010 (22.04.2010)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/172,022 23 April 2009 (23.04.2009) US
61/187,112 15 June 2009 (15.06.2009) US

(71) Applicant *(for all designated States except US)*: **MAGNA MIRRORS OF AMERICA, INC.** [US/US]; 49 West Third Street, Holland, Michigan 49423 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **DEWIND, Darryl P.** [US/US]; 7030 120th Avenue, Holland, Michigan 49424 (US). **BAUR, Michael J.** [US/US]; 2978 Thornbury Drive, Holland, Michigan 49424 (US). **PERKINS, Timothy G.** [US/US]; 4355 Trail East Drive NE, Ada, Michigan 49301 (US).

(74) Agent: **VAN DYKE, GARDNER, LINN & BURKHART, LLP, and its individual attorneys, primarily Timothy A. Flory**; 2851 Charlevoix Drive SE, Suite 207, Grand Rapids, Michigan 49546 (US).

(81) **Designated States** *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) **Designated States** *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

[Continued on next page]

(54) **Title**: MIRROR ASSEMBLY FOR VEHICLE

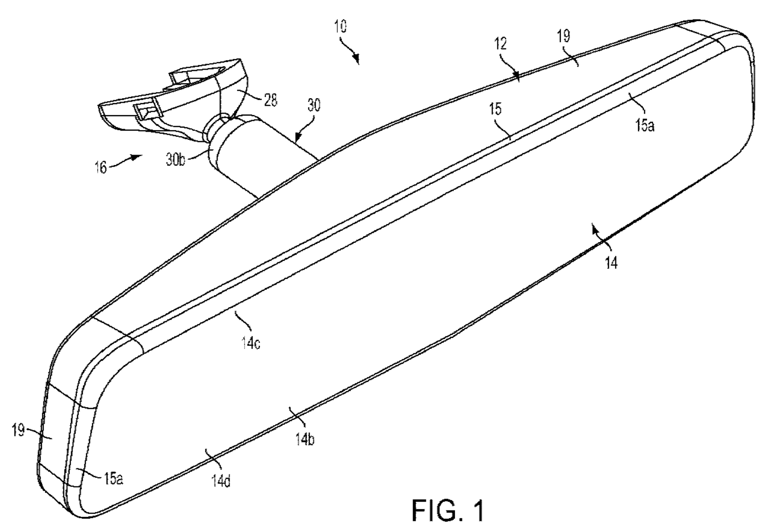


FIG. 1

(57) Abstract: A vehicular rearview mirror assembly includes a mirror casing, a reflective element and a mounting assembly for adjustably mounting the mirror assembly at a portion of the equipped vehicle. The reflective element has a front surface and a rear surface and a perimeter edge about its periphery and extending between the front and rear surfaces. The front surface generally faces a driver of the vehicle when the mirror assembly is normally mounted in the equipped vehicle. The rear surface of the reflective element may be attached to an attachment surface of an attachment plate or of the mirror casing to secure the reflective element relative to the mirror casing. The perimeter edge of the reflective element may be exposed and viewable by the driver of the vehicle when the reflective element is attached to the attachment surface and when the mirror assembly is normally mounted in the equipped vehicle.

WO 2010/124064 A1

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

— *of inventorship (Rule 4.17(iv))*

Published:

— *with international search report (Art. 21(3))*

MIRROR ASSEMBLY FOR VEHICLE

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims the benefit of U.S. provisional applications, Ser. No. 61/187,112, filed Jun. 15, 2009, and Ser. No. 61/172,022, filed Apr. 23, 2009, which are hereby incorporated herein by reference in their entireties.

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 is adjustably mounted to an interior portion of a vehicle.

BACKGROUND OF THE INVENTION

[0003] Typically, a prismatic interior rearview mirror assembly includes a mirror reflective element that is attached to an attachment plate and at least partially received in a casing, with a bezel portion snapped to the casing so that the bezel portion and casing overlap or encompass a perimeter edge of the reflective element and a portion or perimeter region of an outer or front surface of the reflective element (the surface facing the driver of the vehicle when the mirror assembly is normally mounted in the vehicle). The reflective element is adjustable by the driver to adjust the rearward field of view provided by the mirror reflective element.

SUMMARY OF THE INVENTION

[0004] The present invention provides a rearview mirror assembly that includes a casing and a reflective element attached to or adhered to a surface or portion of the casing with no bezel portion overlapping or encompassing a perimeter edge or front surface of the reflective element. The reflective element may comprise a prismatic or wedge-shaped reflective element and the perimeter edge of the reflective element may be rounded or ground or polished so as to provide a rounded profile or curved transition around the perimeter of the reflective element.

[0005] According to an aspect of the present invention, a rearview mirror assembly for a vehicle comprises a casing and a reflective element. The reflective element comprises a front surface (the surface that generally faces the driver of the vehicle when the mirror assembly is normally mounted in the vehicle) and a rear surface opposite the front surface. The rear surface has a reflective mirror reflector coated or established thereat. The rear surface of the reflective element is attached, such as adhered, to a mounting surface or portion of the casing. When the reflective element is attached to the mounting surface of the casing, the perimeter edge of the reflective element is exposed and the casing does not extend over or encompass the perimeter edge or the front surface of the reflective element.

[0006] Optionally, the perimeter edge may be rounded at a front surface (such as via grinding and/or polishing the edge region of the mirror substrate) so as to provide a rounded front edge portion (that is viewable by the driver of the vehicle). The rounded perimeter edge may be tapered to provide a smooth curved transition between the front surface of the reflective element and a rear portion of the perimeter edge of the reflective element and the outer side walls of the mirror casing. The rounded perimeter edge may be polished or otherwise finished to provide a smooth aesthetically pleasing perimeter edge of the reflective element.

[0007] 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

[0008] FIG. 1 is a front perspective view of an interior rearview mirror assembly in accordance with the present invention;

[0009] FIG. 2 is a rear perspective view of the interior rearview mirror assembly of FIG. 1;

[0010] FIG. 3 is a front exploded perspective view of the interior rearview mirror assembly of FIGS. 1 and 2;

[0011] FIG. 4 is a rear exploded perspective view of the interior rearview mirror assembly of FIGS. 1 and 2;

[0012] FIG. 5 is a side elevation and partial sectional view of the interior rearview mirror assembly of FIGS. 1 and 2;

[0013] FIG. 6 is an upper plan view of the interior rearview mirror assembly of FIGS. 1, 2 and 5;

[0014] FIG. 7 is a front perspective view of an interior rearview mirror assembly in accordance with the present invention;

[0015] FIG. 8 is a rear perspective view of the interior rearview mirror assembly of FIG. 7;

[0016] FIG. 9 is a sectional view of the interior rearview mirror assembly of FIG. 7;

[0017] FIG. 10 is a perspective view of the mirror casing of the mirror assembly of FIG. 7, with the reflective element and bezel portion removed therefrom;

[0018] FIGS. 11A-C are rear plan views of the mirror assembly, showing different structural patterned elements at the recesses of the mirror casing;

[0019] FIG. 12 is a side elevation and partial sectional view of another mirror assembly in accordance with the present invention, shown with an electro-optic reflective element attached to a mounting surface or panel of a mirror casing;

[0020] FIG. 13 is an exploded perspective view of another mirror assembly in accordance with the present invention;

[0021] FIG. 14 is a perspective view of the mirror casing of the mirror assembly of FIG. 13;

[0022] FIG. 15 is a side elevation of the mirror assembly of FIG. 13;

[0023] FIG. 16 is a rear elevation of the mirror assembly of FIG. 13;

[0024] FIG. 16A is a sectional view of the mirror assembly taken along the line A-A in FIG. 16;

[0025] FIG. 16B is a sectional view of the mirror assembly taken along the line B-B in FIG. 16;

[0026] FIG. 17 is a lower plan view of the mirror assembly of FIG. 13;

[0027] FIG. 18 is a front elevation of another mirror assembly in accordance with the present invention;

[0028] FIG. 19 is a rear elevation of the mirror assembly of FIG. 18;

[0029] FIG. 20 is a side elevation of the mirror assembly of FIG. 18;

[0030] FIG. 21 is a rear perspective view of a backing plate and toggle element attached at a rear of the reflective element of the mirror assembly of FIG. 18;

[0031] FIG. 22 is a rear perspective view of the mirror assembly of FIG. 18, shown with the mirror casing attached over the backing plate and toggle element of FIG. 21;

[0032] FIG. 23 is another rear perspective view of the mirror assembly of FIG. 18.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0033] Referring now to the drawings and the illustrative embodiments depicted therein, a rearview mirror assembly 10 for a vehicle includes a casing 12 and a reflective element 14 positioned at a front portion of the casing 12 (FIGS. 1-6). In the illustrated embodiment, mirror assembly 10 is configured to be adjustably mounted to an interior portion of a vehicle (such as to an interior or in-cabin surface of a vehicle windshield or a headliner of a vehicle or the like) via a mounting structure or mounting configuration or assembly 16. The mirror casing 12 includes a front mounting surface or panel or substrate 18 (FIGS. 3 and 5) to which a rear surface 14a of the reflective element is attached, such as via an adhesive or adhesive tape 20 (FIGS. 3 and 4) or the like. When so attached or adhered, the perimeter edges of the mirror substrate or reflective element are flush with or generally co-planar with the outer surfaces of the sidewalls of the mirror casing, as discussed below. The reflective element 14 thus is attached to the casing and the mirror assembly does not include a bezel or casing portion that encompasses a front surface 14b and a perimeter edge 15 of the reflective element 14, as also discussed below.

[0034] Reflective element 14 comprises a prismatic or wedge-shaped reflective element having rear surface 14a and front surface 14b (the surface that generally faces the driver of a vehicle when the mirror assembly is normally mounted in the vehicle) with perimeter edge 15 disposed or established about the perimeter of the reflective element and between the front and rear surfaces. Mirror reflective element 14 may be formed from various materials such as plastic or glass, but preferably is glass, and preferably has a planar front surface extending at an angle to a planar rear surface. For example, and as best shown in FIG. 5, the wedge-shaped reflective element 14 has a thicker upper region 14c and a thinner lower region 14d. A mirror reflector, such as a reflective coating or layer of a metallic material or composition, such as, for example, a layer or layers of chromium, aluminum or alloys thereof, such as may be conventionally known in the industry, is disposed or coated or established on rear surface 14a of reflective element 14.

[0035] In the illustrated embodiment, reflective element 14 has a forward edge portion 15a of perimeter edge 15 rounded to provide a smooth curved transition between the perimeter region of front surface 14b and perimeter edge 15 and mirror casing 12. As can be seen in FIG. 5, the upper perimeter edge region has a smooth curved transition from front surface 14b to the upper perimeter edge or surface via curved or rounded forward edge portion 15a, while the lower perimeter edge region has a smooth curved transition from front surface 14b to the lower wall or surface of the mirror casing 12 via the curved or rounded forward edge portion 15a. The radius of curvature of the forward edge portion 15a may be selected so as to provide a desired appearance and a transition to the perimeter edge and/or the mirror casing around the entire periphery of the reflective element. In the illustrated embodiment, the radius of curvature is about 2.5 mm or about 3 mm, but may be greater than or less than this dimension depending on the particular application of the reflective element and mirror casing of the mirror assembly. Typically, it is desired to have at least about a 2.5 mm radius of curvature at the perimeter edges of a mirror assembly (typically at a bezel of a conventional mirror assembly) to meet the minimum safety standards for head impact with the mirror, such as during a sudden stop or collision of the equipped vehicle.

[0036] In the illustrated embodiment, the radius of curvature is substantially uniform around the perimeter of the reflective element. Optionally, however, the radius of curvature of the curved perimeter edge may vary or be non-uniform around the perimeter of the reflective element substrate, while remaining within the spirit and scope of the present invention. For example, the radius of curvature along the lower, thinner perimeter region of the substrate may be smaller than the radius of curvature along the upper, thicker perimeter region of the substrate, with the radius of curvature along the side perimeter regions varying to provide a substantially smooth transition between the smaller radius of curvature at the bottom of the reflective element and the larger radius of curvature at the top of the reflective element. Such a varying or non-uniform radius of curvature configuration may be suitable for a plastic reflective element, where the plastic substrate may be molded to provide any desired profile along the perimeter edges of the substrate. Optionally, the reflective element may comprise any suitable or selected or desired profile around the perimeter edges, such as, for example, curved or rounded edges or substantially flat edges or chamfered edges or edges with a decorative profile or the like (and the formed edges may be established during molding of a plastic substrate or may be established by grinding or polishing or otherwise shaping a glass substrate, such as discussed below), while remaining within the spirit and scope of the present invention.

[0037] The reflective element is pivoted or adjusted or toggled via a toggle device 22 (FIG. 5) that is adjustable by a user to adjust the mirror reflective element between a day state orientation or higher reflectivity orientation (where the reflective element is adjusted or set to reflect a greater percentage of light incident thereon toward the driver of the vehicle) and a night state orientation or lower reflectivity orientation (where the reflective element is adjusted or set to reflect a lower percentage of light incident thereon toward the driver of the vehicle), as also discussed below. The toggle device or element 22 may comprise any suitable toggle device, such as a toggle device of the types described in U.S. Pat. Nos. 6,318,870 and/or 7,249,860, and/or U.S. patent application Ser. No. 12/558,892, filed Sep. 14, 2009 (Attorney Docket DON01 P-1552), which are hereby incorporated herein by reference in their entireties. In the illustrated embodiment, the toggle device 22 includes a toggle element or flip element or tab 22a extending downward from a body portion 22c and a ball member 22b extending rearward from the body portion 22c. The toggle body 22c is received within central cavity 24 of mirror casing 12 and may be secured or attached or mounted at central cavity 24 of mirror casing 12, such as via snapping the toggle device 22 to snap elements or attachment elements formed or molded at central cavity 24 of mirror casing 12. Thus, when the tab 22a is flipped by the user, the body portion 22c may flex to pivot the mirror casing and reflective element about a generally horizontal pivot axis and relative to the ball member 22b and mounting structure 16 to adjust the mirror reflective element between a daytime orientation and nighttime orientation, such as in a known manner.

[0038] Mirror casing 12 and reflective element 14 thus are pivotable relative to the mirror mounting assembly 16 to pivot the reflective surface of reflective element 14 in order to reduce glare during nighttime conditions. When mirror assembly 10 is pivoted from a full reflectivity day position to a reduced reflectivity night position, the reflective surface of reflective element 14 is rotated or pivoted or adjusted such that uncoated front surface of the reflective element is aligned for viewing by the vehicle driver instead of rear reflective surface of the reflective element 14. The rear reflective surface may reflect at least about 60 percent to about 95 percent of the light incident thereon, while the uncoated front surface may reflect about 4 percent or thereabouts of the light incident thereon, thereby significantly reducing glare from headlights or other bright lights to the rear of the vehicle to the driver's eyes. Optionally, however, it is envisioned that the reflective element may comprise a flat or generally planar substrate or non-prismatic substrate or slightly curved substrate, and optionally without any day/night adjustment, and without any bezel or casing portion encompassing the perimeter edge and front surface of the reflective element substrate, while remaining within the spirit and scope of the present invention.

[0039] Mirror casing 12 comprises a plastic or polymeric molded casing having at least one generally planar front attachment surface or panel or wall 18 and upper, lower and side walls or outer surfaces 19 around the periphery of the mirror casing. In the illustrated embodiment, and as shown in FIG. 3, the mirror casing 12 is formed with two spaced apart attachment panels or surfaces 18, with the central region of the casing having a central cavity 24 that is open or vacant for receiving the toggle device 22 therein. As shown in FIGS. 2 and 4, the rear portion of the casing 12 may have recesses 26 formed therein. Such recesses 26 are formed during the molding of mirror casing so that mirror casing 12 may be unitarily molded (such as via injection molding), whereby the central cavity 24 is established to be open at the front portion of the mirror casing and the recesses 26 are open at the rear portion of the mirror casing. The recesses may be closed or covered via a cap portion or cover element (not shown) or the like, and such cap portions or cover elements may include or encase or house or cover one or more accessories (such as, for example, compass components or circuitry and/or garage door opener components or circuitry or any other electronic accessory or content desired for the particular mirror application), 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. For example, a cover element may be snapped to the mirror casing or otherwise attached (such as via adhesive or fasteners or the like) at the mirror casing and at one of the rear recesses of the mirror casing to cover the recesses to provide a desired appearance at the rear of the mirror casing and/or to encase or support or house one or more electrical or non-electrical accessories or mirror content at the rear of the mirror casing.

[0040] Optionally, the mirror casing may be otherwise formed with a central cavity and generally planar attachment panels or surfaces or wings. For example, the mirror casing may include the center portion and central cavity and side panels or wings, but without the rear recesses and side walls and upper and lower walls around the perimeter of the side panels.

Optionally, the mirror casing may comprise an injected molded plastic or polymeric casing, or may comprise a stamped metallic casing or may be an otherwise formed plastic or polymeric or metallic casing, while remaining within the spirit and scope of the present invention.

[0041] The reflective element 14 thus may be readily attached to the front surfaces 18 of the mirror casing 12. In the illustrated embodiment, and as shown in FIGS. 3 and 4, the reflective element 14 is attached via an adhesive tape 20, such as a double-sided adhesive tape disposed between the rear surface 14a of reflective element 14 and the front surface 18 of mirror casing 12. The tape may be disposed at each of the panel portions or attachment surfaces of the mirror casing or may extend across the entire width or substantially the entire width of the reflective element (such as shown in phantom in FIGS. 3 and 4), and the adhesive tape may function as an anti-scatter barrier or element at the rear of the reflective element. The reflective element 14 thus may be fixedly attached to the mirror casing 12 and may be pivoted with the mirror casing 12 relative to the mounting assembly 16 to adjust the rearward field of view to the driver of the vehicle. When the reflective element 14 is attached to the attachment surfaces 18 of mirror casing 12, the perimeter edges or regions of the reflective element are generally flush or co-planar with the respective outer walls or surfaces 19 of the mirror casing 12.

[0042] Although shown and described as being adhesively attached to the attachment surfaces of the mirror casing, it is envisioned that the reflective element may be otherwise attached to the mirror casing, while remaining within the spirit and scope of the present invention. For example, the reflective element may include or may be adhered to a back plate structure that includes attachment elements for connecting to corresponding attachment elements of the mirror casing. For example, the back plate may include flexible tabs extending therefrom that flex to engage and snap to corresponding slots and tabs at the mirror casing to secure the reflective element to the mirror casing. The reflective element thus may be attached to the mirror casing via other suitable attachment means while the mirror casing does not encompass or overlap the perimeter edge and/or the perimeter region of the front surface of the reflective element.

[0043] In the illustrated embodiment, mounting assembly 16 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 two pivot joints. Mounting assembly 16 includes a base portion or mounting base 28 and a mounting arm 30, with the reflective element 14 and mirror casing 12 pivotally mounted at an outer or rearward or mirror or socket end 30a of mounting arm 30 about a first or 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 vertically and horizontally to adjust the rearward field of view of the driver). The opposite or forward or base end 30b of mounting arm 30 is adjustably mounted to mounting base 28 about a second or adjustable or base joint.

[0044] In the illustrated embodiment, mounting base 28 is attached to an interior or in-cabin surface of a vehicle windshield (such as to a mounting button or attachment element adhered to the in-cabin 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. Mounting arm 28 may comprise a metallic arm or a molded (such as injection molded) polymeric mounting arm or may be otherwise formed of other materials, depending on the particular application of the mirror assembly (and the mounting assembly 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 (Attorney Docket DON01 P-1236), and/or PCT Application No. PCT/US2010/028130, filed March 22, 2010, which are hereby incorporated herein by reference in their entireties).

[0045] Thus, the mirror casing 12 may be molded (such as via injection molding) and the toggle assembly 22 may be inserted into or received in the central cavity 24, with its toggle element or flip element or tab 22a inserted through an opening or aperture 12a formed at a lower region of mirror casing 12, and with its ball member 22b inserted through an opening or aperture 12b at a rear portion of mirror casing 12 (such as can be seen with reference to FIG. 5). The toggle body 22c of toggle device 22 may be secured or attached or mounted at central cavity 24 of mirror casing 12, such as via snapping the body portion 22c of toggle device 22 to snap elements or attachment elements formed or molded at central cavity 24 of mirror casing 12. The mounting arm 30 may then attach to ball member 22b to attach the mirror casing 12 and reflective element 14 to the mounting structure 16.

[0046] Optionally, and with reference to FIGS. 13-17, a mirror assembly 10' may have a casing 12' and a bezelless reflective element 14' positioned at a front portion of the casing 12'. Mirror assembly 10' is adjustably mounted to an interior portion of a vehicle (such as to an interior or in-cabin surface of a vehicle windshield or a headliner of a vehicle or the like) via a mounting structure or mounting configuration or assembly (not shown in FIGS. 13-17), such as in a similar manner as discussed above. The mirror casing 12' includes a front mounting surface or panel or substrate 18' (FIGS. 13 and 14) to which a rear surface of the reflective element 14' is attached, such as via an adhesive or adhesive tape 20' (FIG. 13) or the like. When so attached or adhered, the perimeter edges of the mirror substrate or reflective element are flush with or generally co-planar with the outer surfaces of the sidewalls of the mirror casing, such as in a similar manner as discussed above with respect to mirror assembly 10.

[0047] In the illustrated embodiment, mirror casing 12' comprises a plastic or polymeric molded casing having at least one generally planar front attachment surface or panel or wall 18' and upper, lower and side walls or outer surfaces 19' around the periphery of the mirror casing. Similar to mirror casing 12, discussed above, mirror casing 12' is formed with two spaced apart attachment panels or surfaces 18', with the central region of the casing having a central cavity 24' that is open or vacant for receiving the toggle device 22' therein, and the rear portion of the casing 12' may have recesses 26' formed therein (FIGS. 15 and 16), which optionally may be closed or covered via a cap portion or cover element (not shown) or the like as discussed above.

[0048] As shown in FIG. 13, mirror casing 12' includes a pair of toggle mounting walls 15', which include attachment elements 15a' formed or established thereat. Thus, the mirror casing 12' may be molded (such as via injection molding) and the toggle assembly 22' may be inserted into or received in the central cavity 24', with its toggle element or flip element or tab 22a' inserted through an opening or aperture 12a' formed at a lower region of mirror casing 12', and with its socket element or receiving portion 22b' disposed at (and optionally at least partially through) an opening or aperture 12b' at a rear portion of mirror casing 12'. The toggle body 22c' of toggle device 22' may be secured or attached or mounted at central cavity 24' of mirror casing 12', such as via snapping the body portion 22c' of toggle device 22' to snap elements or attachment elements 15a' formed or molded at walls 15' at central cavity 24' of mirror casing 12'.

[0049] The mounting arm or mounting element (not shown in FIGS. 13-17) attaches to receiving portion 22b' of toggle device 22' to attach the mirror casing 12' and reflective element 14' to the mounting structure. As shown in FIG. 13, a spring ring or pressure applying element 23' may be disposed at receiving portion 22b' and is used to apply generally even pressure around the ball socket to control the torque/effort required to adjust the mirror casing relative to the ball member of the mounting arm or element to adjust the driver's rearward field of view. As also can be seen in FIG. 13, an adhesive layer or tape or element 20' is disposed between attachment surfaces 18' and reflective element 14' and also between toggle device 22' and reflective element 14'. The adhesive layer or tape may comprise a foam tape or the like and may adhere the reflective element 14' to the mirror casing 12' and may also function as an anti-scatter barrier or element for the reflective element (to limit or substantially preclude shattering of the mirror glass during impact). Mirror assembly 10' may otherwise be substantially similar to mirror assembly 10, discussed above, such that a detailed discussion of the mirror assemblies need not be repeated herein.

[0050] Therefore, the present invention provides a bezelless mirror assembly that has a reflective element adhered or attached to a front or mounting surface of a mirror casing, with no mirror casing or bezel portion encompassing the perimeter edge and/or front surface of the mirror reflective element. When the reflective element is attached to the mirror casing, the perimeter region of the reflective element is generally flush or co-planar with the side walls of the mirror casing. The reflective element may include rounded perimeter edges to provide an enhanced appearance to the mirror assembly. Thus, the mirror assembly may be readily assembled by attaching the toggle device to a unitarily molded mirror casing and attaching the reflective element to the unitary mirror casing to retain the reflective element at the mirror casing and to encase the toggle device within the mirror casing. For mirror applications with one or more mirror-based accessories, the accessory or accessories may be received in or disposed at the rear recesses or cavities formed at the rear of the mirror casing and/or may be disposed at the mounting structure of the mirror assembly.

[0051] Optionally, the mirror casing may be formed to provide the generally planar attachment surfaces for adhering the mirror reflective element to the mirror casing (such as described above), and the mirror assembly may include a bezel portion that overlaps or encompasses the perimeter edges of the reflective element and a perimeter border region of the front surface of the reflective element, with the bezel portion snapping or otherwise attaching to the mirror casing, such as in a known manner. For example, and with reference to FIGS. 7-10, an interior rearview mirror assembly 110 for a vehicle includes a casing 112 and a reflective element 114 positioned at a front portion of the casing 112. Mirror assembly 110 is adjustably mounted to an interior portion of a vehicle (such as to an interior or in-cabin surface of a vehicle windshield or a headliner of a vehicle or the like) via a mounting structure or mounting configuration or assembly (not shown in FIGS. 7-10). The mirror casing 112 includes a front mounting surface or panel or substrate 118 (FIGS. 9 and 10) to which a rear surface 114a of the reflective element 114 is attached, such as via an adhesive or adhesive tape or the like. A bezel portion 116 encompasses the perimeter of the reflective element 114 and attaches to the mirror casing 112, such as via snapping or otherwise attaching to a forward perimeter edge region 112a of mirror casing 112.

[0052] Reflective element 114 may comprise an electro-optic (such as electrochromic) reflective element or may comprise a prismatic or wedge-shaped reflective element. Reflective element 114 includes rear surface 114a and front surface 114b (the surface that generally faces the driver of a vehicle when the mirror assembly is normally mounted in the vehicle). In the illustrated embodiment, reflective element 114 comprises an electrochromic reflective element that is adjustable relative to a mounting arm or pivot assembly. As shown in FIG. 9, the mirror assembly may include a socket or pivot mount 125 that is insert molded at a rear wall or center portion 120 of mirror casing 112, whereby the pivot mount 125 may receive a ball member of a mounting arm of a pivot assembly or mounting structure, 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 (Attorney Docket DON01 P-1236), which are hereby incorporated herein by reference in their entireties).

[0053] Mirror casing 112 comprises a plastic or polymeric molded casing having at least one generally planar front attachment surface or panel or wall 118 and upper, lower and side walls or outer surfaces 119 around the periphery of the mirror casing. In the illustrated embodiment, and as shown in FIG. 10, the mirror casing 112 is formed with two spaced apart attachment panels or surfaces 118, with the central region of the casing having a central cavity 124 and pivot mount 125 for receiving or attaching to a pivot mounting arm of a mounting structure of the mirror assembly. As shown in FIGS. 8 and 9, the rear portion of the casing 112 may have recesses 126 formed therein. Such recesses 126 are formed during the molding of mirror casing so that mirror casing 112 may be unitarily molded (such as via injection molding), whereby the central cavity 124 is established to be open at the front portion of the mirror casing and the recesses 126 are open at the rear portion of the mirror casing. The recesses may be closed or covered via cap portions or structural elements 130a-c (such as shown in FIGS. 11A-C, respectively) or the like, and such cap portions may be for aesthetic purposes and/or may include one or more accessories, 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.

[0054] Optionally, the mirror casing may be otherwise formed with a central cavity and generally planar attachment panels or surfaces or wings. For example, the mirror casing may include the center portion and central cavity and side panels or wings, but without the rear recesses and side walls and upper and lower walls around the perimeter of the side panels. Optionally, the mirror casing may comprise an injected molded plastic or polymeric casing, or may comprise a stamped metallic casing or may be an otherwise formed plastic or polymeric or metallic casing, while remaining within the spirit and scope of the present invention.

[0055] The reflective element 114 thus may be readily attached to the front surfaces 118 of the mirror casing 112. The reflective element 114 thus may be fixedly attached to the mirror casing 112 and may be pivoted with the mirror casing 112 relative to the mounting assembly to adjust the rearward field of view to the driver of the vehicle. The reflective element may be adhesively attached to the attachment surfaces of the mirror casing, or may be otherwise attached to the mirror casing, while remaining within the spirit and scope of the present invention. For example, the reflective element may include or may be adhered to a back plate structure that includes attachment elements for connecting to corresponding attachment elements of the mirror casing. For example, the back plate may include flexible tabs extending therefrom that flex to engage and snap to corresponding slots and tabs at the mirror casing to secure the reflective element to the mirror casing. The reflective element thus may be attached to the mirror casing via other suitable attachment means while the bezel portion 116 encompasses or overlaps the perimeter edge and a perimeter region of the front surface of the reflective element and snaps or otherwise attaches to the mirror casing 112.

[0056] Optionally, and with reference to FIGS. 11A-C, the recesses 118 at the rear of mirror casing 112 may have a structural element or cap portion 130a-c disposed therein. The cap portion or portions may be for aesthetic purposes and/or may provide structural rigidity to the mirror casing and may enclose or encompass the recesses to provide an enhanced, generally uniform appearance to the back of the mirror casing. Optionally, the element or elements may include accessories or circuitry or the like to provide optional electrical content to the mirror assembly, depending on the particular application of the mirror assembly (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). Optionally, the element or elements may be customized or selected by the vehicle manufacturer or dealership or vehicle owner to provide a desired appearance to the mirror casing (such as by utilizing aspects of the mirror assemblies described in U.S. patent application Ser. No. 11/912,576, filed Oct. 25, 2005, now U.S. Pat. No. 7,626,749, which is hereby incorporated herein by reference in its entirety).

[0057] Optionally, and with reference to FIG. 12, an interior rearview mirror assembly 110' includes a casing 112', a reflective element 114' positioned at a front portion of the casing 112' with a front casing portion 119a' disposed around a periphery of the rear substrate 142' of the reflective element 114'. Mirror assembly 110' is adjustably mounted to an interior portion of a vehicle (such as to an interior or in-cabin surface of a vehicle windshield or a headliner of a vehicle or the like) via a mounting structure or mounting configuration or assembly 130', such as in a similar manner as described above. The front casing portion or outer wall of the front casing portion 119a' receives the rear substrate 142' of the reflective element therein and encompasses the perimeter edges 142c' of the rear substrate 142' of the reflective element 114'. As can be seen in FIG. 12, the front casing portion 112' abuts or is in close proximity to the rear surface 140b' of the front substrate 140' and does not overlap or encompass the perimeter edges of the front substrate 140' and does not overlap or encompass the perimeter regions of the front surface of the reflective element 114', and the front substrate 140' includes a ground or curved or rounded surface or bevel or contour or curvature 140c' at the front perimeter edge and side edge dimension to provide a smooth continuous transition between the generally planar front surface 140a' of the front substrate 140' and the generally planar or beveled or contoured or curved exterior surface 119b' of the front casing portion 119a' of mirror casing 112', as discussed below. The rear substrate 142' may be bonded or adhered (such as via an adhesive tape or the like that may also function as an anti-scatter barrier or element at the rear substrate of the reflective element) to an attachment surface or panel 118' of mirror casing 112', such as in a similar manner as described above.

[0058] In the illustrated embodiment, reflective element 114' comprises an electro-optic (such as electrochromic) reflective element or may comprise a prismatic or wedge-shaped reflective element. Reflective element 114' includes front substrate 140' having front or first surface 140a' (the surface that generally faces the driver of a vehicle when the mirror assembly is normally mounted in the vehicle) and rear or second surface 140b' opposite the front surface 140a', and a rear substrate 142' having a front or third surface 142a' and a rear or fourth surface 142b' opposite the front surface 142a', with an electro-optic medium 144' disposed between the second surface 140b' and the third surface 142a' and bounded by a perimeter seal 146' of the reflective element (such as is known in the electrochromic mirror art). The second surface 140a' has a transparent conductive coating established thereat, while the third surface 142a' has a conductive coating (such as a metallic reflector coating for a third surface reflector mirror element or such as a transparent conductive coating for a fourth surface reflector mirror element) established thereat.

[0059] Reflective element 114' includes an opaque or substantially opaque or hiding perimeter layer or coating or band 143' disposed around a perimeter edge region of the front substrate 140' (such as at a perimeter region of the rear or second surface 140b' 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 (such as specularly reflective) or not reflective and may utilize aspects of the perimeter bands and mirror assemblies described in U.S. Pat. Nos. 7,626,749; 7,274,501; 7,184,190;

and/or 7,255,451, PCT Application No. PCT/US2006/018567, filed May 15, 2006; PCT Application No. PCT/US2003/029776, filed Sep. 19, 2003; and/or PCT Application No. PCT/US2003/035381, filed Nov. 5, 2003, and/or U.S. patent application Ser. No. 11/226,628, filed Sep. 14, 2005 (Attorney Docket DON01 P-1236), which are 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.

[0060] Optionally, the perimeter border layer or band may be established via any suitable means, such as screen printing or vacuum deposition or the like. Optionally, the perimeter or border band (either specularly reflecting or non-reflecting or the like) may be established at the front surface of the front substrate (such as over the curved perimeter edge and a perimeter region of the front surface of the front substrate). Optionally, the front substrate may be frosted or diffused at the perimeter region so that the perimeter seal and mirror casing are concealed or rendered covert to a person viewing the mirror assembly and reflective element when the mirror assembly is normally mounted in a vehicle.

[0061] The reflective element 114' and mirror casing 112' are adjustable relative to the mounting arm or pivot assembly 130' to adjust the driver's rearward field of view when the mirror assembly is normally mounted at or in the vehicle. In the illustrated embodiment, mounting assembly 130' 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 or in-cabin portion of the vehicle) about a pair of pivot joints. Mounting assembly 130' includes a base portion or mounting base 132' and a mounting arm 134', with the mounting arm 134' pivotally mounted at the mounting base 132' at a base or first ball pivot joint and the reflective element 114' and mirror casing 112' pivotally mounted at mounting arm 134' about a mirror or second ball pivot joint. 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.

[0062] Mirror casing 112' comprises a plastic or polymeric molded casing that may attach to the mounting assembly 130' via any suitable manner. The casing may comprise any suitable casing construction, and has a forward perimeter edge or receiving portion 119a' for receiving the rear substrate 142' of the mirror reflective element 114' therein, and may have the attachment panel or panels integrally molded with the outer casing walls 119', such as in a similar manner as described above. Optionally, the mirror casing may include cap portions that may include one or more accessories, 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.

[0063] As can be seen in FIG. 12, front surface 140a' of front substrate 140' includes a perimeter portion or element that has an outer curved front edge or surface 140c' (that may be ground or otherwise formed or established) that provides a smooth or curved transition surface between the front surface 140a' of the reflective element 114' and the exterior surface 119b' of the front casing portion 119a' of walls 119' of mirror casing 112' (which is generally coplanar or generally flush with the rear perimeter edge dimension 140d' of front substrate 140' when the mirror reflective element 114' is received in front casing portion 119a' of mirror casing 112'). The front casing portion 119a' abuts or is in close proximity to the rear surface 140b' of front substrate 140' to encompass the rear substrate 142' and the perimeter seal 146' and electro-optic medium 144', and the perimeter band 143' hides or conceals the perimeter seal 146' from view by a person viewing the reflective element when the mirror assembly is normally mounted in a vehicle. The reflective element 114' thus may utilize aspects of the reflective element assemblies described in U.S. provisional application Ser. No. 61/261,839, filed Nov. 17, 2009, which is hereby incorporated herein by reference in its entirety.

[0064] In the illustrated embodiment, the radius of curvature of the curved surface 140c' of front substrate 140' is about 2.5 mm or about 3 mm or thereabouts, but may be greater than or less than this dimension depending on the particular application of the reflective element and mirror casing of the mirror assembly. Typically, it is desired to have at least about a 2.5 mm radius of curvature at the perimeter edges of a mirror assembly (typically at a bezel of a conventional mirror assembly) to meet the minimum safety standards for head impact with the mirror, such as during a sudden stop or collision of the equipped vehicle.

[0065] Thus, the bevel or contour or curvature of the curved edges 140c' of the front substrate 140' and the bevel or contour or curvature of surface 119b' of the mirror casing 112' may generally align or match to provide a generally continuous surface or contour or curvature at the junction of the front substrate and the mirror casing. Any interface between the front substrate and the mirror casing may be reduced or minimized, such as by a close fit arrangement of the front substrate and mirror casing and/or by the glass front substrate slightly nesting into a the mirror casing (such as via a slight lip at the mirror casing that may overlap a slight portion of the side perimeter edge of mirror front substrate), or such as by affirmatively filling any gap between the front substrate and mirror casing with a gap closing or gap filling material or means. Therefore, the mirror casing 112' receives the rear substrate 142' of the reflective element therein and does not encompass the perimeter edges of the front substrate or the front surface 140a' of the reflective element such that the entire front surface 140a' of the reflective element 114' is exposed and viewable by the driver of a vehicle when the mirror assembly is normally mounted in the vehicle. The curved transition surface 140c' of the front substrate 140' provides a smooth continuous curved transition between the generally planar front surface 140a' of the front substrate 140' and the generally planar or curved or contoured or beveled exterior surface 119b' of the mirror casing 112'. The front substrate thus has larger cross dimensions relative to the rear substrate so that the front substrate extends beyond corresponding edges of the rear substrate, and the perimeter edge of the front substrate of the reflective element is exposed and viewable by the driver of the vehicle when the reflective element is attached to the attachment surface or panel and when the mirror assembly is normally mounted in the equipped vehicle. The exposed perimeter edge of the front substrate has a rounded front portion to provide a curved transition between a front surface of the front substrate and the exterior surface of the mirror casing.

[0066] Optionally, the mirror assembly of the present invention may have a mirror casing that has the reflective element adhered thereto, and that does not include recesses formed at the rear of the mirror casing. For example, and with reference to FIGS. 18-23, a mirror assembly 210 includes a casing 212 and a bezelless reflective element 214 (having a forward edge portion 215a of a perimeter edge 215 rounded to provide a smooth curved transition between the perimeter region of a front surface 214a of reflective element 214 and perimeter edge 215 and mirror casing 212, such as discussed above with respect to mirror assembly 10) positioned at a front portion of the casing 212. Mirror assembly 210 is adjustably mounted to an interior portion of a vehicle (such as to an interior or in-cabin surface of a vehicle windshield or a headliner of a vehicle or the like) via a mounting structure or mounting configuration or assembly (not shown in FIGS. 18-23), such as in a similar manner as discussed above. The mirror assembly 210 includes an attachment plate 218 that is bonded to (such as via an adhesive tape or other suitable adhesive layer or material or the like) the rear surface of reflective element 214, such as shown in FIG. 21. Mirror casing 212 attaches to attachment plate 218 at the rear of the reflective element and mirror casing 212 has a solid or non-recessed rear surface 212c (FIGS. 19, 20, 22 and 23) and does not include recesses established thereat.

[0067] In the illustrated embodiment, attachment plate 218 includes a front mounting surface or panel 218a to which a rear surface of the reflective element 214 is attached, such as via an adhesive or adhesive tape or the like. Attachment plate 218 includes a perimeter wall or flange 218b that extends rearward from panel 218a to provide an attaching flange to which mirror casing 212 is attached. As shown in FIG. 21, attachment plate 218 may include toggle mounting walls or elements 218c that protrude rearward from panel 218a and that may include toggle attaching elements or snap elements to facilitate attachment of or mounting of toggle device 222 at or to the attachment plate 218.

[0068] When the reflective element 214 is attached or adhered to panel 218a of attachment plate 218, the perimeter edges of the mirror substrate or reflective element extend beyond the perimeter edges and perimeter flange 218b to establish overhang regions 214b of reflective element 214, as can be seen in FIG. 21. The flange and mirror casing are configured to provide attachment of the casing to the attachment plate. For example, the flange or rib 218b may have slots or snap elements formed therein that are similar to slots or snap elements on bezels and/or casings of known snap-together mirror designs, and the mirror casing may include snap or latch elements or features or slots at locations that correspond to the respective features or elements on the flange of the attachment plate, so as to substantially retain or lock the two components together when the mirror casing is moved into engagement with the flange of the attachment plate. As shown in FIGS. 22 and 23, when the mirror casing 212 is attached to attachment plate 218 (such as via the mirror casing snapping and/or adhering to the flange of the attachment plate), the forward edges 219a of the perimeter walls 219 of mirror casing generally abut or approach the perimeter regions of the rear surface of the reflective element and the perimeter edge regions of the reflective element are flush with or generally co-planar with the outer surfaces of the sidewalls of the mirror casing, such as in a similar manner as discussed above with respect to mirror assembly 10.

[0069] Thus, the mirror casing 212 may be molded (such as via injection molding) and may be attached to the attachment plate 218. When so attached, the toggle element or flip element or tab 222a of toggle assembly 222 (disposed at and mounted at the rear of attachment plate 218) is received or inserted through an opening or aperture 212a formed at a lower region of mirror casing 212, and the socket element or receiving portion 222b of toggle device 222 is disposed at (and optionally at least partially through) an opening or aperture 212b at a rear portion of mirror casing 212. The toggle body 222c of toggle device 222 may be secured or attached or mounted at toggle mounting walls 218c of attachment plate 218, such as via snapping the body portion

222c of toggle device 222 to snap elements or attachment elements formed or molded at walls 218c of attachment plate 218.

[0070] The mounting arm or mounting element (not shown in FIGS. 18-23) attaches to receiving portion 222b of toggle device 222 to attach the mirror casing 212 and attachment plate 218 and reflective element 214 to the mounting structure. An adhesive layer or tape or element is disposed between the front surface of the attachment panel 218a of attachment plate 218 and reflective element 214 to adhere or attach the reflective element 214 to the attachment plate 218. The mirror casing 212 may snap or adhere to the attachment plate 218, whereby the perimeter edges of the reflective element are generally flush with the outer surfaces of the perimeter walls of the mirror casing. The mirror casing may comprise an injection molded casing, with its perimeter walls and rear walls or surfaces unitarily formed together and establishing or providing a cavity within the mirror assembly and between the casing and the attachment plate when the mirror casing is attached to the attachment plate. The cavity may house one or more accessories or circuitry or the like within the mirror assembly. Mirror assembly 210 may otherwise be substantially similar to mirror assembly 10, discussed above, such that a detailed discussion of the mirror assemblies need not be repeated herein.

[0071] In the illustrated embodiment, the reflective element of mirror assembly 210 comprises a prismatic reflective element that can be flipped or toggled between a daytime position and a nighttime position via the toggle device. Although shown and described as being a prismatic reflective element, it is envisioned that a mirror assembly similar to mirror assembly 210 may include or support an electro-optic reflective element (such as, for example, an electrochromic reflective element or the like). In such an application, the attachment plate may be adhered or bonded to the rear of the rear substrate of the reflective element and the mirror casing may receive the flange of the attachment plate and the rear substrate and perimeter seal and electro-optic medium therein, with the forward periphery edges of the mirror casing abutting or being in close proximity to the rear surface of the front substrate, such as in a similar manner as discussed above with respect to mirror assembly 110'.

[0072] The exposed front substrate of an electro-optic mirror reflective element or the exposed substrate of a prismatic mirror reflective element of a mirror assembly of the present invention preferably has rounded or curved or ground and/or polished perimeter edges to provide a smooth transition between the generally planar front surface of the mirror element (that is viewed by the driver of the vehicle when the mirror assembly is normally mounted in the vehicle) and the outer surfaces of the walls of the mirror casing. The substrate may be cut or machined or otherwise formed via any suitable forming process and the curved or rounded perimeter edges of the substrate may be ground or otherwise established via any suitable forming process, while remaining within the spirit and scope of the present invention.

[0073] For example, the mirror glass substrate may be machined via a Computer Numerical Control (CNC) type equipment or process, where the mirror glass may be aligned and fixed to a fixture which properly supports and positions the mirror glass substrate. The grinding and polishing wheels are typically attached to a moving head which follows a predetermined program and moves around the perimeter of the mirror glass substrate. The wheel centerline is typically, but not always, at about a 90 degree angle relative to the front surface of the mirror glass to apply a sharp edge radius at the perimeter edge of the mirror glass substrate. Optionally, the wheel may pivot on its centerline axis to maintain a selected or appropriate or proper angle relative to the appropriate mirror glass surface to apply the required edge application. An example of such a machining application is for establishing or applying the rear seam to the mirror glass substrate when the mirror glass is in a fixed position.

[0074] Optionally, the mirror glass substrate may be formed or established via a robot controlled wheel movement. Such a process is similar to the CNC machining process, discussed above, and the mirror glass substrate is aligned and fixed to a fixture which properly supports and positions the mirror glass substrate. The grinding and polishing wheels are attached to the end of the robot arm and manipulated around the perimeter of the mirror glass in accordance with a predetermined program to establish the desired or selected edge profile around the mirror glass substrate. Another optional approach is a robot controlled substrate movement process, where the mirror glass substrate is aligned and fixed to the robot End of Arm Tooling (EOAT), and where the grinding and polishing wheels are in fixed positions. Per a predetermined program, the robot manipulates the EOAT with the mirror glass around the grind and polish wheels, thereby establishing and maintaining the proper part profile. The wheel centerline is typically, but not always, at about a 90 degree angle relative to the front surface of the mirror glass substrate to apply the edge radius. However, the wheel may pivot on its centerline axis to establish and maintain the proper angle relative to the appropriate mirror glass surface to apply the required edge application.

[0075] Optionally, other means may be utilized to establish the desired or appropriate or selected edge radius around the perimeter edge of the exposed substrate. For example, a radius edge of about a 2.5 mm radius or more (a minimum of about a 2.5 mm radius is desired or required on the exposed mirror glass edge for safety reasons) may be established via any suitable means. The radius applied to the mirror glass edge may be greater than about 2.5 mm, such as about a 3.0 mm edge radius or more. A larger edge radius (such as about 3.0 mm) may be selected to allow for tool wear during the grind and polish process, while ensuring that the substrate has a minimum of about a 2.5 mm radius, as well as produce a pleasing appearance at the glass edge. Once the tool wears from about a 3.0 mm radius sufficiently enough to produce about a 2.5 mm radius, the tool then may have the about 3.0 mm radius reapplied. A larger radius may be applied, ensuring that the minimum field of view of the reflective element is maintained, as required, at the front surface of the glass between the radius tangency points.

[0076] The grinding of the perimeter edges may be accomplished via any suitable grinding / polishing tools. For example, the grinding process can be done using a single grind wheel or a series of grinding wheels at varying degrees of coarseness. A typical process may have one coarse grind wheel and one fine grind wheel. The coarse grind wheel could be of, for example, about a 150-200 grit level, while the fine grind wheel could be of, for example, about a 200-500 grit level. If a single grind wheel is used, it could be of, for example, about a 200-250 grit level or thereabouts or other suitable grit level. The grinding wheel is typically a metal bond type wheel impregnated with a diamond cutting media, but other forms of grinding wheels or means may be contemplated within the spirit and scope of the present invention.

[0077] Optionally, the rear seam grinding process may be achieved in the same or similar manner as the radius edge grind. For example, a grinding wheel (many shapes possible: flat angled, beveled, convex, concave, and/or the like) may be used along the rear edge to seam and seal the painted edge with a single grind wheel. Such a grind wheel may be of, for example, about a 200-250 grit level.

[0078] The polishing process can be done using many different types of wheel compounds, including, but not limited to, clay, rubber, felt, metal/resin hybrids, cork, urethane, and/or the like. A polishing media may be applied, including, but not limited to, water, oils, polishing compounds (rouge), and/or the like. The polishing wheels may be of varying hardness levels, and may include one or several levels and/or wheels within the process.

[0079] During the grinding and/or polishing processes, a coolant may be used to limit heating of the glass substrate as it is ground and/or polished. For example, a typical processing coolant for mirror glass grinding and polishing is water, and optionally a series of oils or compounds may be added, if required or desired, to limit or reduce or prevent equipment rusting or bacteria growth, or to improve the level of surface finish. Typical water filtration may be sufficient to provide filtering down to about 5 microns. The quantity of water flow should be sufficient to supply coolant liquid to the glass/wheel surfaces from the inside (through head coolant) and outside (via spray nozzles, hose and/or the like). Typical water flow requirements are 50-80 gpm, but this can be process and equipment dependent.

[0080] During the grinding operation, a typical grinding process may have the grinding wheel spinning at about 4,000 – 6,000 RPM (or more or less), with a feed rate from about 120 in/min to about 400 in/min (or faster or slower), depending on process requirements, part dimensional features (such as a thinner edge of the glass substrate versus a thicker edge of the glass substrate), wheel composition and/or the like. The feed rates can vary during the grinding process as the grinding wheel moves along mirror glass edge, or the feed rates may be maintained constant during the grinding process or operation. During the polishing operation, a typical polishing process may have a polishing wheel spinning at about 3,000 – 5,000 RPM (or more or less), with a feed rate from about 30 in/min to about 200 in/min (or faster or slower feed rate), depending on process requirements, part dimensional features (such as a thinner edge of the glass substrate versus a thicker edge of the glass substrate), wheel composition and/or the like. The feed rates can vary during the polishing process as the polishing wheel moves along mirror glass edge, or the feed rates may be maintained constant during the polishing process or operation.

[0081] Optionally, and desirably, the mirror glass may be held via part fixturing during the grinding and/or polishing processes. For example, the mirror glass is typically held in such a way that it is at the required angle to the grind or polish wheel with all sides or edges of the mirror glass being able to be exposed to the grind or polish wheel, while maintaining the desired or selected or required part profile. Such part fixturing can be accomplished by a typical fixture that holds the properly aligned mirror glass by use of vacuum (such as via a suction cup type device that engages a surface of the mirror glass substrate inboard of the perimeter edges of the mirror glass substrate), keeping all edges exposed around the entire profile, while preventing the mirror glass from moving on the fixture and becoming misaligned relative to the grinding or polishing wheel. Another method may be to hold the prism between a lower support member and an upper retention arm that can pivot as needed to allow the selected or required mirror glass edge to be exposed to the grinding or polishing wheel. Such holding or fixturing methods may apply for fixtures used on CNC type equipment, robot controlled prism or wheel movement or the like, or any other suitable method for applying the grinding and polishing processes to the perimeter edges of the mirror glass substrate.

[0082] Optionally, for example, a method of preventing the mirror glass from moving, shifting and/or sliding at or on the surface of the fixture (and thus losing proper alignment) when lateral forces are applied during the grinding and polishing process may include applying a rubber or silicone material to the top of the fixture, beneath the mirror glass. Such a material may function to grip the under surface of the mirror glass as it is positioned on the fixture. A series of holes or channels may be established in or through the grip material to allow sufficient vacuum be drawn through the material via a vacuum source or the like.

[0083] Optionally, the selected or desired part geometry and profile of the mirror glass substrate may require unique or shared fixtures for many parts. The mirror glass must be sufficiently supported on the fixture side, while maintaining an exposed perimeter of about 3 mm to about 8 mm (or more or less) around the fixture to glass edge for proper grinding or polishing wheel clearance. This will help prevent the grinding or polishing wheel from contacting the fixture edge during operation, and such as when tool wear occurs and excessive wheel protrusion to the mirror glass underside takes place. The level of the exposed backside perimeter clearance desired or required is dependent on, but not limited to, the part geometry, the material thickness of the substrate, the part to wheel movement rates, the required surface finish, the speed of the process, the forces applied on the mirror glass substrate from the grinding wheel or polishing wheel and/or the like.

[0084] Therefore, the present invention provides a mirror assembly comprising a housing or casing having a two pocket or recessed back design, which allows for the mirror substrate to be adhered or otherwise attached to the attachment panel or panels or surfaces of the mirror casing, thereby eliminating the need for a separate attachment plate. The present invention also provides a bezelless mirror assembly comprising a mirror glass substrate (either a prismatic substrate or a planar substrate or a front substrate of an electro-optic reflective element) that has an exposed perimeter edge radius which gives the mirror a unique appearance and can eliminate the need for a bezel in electro-optic mirrors. Optionally, for example, a mirror assembly of the present invention may comprise a prismatic or planar reflective element that has exposed curved or rounded perimeter edges (and either is bonded to the attachment panels of the mirror casing without an attachment plate or is bonded to an attachment plate), thereby eliminating the need for a separate bezel element, or a mirror assembly of the present invention may comprise a prismatic or planar reflective element that is bonded to the attachment panels of the mirror casing (thereby eliminating the need for a separate attachment plate) and has a bezel portion around its perimeter edges. Optionally, for example, a mirror assembly of the present invention may comprise an electro-optic reflective element (such as an electrochromic reflective element) that has exposed curved or rounded perimeter edges of a front substrate (and either is bonded to the attachment panels of the mirror casing without an attachment plate or is bonded to an attachment plate)), thereby eliminating the need for a separate bezel element, or a mirror assembly of the present invention may comprise an electro-optic reflective element (such as an electrochromic reflective element) that is bonded to the attachment panels of the mirror casing (thereby eliminating the need for a separate attachment plate) and has a bezel portion around its perimeter edges.

[0085] The present invention thus provides a mirror assembly comprising a recessed mirror casing (with the attachment panels or surfaces for attachment of the mirror reflective element thereto) that has generally planar reflective element attachment surfaces such that the reflective element is adhered or attached to a front or mounting surface of the mirror casing, with no separate mounting or backing plate at the reflective element for mounting the reflective element at or in the mirror casing and bezel portion. Thus, the mirror assembly may be readily assembled by attaching the mounting arm or structure to a unitarily molded mirror casing and attaching the reflective element to the unitary mirror casing to retain the reflective element at the mirror casing, and the bezel portion may be readily snapped or attached at the forward perimeter edges of the mirror casing. For mirror applications with one or more mirror-based accessories, the accessory or accessories may be received in or disposed at the rear recesses or cavities formed at the rear of the mirror casing and/or may be disposed at the mounting structure of the mirror assembly.

[0086] Although shown and described as interior rearview mirror assemblies attached to a windshield or in-cabin portion of a vehicle, it is envisioned that aspects of the present invention may be suitable for use in exterior rearview mirror applications. For example, an exterior rearview mirror may have a generally planar mirror glass substrate with rounded or curved exposed perimeter edges or may have an electro-optic reflective element with an oversized front substrate that has the rounded or curved exposed perimeter edges, while the rear substrate is received in the mirror casing. In applications where the mirror substrate is adhered or attached to the mirror casing panel or panels, the mirror casing itself may be adjustable relative to the side of the vehicle to which it is mounted to provide adjustment of the rearward and sideward field of view of the driver of the vehicle.

[0087] The rearview mirror assembly may comprise a prismatic mirror assembly (typically for interior mirror applications) or a non-electro-optic mirror assembly (such as a generally planar or optionally slightly curved mirror substrate typically for exterior mirror applications) or an electro-optic or electrochromic mirror assembly. For example, the 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; and PCT Application No. PCT/US2004/015424, filed May 18, 2004 by Donnelly Corporation et al. for MIRROR ASSEMBLY FOR VEHICLE, and published on Dec. 2, 2004, as International Publication No. WO 2004/103772, 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, and/or PCT Application No. PCT/US2003/029776, filed Sep. 19, 2003 by Donnelly Corp. et al. for MIRROR REFLECTIVE ELEMENT ASSEMBLY, and published Apr. 1, 2004 as International Publication No. WO 2004/026633; and/or PCT Application No. PCT/US2004/015424, filed May 18, 2004 by Donnelly Corporation et al. for MIRROR ASSEMBLY FOR VEHICLE, and published on Dec. 2, 2004, as International Publication No. WO 2004/103772, 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 (the entire disclosures of which are hereby incorporated by reference herein), that can benefit from the present invention.

[0088] Optionally, it is envisioned that the mirror assembly may comprise an electro-optic or electrochromic mirror assembly and may include an electro-optic or electrochromic reflective element. In such an embodiment, the perimeter of the reflective element may be encased or encompassed by a perimeter element 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. 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. 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. 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. 7,274,501; 7,255,451; 7,195,381; 7,184,190; 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 (Attorney Docket DON01 P-1236); and/or Ser. No. 10/538,724, filed Jun. 13, 2005 (Attorney Docket DON01 P-1123), and/or PCT Application No. PCT/US2003/029776, filed Sep. 9, 2003 by Donnelly Corp. et al. for MIRROR REFLECTIVE ELEMENT ASSEMBLY, and published Apr. 1, 2004 as International Publication No. WO 2004/026633, which are all hereby incorporated herein by reference in their entireties. 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, and in PCT Application No. PCT/US2003/029776, filed Sep. 9, 2003 by Donnelly Corp. et al. for MIRROR REFLECTIVE ELEMENT ASSEMBLY, and published Apr. 1, 2004 as International Publication No. WO 2004/026633, which are all hereby incorporated herein by reference in their entireties.

[0089] Optionally, the mirror assembly may include user interface inputs, such as buttons or switches or touch or proximity sensors or the like, with which a user may adjust or control one or more accessories, such as via the principles described in U.S. Pat. No. 7,360,932, and/or U.S. patent applications, Ser. No. 12/091,525, filed Apr. 25, 2008 (Attorney Docket DON01 P-1300); Ser. No. 11/239,980, filed Sep. 30, 2005 (Attorney Docket DON01 P-1238); and/or Ser. No. 12/576,550, filed Oct. 9, 2009 (Attorney Docket DON01 P-1562), and/or U.S. provisional application Ser. No. 60/618,686, filed Oct. 14, 2004, which are hereby incorporated herein by reference in their entireties.

[0090] The 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; and/or PCT Application No. PCT/US2004/015424, filed May 18, 2004 by Donnelly Corp. et al. for MIRROR ASSEMBLY FOR VEHICLE, and published on Dec. 2, 2004, as International Publication No. WO 2004/103772, 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. 7,289,037; 7,255,451; 7,274,501; and/or 7,184,190, and/or in PCT Application No. PCT/US2004/015424, filed May 18, 2004 by Donnelly Corp. et al. for MIRROR ASSEMBLY FOR VEHICLE, and published on Dec. 2, 2004, as International Publication No. WO 2004/103772; PCT Application No. PCT/US2003/035381, filed Nov. 5, 2003 by Donnelly Corp. et al. for ELECTRO-OPTIC REFLECTIVE ELEMENT ASSEMBLY, and published May 21, 2004 as International Publication No. WO 2004/042457; and/or in U.S. patent applications, Ser. No. 11/140,396, filed May 27, 2005, now U.S. Pat. No. 7,360,932; Ser. No. 11/226,628, filed Sep. 14, 2005 (Attorney Docket DON01 P-1236); Ser. No. 11/912,576, filed Oct. 25, 2005, now U.S. Pat. No. 7,626,749; and/or Ser. No. 10/538,724, filed Jun. 13, 2005 (Attorney Docket DON01 P-1123), which are all hereby incorporated herein by reference in their entireties.

[0091] 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 and PCT Application No. PCT/US2004/015424, filed May 18, 2004 by Donnelly Corporation et al. for MIRROR ASSEMBLY FOR VEHICLE, and published on Dec. 2, 2004, as International Publication No. WO 2004/103772, which are hereby incorporated herein by reference in their entireties. 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 slide-out 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 (Attorney Docket DON01 P-1123); and/or Ser. No. 12/091,525, filed Apr. 25, 2008 (Attorney Docket DON01 P-1300), 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.

[0092] 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. No. 7,289,037, and/or PCT Application No. PCT/US2004/015424, filed May 18, 2004 by Donnelly Corporation et al. for MIRROR ASSEMBLY FOR VEHICLE, and published on Dec. 2, 2004, as International Publication No. WO 2004/103772; and/or U.S. patent applications, Ser.

No. 11/912,576, filed Oct. 25, 2005, now U.S. Pat. No. 7,626,749; Ser. No. 11/243,783, filed Oct. 5, 2005; and/or Ser. No. 11/021,065, filed Dec. 23, 2004, now U.S. Pat. No. 7,255,451, which are hereby incorporated herein by reference in their entireties.

[0093] 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. 7,581,859; 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 by Karner et al. (Attorney Docket DON01 P-1236); Ser. No. 12/091,525, filed Jul. 15, 2008 (Attorney Docket DON01 P-1300); and/or Ser. No. 10/993,302, filed Nov. 19, 2004, now U.S. Pat. No. 7,338,177, and/or in PCT Application No. PCT/US2003/029776, filed Sep. 19, 2003 by Donnelly Corp. et al. for MIRROR REFLECTIVE ELEMENT ASSEMBLY, and published Apr. 1, 2004 as International Publication No. WO 2004/026633, 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. No. 7,274,501 and/or PCT Application No. PCT/US2003/029776, filed Sep. 19, 2003 by Donnelly Corp. et al. for MIRROR REFLECTIVE ELEMENT ASSEMBLY, and published Apr. 1, 2004 as International Publication No. WO 2004/026633; and/or U.S. patent application Ser. No. 10/993,302, filed Nov. 19, 2004, now U.S. Pat. No. 7,338,177, which are all 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.

[0094] Such a video display screen device or module may comprise any 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 display (LCD), preferably a thin film transistor (TFT) multi-pixel liquid crystal display (such as discussed below), or the screen may comprise a multi-pixel organic electroluminescent display or a multi-pixel light emitting diode (LED), such as an organic light emitting diode (OLED) or inorganic light emitting diode display or the like, or a passive reflective and/or backlit pixelated display, or an electroluminescent (EL) display, or a vacuum fluorescent (VF) display or the like. For example, the video display screen may comprise a video screen of the types disclosed in U.S. Pat. Nos. 7,370,983; 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. 10/538,724, filed Jun. 13, 2005 (Attorney Docket DON01 P-1123); Ser. No. 11/226,628, filed Sep. 14, 2005 by Karner et al. (Attorney Docket DON01 P-1236); Ser. No. 12/091,525, filed Apr. 25, 2008 (Attorney Docket DON01 P-1300); Ser. No. 09/585,379, filed Jun. 1, 2000; Ser. No. 10/207,291, filed Jul. 29, 2002; and/or Ser. No. 10/538,724, filed Jun. 13, 2005 (Attorney Docket DON01 P-1123), which are hereby incorporated herein by reference in their entireties.

[0095] 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 (Attorney Docket DON01 P-1118), 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.

[0096] Optionally, the mirror assembly may include or may be associated with a compass sensor and circuitry for a compass system that detects and displays the vehicle directional heading to a driver of the vehicle. 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 magneto-responsive sensor elements (such as a Hall sensor or multiple Hall 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 ASIC chip, such as utilizing principles described in U.S. Pat. Nos. 7,329,013 and/or 7,370,983, and/or U.S. patent application Ser. No. 11/226,628, filed Sep. 14, 2005 (Attorney Docket DON01 P-1236), which are hereby incorporated herein by reference in their entireties, 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. patent application Ser. No. 11/201,661, filed Aug. 11, 2005, now U.S. Pat. No. 7,480,149, which is hereby incorporated herein by reference in its entirety. The ASIC chip may be small (preferably less than approximately a two square centimeter area, more preferably less than approximately a 1.5 square centimeter area, and most preferably less than approximately a one square centimeter area or thereabouts) and readily packagable into the mirror assembly (or a feed from such a compass-on-a-chip may be provided to the mirror assembly from a compass-on-a-chip packaged elsewhere in the vehicle cabin remote from the mirror assembly such as in an instrument panel portion or in roof console portion). Such large scale integration onto the likes of the silicon substrate/chip can allow a compass functionality to be provided by a relatively small chip, and with appropriate pin out or electrical leads provided as is common in the electrical art.

[0097] Optionally, a compass chip or compass module may be disposed at an upper end of the mounting base of a mirror assembly, such as at an upper or connecting end of a wire management element connected to or extending from the mounting base of the mirror assembly, such as by utilizing aspects of the mirror systems described in U.S. patent application Ser. No. 12/578,732, filed Oct. 14, 2009 (Attorney Docket DON01 P-1564), which is hereby incorporated herein by reference in its entirety. The wire management system may include a wire management element or channel or cover element, such as by utilizing aspects of the wire management systems or elements described in U.S. patent applications, Ser. No. 11/226,628, filed Sep. 14, 2005 (Attorney Docket DON01 P-1236); and/or Ser. No. 11/584,697, filed Oct. 20, 2006, now U.S. Pat. No. 7,510,287, which are hereby incorporated herein by reference in their entireties.

[0098] The compass chip may be in communication with a compass display, which may provide a display region at the reflective element, and which includes ports or portions, which may comprise icons, characters or letters or the like representative of only the cardinal directional points, such as, for example, the characters N, S, E, W, formed or etched in the reflective film coating of the reflective element (and forming a transparent window therein), such as via techniques such as disclosed in commonly assigned U.S. Pat. Nos. 4,882,565 and/or 7,004,593, which are hereby incorporated by reference herein in their entireties. Optionally, however, reflective element may comprise a transflective or display on demand (DOD) reflective element, and the compass display may be a display on demand (DOD) type of display, such as disclosed in commonly assigned U.S. Pat. Nos. 7,195,381; 6,690,268; 5,668,663 and 5,724,187, which are hereby incorporated by reference herein in their entireties, without affecting the scope of the present invention.

[0099] Optionally, the compass system and compass circuitry may utilize 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 PCT Application No. PCT/US2004/015424, filed May 18, 2004 by Donnelly Corp. et al. for MIRROR ASSEMBLY FOR VEHICLE, and published on Dec. 2, 2004, as International Publication No. WO 2004/103772, 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 (Attorney Docket DON01 P-1236), 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 sensor or sensors may be positioned at and within a base portion or mounting base of the mirror assembly so that the sensor/sensors is/are substantially fixedly positioned within the vehicle, or may be attached or positioned within the mirror casing. Note that the magneto-responsive sensor used with the mirror assembly may comprise a magneto-responsive sensor, such as a magneto-resistive sensor, such as the types disclosed in U.S. Pat. Nos. 5,255,442; 5,632,092; 5,802,727; 6,173,501; 6,427,349; and 6,513,252 (which are hereby incorporated herein by reference in their entireties), or a magneto-inductive sensor, such as described in U.S. Pat. No. 5,878,370 (which is hereby incorporated herein by reference in its entirety), or a magneto-impedance sensor, such as the types described in PCT Publication No. WO 2004/076971 A2, published Sep. 10, 2004 (which is hereby incorporated herein by reference in its entirety), or a Hall-effect sensor, such as the types described in U.S. Pat. Nos. 6,278,271; 5,942,895 and 6,184,679 (which are hereby incorporated herein by reference in their entireties). The sensor circuitry and/or the circuitry in the mirror housing and associated with the sensor may include processing circuitry. For example, a printed circuit board may include processing circuitry which may include compensation methods, such as those described in U.S. Pat. Nos. 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 6,642,851, which are all hereby incorporated herein by reference in their entireties. 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. 5,924,212; 4,862,594; 4,937,945; 5,131,154; 5,255,442; 5,632,092; 7,004,593; and/or 7,289,037, and/or PCT Application No. PCT/US2004/015424, filed May 18, 2004 by Donnelly Corp. et al. for MIRROR ASSEMBLY FOR VEHICLE, and published on Dec. 2, 2004, as International Publication No. WO 2004/103772, which are all hereby incorporated herein by reference in their entireties.

[00100] 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 6,124,886, and/or, and/or PCT Application No. PCT/US2003/003012, filed Jan. 31, 2003 by Donnelly Corporation for VEHICLE ACCESSORY MODULE, and published Aug. 7, 2003 as International Publication No. WO 03/065084, and/or PCT Application No. PCT/US2003/040611, filed Dec. 19, 2003 by Donnelly Corporation for ACCESSORY SYSTEM FOR VEHICLE, and published Jul. 15, 2004 as International Publication No. WO 2004/058540, and/or PCT Application No. PCT/US2004/015424, filed May 18, 2004 by Donnelly Corporation et al. for MIRROR ASSEMBLY FOR VEHICLE, and published on Dec. 2, 2004, as International Publication No. WO 2004/103772, which are hereby incorporated herein by reference in their entireties.

[00101] Optionally, the user inputs of the mirror assembly may comprise other types of buttons or switches for controlling or activating/deactivating one or more electrical accessories or devices of or associated with the mirror assembly. The mirror assembly may comprise any type of switches or buttons, such as touch or proximity sensing switches, such as touch or proximity switches of the types described above, or the inputs may comprise other types of buttons or switches, such as those described in U.S. patent applications, Ser. No. 12/414,190, filed Mar. 30,

2009 (Attorney Docket DON01 P-1509), and/or Ser. No. 11/029,695, filed Jan. 5, 2005, now U.S. Pat. No. 7,253,723, which are hereby incorporated herein by reference in their entireties, or such as fabric-made position detectors, such as those described in U.S. Pat. Nos. 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. For example, the inputs may comprise a touch or proximity sensor of the types commercially available from TouchSensor Technologies, LLC of Wheaton, IL. The touch or proximity sensor may be operable to generate an electric field and to detect the presence of a conductive mass entering the field. When a voltage is applied to the sensor, the sensor generates the electric field, which emanates through any dielectric material, such as plastic or the like, at the sensor. When a conductive mass (such as a person's finger or the like, or metal or the like) enters the electric field, the sensor may detect a change in the field and may indicate such a detection. Other types of switches or buttons or inputs or sensors may be incorporated to provide the desired function, without affecting the scope of the present invention.

[00102] 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 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; and 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 PCT Application No. PCT/US2003/040611, filed Dec. 19, 2003 by Donnelly Corporation et al. for ACCESSORY SYSTEM FOR VEHICLE, and published Jul. 15, 2004 as International Publication No. WO 2004/058540, and/or PCT Application No. PCT/US2003/030877, filed Oct. 1, 2003 by Donnelly Corp. for MICROPHONE SYSTEM FOR VEHICLE, and published Apr. 15, 2004 as International Publication No. WO 2004/032568, which are all hereby incorporated herein by reference in their entireties.

[00103] 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. 6,243,003; 6,278,377; and/or 6,420,975; and/or U.S. patent application Ser. No. 10/529,715, filed Mar. 30, 2005, now U.S. Pat. No. 7,657,052; and/or PCT Application No. PCT/US2003/030877, filed Oct. 1, 2003, and published Apr. 15, 2004 as International Publication No. WO 2004/032568, 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. 5,929,786 and/or 5,786,772, and/or U.S. patent applications, Ser. No. 10/427,051, filed Apr. 30, 2003, now U.S. Pat. No. 7,038,577; and Ser. No. 10/209,173, filed Jul. 31, 2002, now U.S. Pat. No. 6,882,287; and/or Ser. No. 11/315,675, filed Dec. 22, 2005 (Attorney Docket DON01 P-1253), 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. 6,690,268; 6,847,487; and/or 7,400,435, and/or U.S. provisional application Ser. No. 60/618,686, filed Oct. 14, 2004, and/or U.S. patent applications, Ser. No. 11/105,757, filed Apr. 14, 2005, now U.S. Pat. No. 7,526,103, and/or Ser. No. 11/239,980, filed Sep. 30, 2005 (Attorney Docket DON01 P-1238), 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 with the disclosures of the referenced patents and patent applications being hereby incorporated herein by reference in their entireties).

[00104] 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; and 7,004,606; and/or U.S. patent applications, Ser. No. 11/315,675, filed Dec. 22, 2005 and published Aug. 17, 2006 as U.S. Patent Publication No. US-2006-0184297A1 (Attorney Docket DON01 P-1253); Ser. No. 10/534,632, filed May 11, 2005 and published Aug. 3, 2006 as U.S. Patent Publication No. US-2006-0171704-A1 (Attorney Docket DON01 P-1118); Ser. No. 12/091,359, filed Jun. 10, 2008 (Attorney Docket MAG04 P-1299); and/or Ser. No. 12/377,054, filed Feb. 10, 2009 (Attorney Docket DON01 P-1367); and/or PCT Application No. PCT/US2006/041709 filed Oct. 27, 2006, published May 10, 2007 as PCT Publication No. WO 07/053404; and/or PCT Application No. PCT/ US2007/075702, filed Aug. 10, 2007, published Feb. 28, 2008 as PCT Publication No. WO 08/024639, 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 application Serial No. 10/534,632, filed May 11, 2005 (Attorney Docket DON01 P-1118); and/or PCT Application No. PCT/US2006/041709, filed Oct. 27, 2006 and published May 10, 2007 as International Publication No. WO 07/053404; and/or PCT Application No. PCT/US2003/036177 filed Nov. 14, 2003 and published Jun. 3, 2004 as PCT Publication No. WO 2004/047421, which are hereby incorporated herein by reference in their entireties.

[00105] 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.

[00106] 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. A rearview mirror assembly for a vehicle, said rearview mirror assembly comprising:

a mirror casing;

a reflective element having a front surface and a rear surface and a perimeter edge about a periphery of said reflective element and extending between said front and rear surfaces, said front surface generally facing a driver of a vehicle when said mirror assembly is normally mounted in a vehicle equipped with said mirror assembly;

a mounting assembly for adjustably mounting said mirror assembly at a portion of the equipped vehicle;

wherein said rear surface of said reflective element is attached to an attachment surface to secure said reflective element relative to said mirror casing; and

wherein said perimeter edge of said reflective element is exposed and viewable by the driver of the vehicle when said reflective element is attached to said attachment surface and when said mirror assembly is normally mounted in the equipped vehicle.

2. The rearview mirror assembly of claim 1, wherein said rear surface of said reflective element is adhered to said attachment surface of said mirror casing.

3. The rearview mirror assembly of claim 1, wherein said rear surface of said reflective element is adhered to an attachment plate that is attached to said mirror casing.

4. The rearview mirror assembly of claim 1, wherein said reflective element comprises a perimeter edge between said front and rear surfaces, and wherein said perimeter edge has a rounded front portion to provide a curved transition between said front surface and said mirror casing.

5. The rearview mirror assembly of claim 1, wherein the perimeter regions of said reflective element are generally flush or co-planar with respective side walls of said mirror casing when said rear surface of said reflective element is attached to said attachment surface of said mirror casing.

6. The rearview mirror assembly of claim 1, wherein said reflective element comprises a prismatic reflective element.

7. The rearview mirror assembly of claim 6, further comprising a toggle device for adjusting a reflectivity of said prismatic reflective element, and wherein said mirror casing comprises a pair of spaced apart attachment surfaces and a central cavity formed between said attachment surfaces, said toggle device being at least partially received in said central cavity.

8. The rearview mirror assembly of claim 1, wherein said reflective element comprises an electro-optic reflective element, and wherein said electro-optic reflective element comprises a front substrate and a rear substrate with an electro-optic medium sandwiched therebetween.

9. The rearview mirror assembly of claim 8, wherein said front substrate has larger cross dimensions relative to said rear substrate so that said front substrate extends beyond corresponding edges of said rear substrate, and wherein said perimeter edge of said front substrate of said reflective element is exposed and viewable by the driver of the vehicle when said reflective element is attached to said attachment surface and when said mirror assembly is normally mounted in the equipped vehicle, and wherein said rear substrate is received in a forward portion of said mirror casing, and wherein said perimeter edge of said front substrate has a rounded front portion to provide a curved transition between a front surface of said front substrate and said mirror casing.

10. The rearview mirror assembly of claim 1, wherein said mirror casing comprises a recessed portion rearward of said attachment surface.

11. A rearview mirror assembly for a vehicle, said rearview mirror assembly comprising:

a mirror casing;

a reflective element having a front surface and a rear surface and a perimeter edge about a periphery of said reflective element and extending between said front and rear surfaces, said front surface generally facing a driver of a vehicle when said mirror assembly is normally mounted in a vehicle equipped with said mirror assembly;

a mounting assembly for adjustably mounting said mirror assembly at a portion of the equipped vehicle; and

wherein said mirror casing comprises a generally planar attachment surface unitarily formed with the walls of said mirror casing, and wherein said rear surface of said reflective element is attached to said attachment surface to secure said reflective element to said mirror casing.

12. The rearview mirror assembly of claim 11, wherein said rear surface of said reflective element is adhered to said attachment surface of said mirror casing.

13. The rearview mirror assembly of claim 12, wherein said mirror casing comprises a pair of spaced apart attachment surfaces and a central portion formed between said attachment surfaces, wherein said mounting assembly attaches to said mirror casing at said central portion.

14. The rearview mirror assembly of claim 11 further including a bezel portion that encompasses said perimeter edge of said reflective element and that attaches to a forward perimeter region of said mirror casing.

15. The rearview mirror assembly of claim 11, wherein said perimeter edge of said reflective element is exposed and viewable by the driver of the vehicle when said reflective element is attached to said attachment surface and when said mirror assembly is normally mounted in the equipped vehicle.

16. The rearview mirror assembly of claim 11, wherein said reflective element comprises a prismatic reflective element.

17. The rearview mirror assembly of claim 11, wherein said reflective element comprises an electro-optic reflective element and wherein said electro-optic reflective element comprises a front substrate and a rear substrate with an electro-optic medium sandwiched therebetween.

18. The rearview mirror assembly of claim 17, wherein said front substrate has larger cross dimensions relative to said rear substrate so that said front substrate extends beyond corresponding edges of said rear substrate, and wherein said perimeter edge of said front substrate of said reflective element is exposed and viewable by the driver of the vehicle when said reflective element is attached to said attachment surface and when said mirror assembly is normally mounted in the equipped vehicle, and wherein said rear substrate is received in a forward portion of said mirror casing, and wherein said perimeter edge of said front substrate has a rounded front portion to provide a curved transition between a front surface of said front substrate and said mirror casing.

19. A rearview mirror assembly for a vehicle, said rearview mirror assembly comprising:

a mirror casing;

an attachment plate having a generally planar attaching surface;

a reflective element having a front surface and a rear surface and a perimeter edge about a periphery of said reflective element and extending between said front and rear surfaces, said front surface generally facing a driver of a vehicle when said mirror assembly is normally mounted in a vehicle equipped with said mirror assembly;

a mounting assembly for adjustably mounting said mirror assembly at a portion of the equipped vehicle; and

wherein said generally planar attachment surface of said attachment plate is adhered to said rear surface of said reflective element and wherein perimeter regions of said reflective element extend radially outward and beyond perimeter regions of said attachment plate to establish overhang regions around the periphery of said reflective element;

wherein said mirror casing is attached to said attachment plate at said perimeter regions of said attachment plate, and wherein, when said mirror casing is attached to said attachment plate, a forward edge portion of said mirror casing is received at said overhang regions and said perimeter edge of said reflective element is generally flush with an outer surface of said mirror casing and is exposed and viewable by the driver of the vehicle when said mirror assembly is normally mounted in the equipped vehicle, and wherein said perimeter edge of said reflective element is exposed and viewable by the driver of the vehicle when said reflective element is attached to said attachment plate and when said mirror assembly is normally mounted in the equipped vehicle.

20. The rearview mirror assembly of claim 19, wherein said attachment plate has an attaching flange around its periphery and wherein said attaching flange is received in said mirror casing when said mirror casing is attached to said attachment plate, and wherein said forward edge portion of said mirror casing is attached to said attaching flange to attach said mirror casing to said attachment plate.

21. The rearview mirror assembly of claim 20, wherein said forward edge portion of said mirror casing is one of (a) adhered to said attaching flange to attach said mirror casing to said attachment plate and (b) snapped to said attaching flange to attach said mirror casing to said attachment plate.

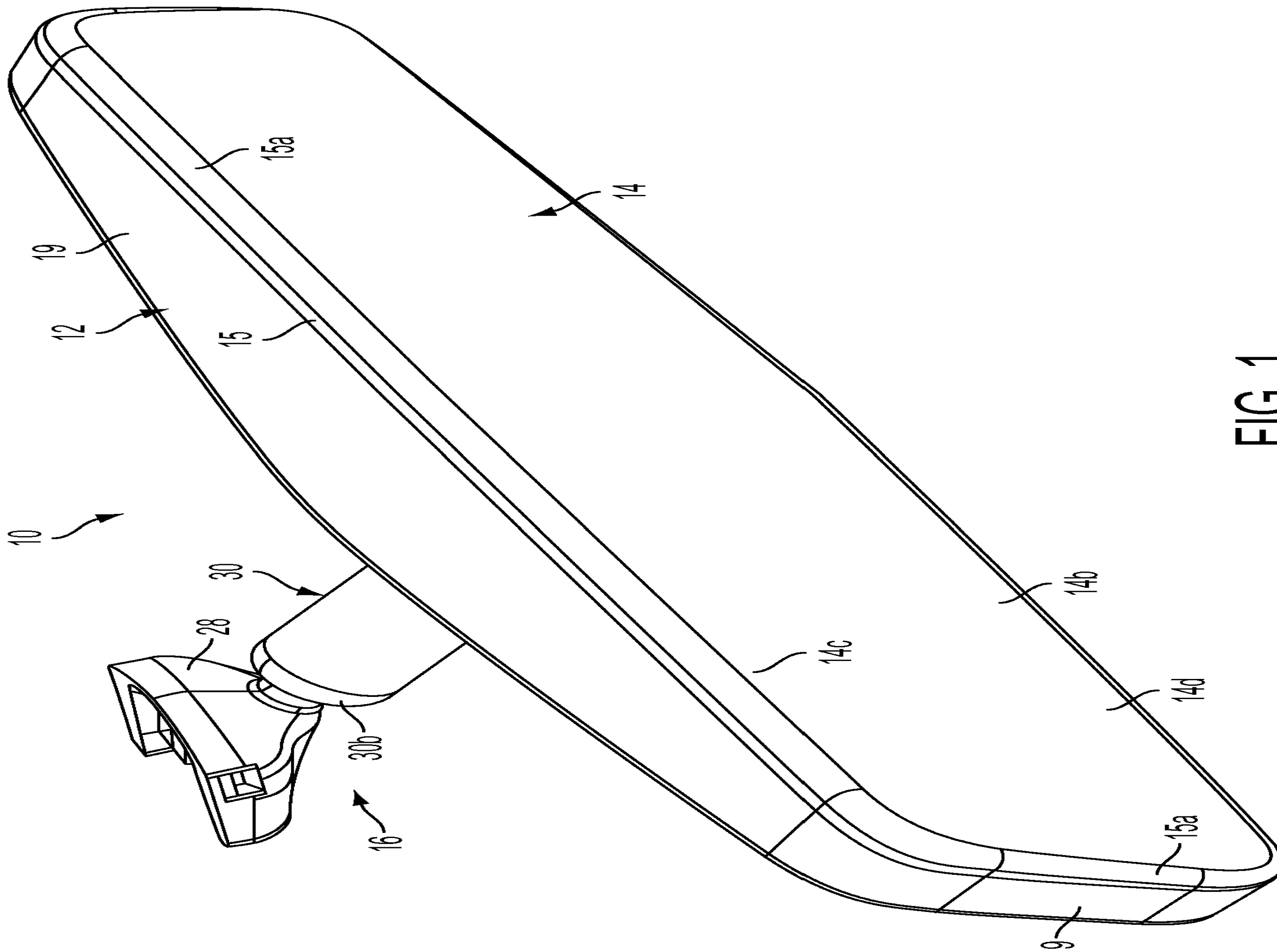


FIG. 1

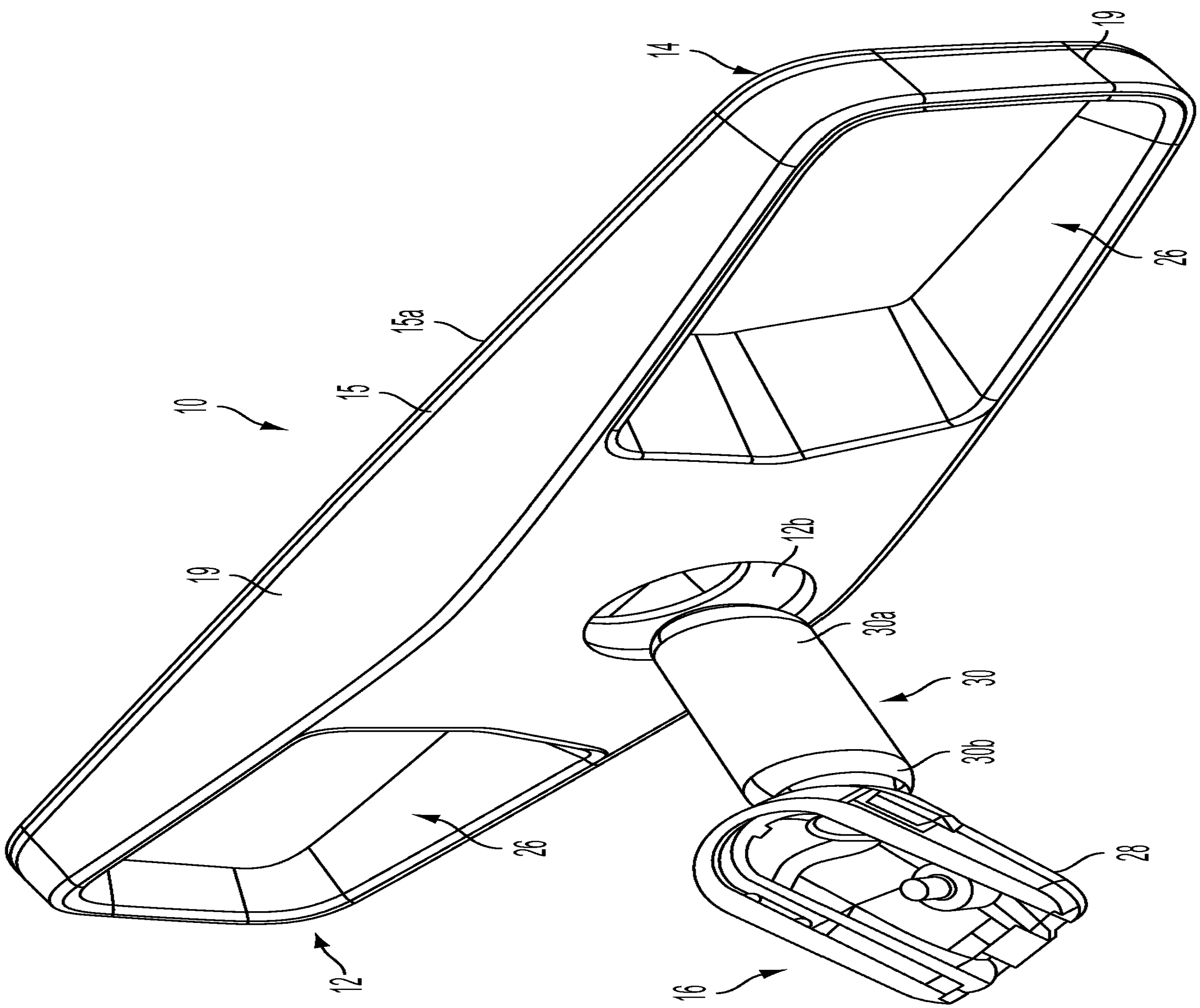


FIG. 2

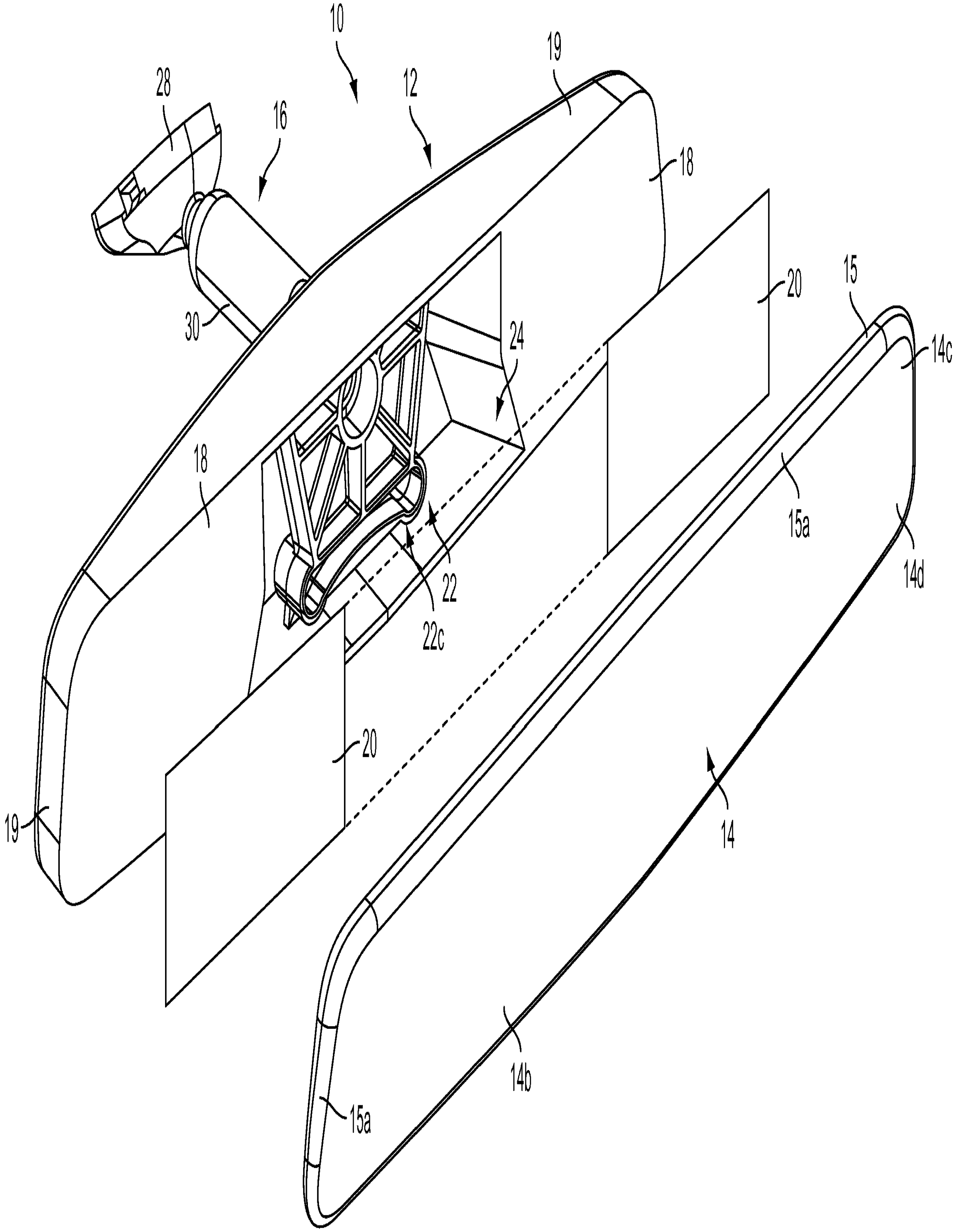


FIG. 3

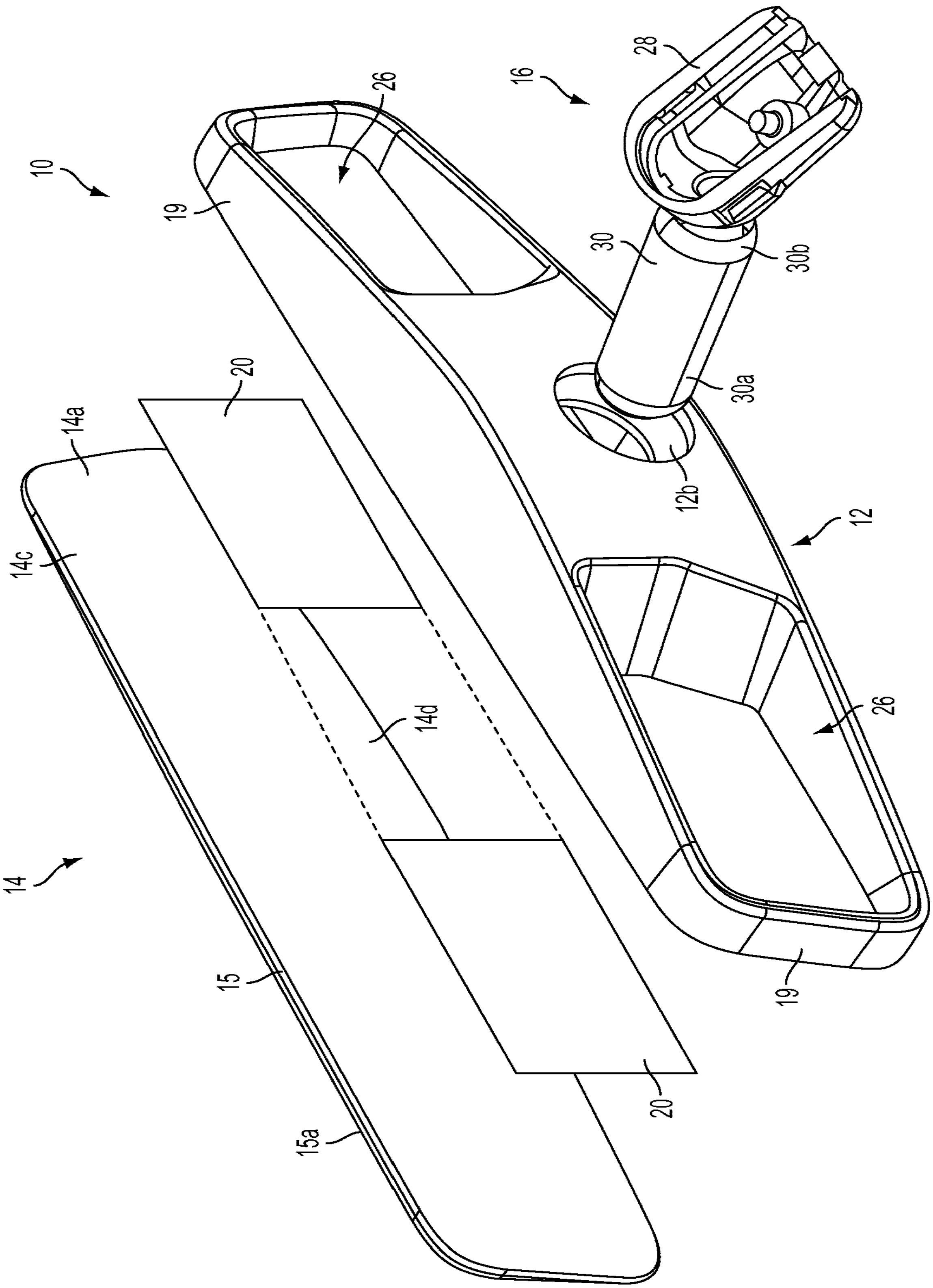


FIG. 4

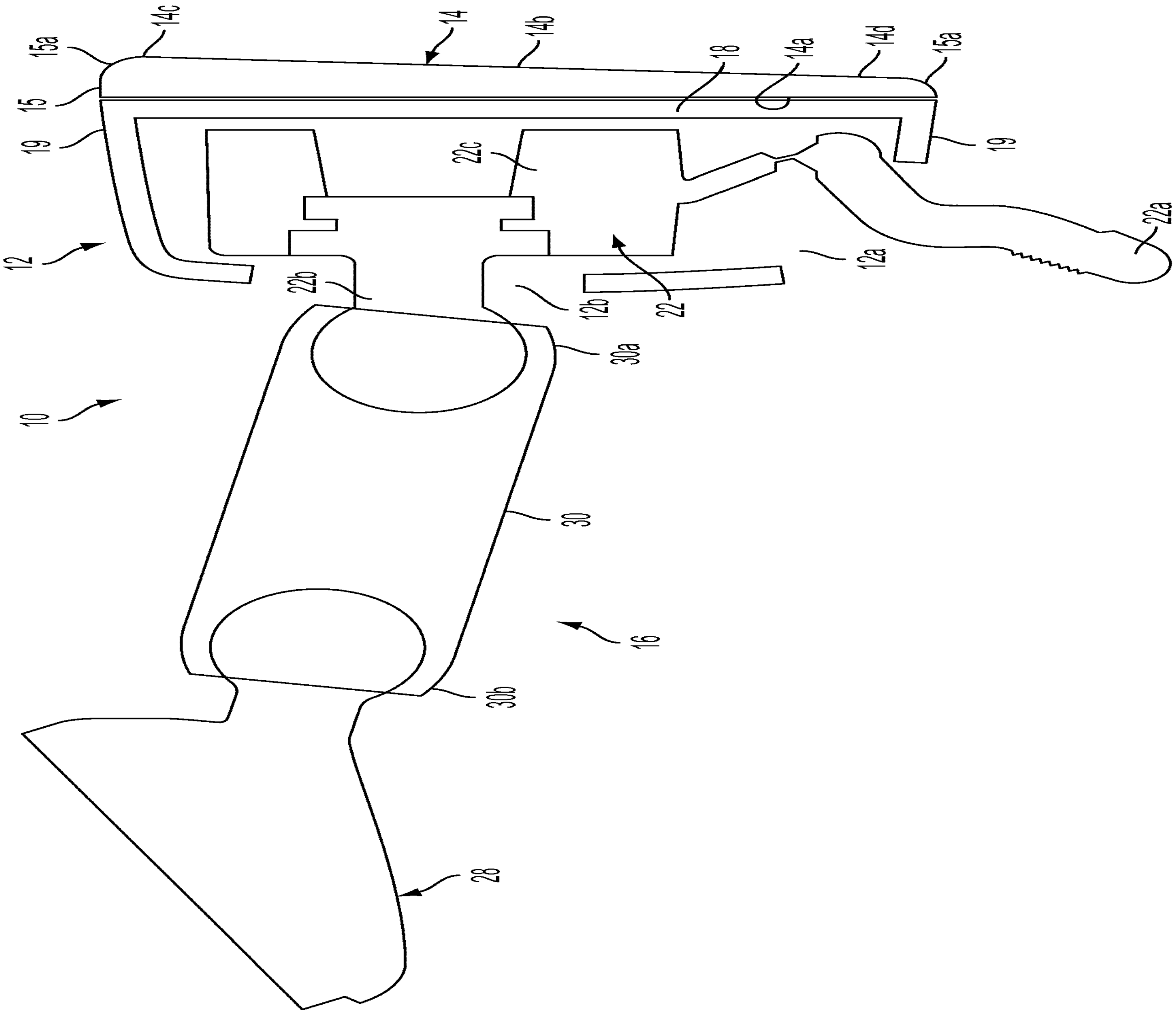

14c
14
14b
18
14a
14d
15a
15a
15
19
19
22c
22a
12
12a
22b
12b
22
30a
10
30
16
30b
28

FIG. 5

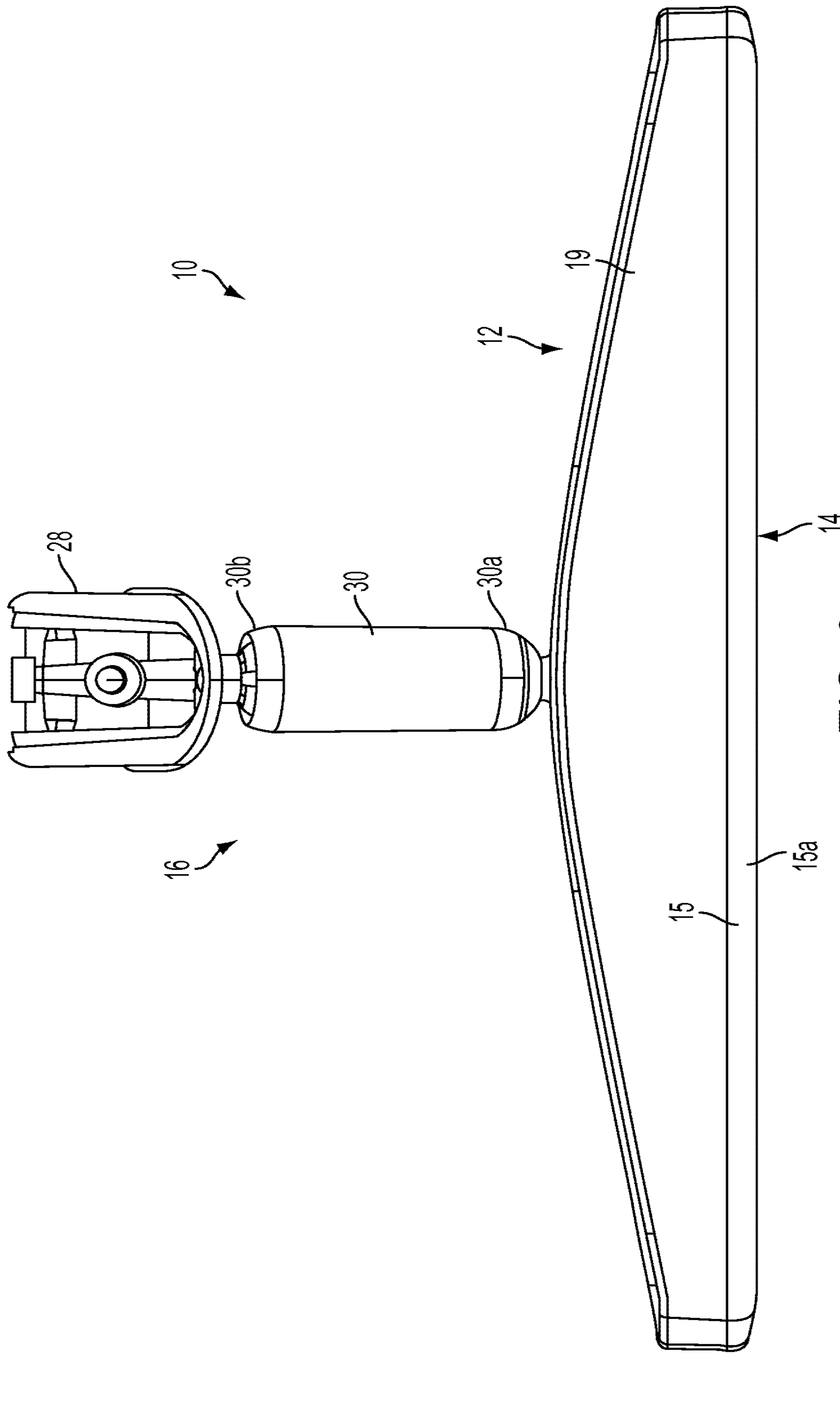


FIG. 6

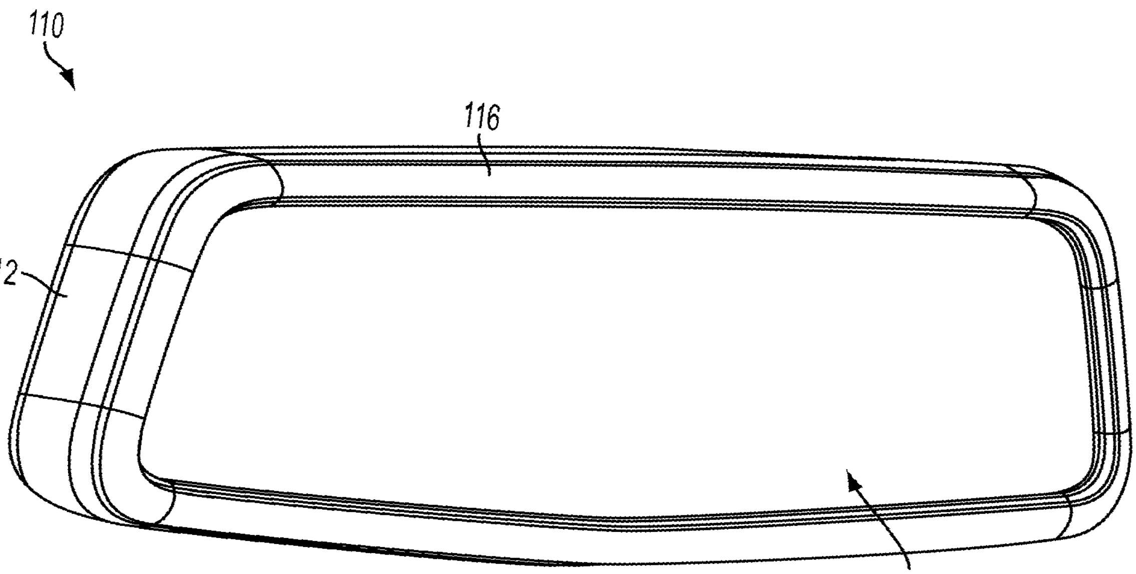


FIG. 7

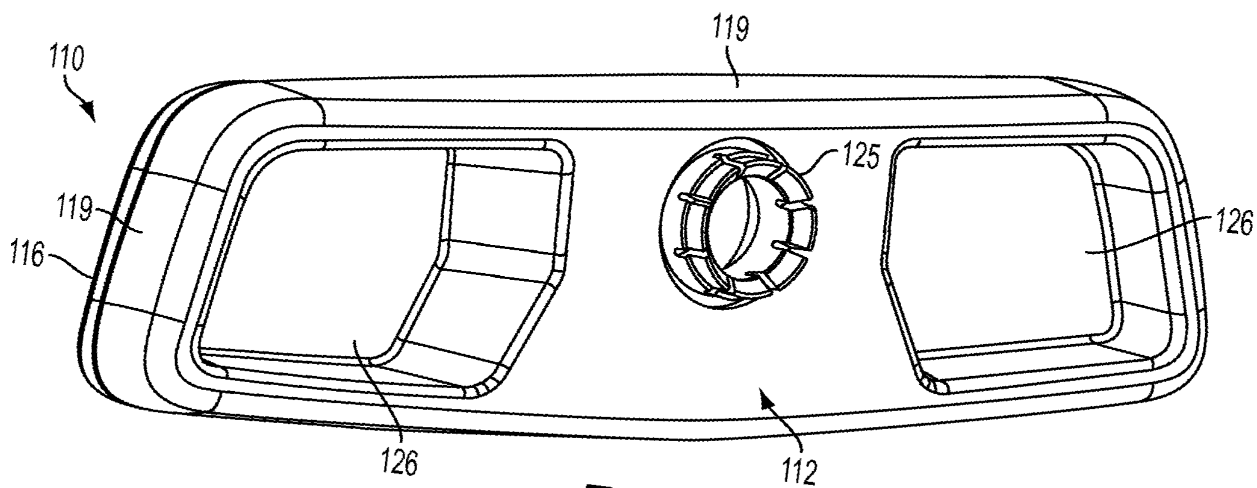


FIG. 8

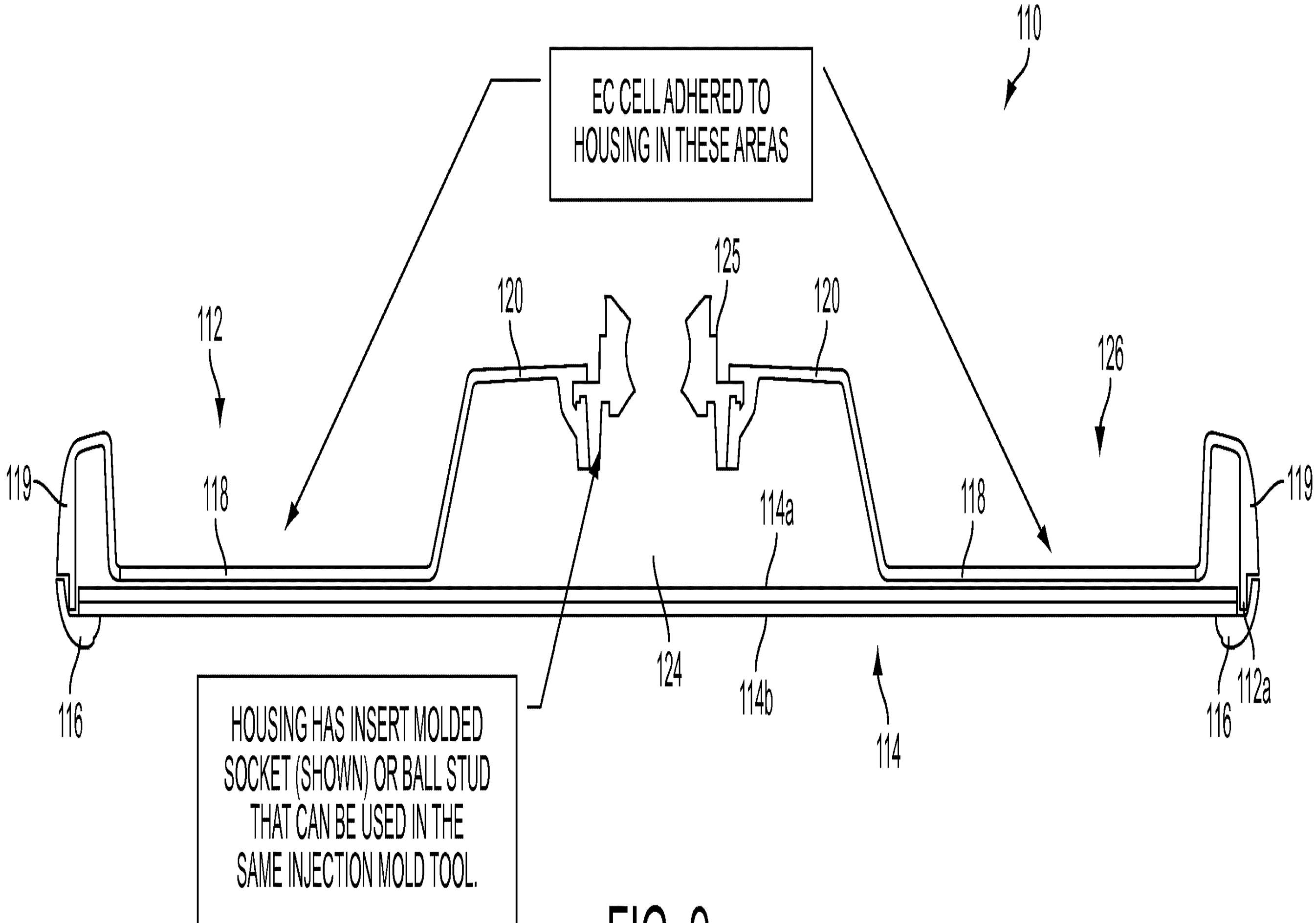

110
EC CELL ADHERED TO
HOUSING IN THESE AREAS
125
120
120
112
126
119
118
114a
118
119
116
124
114b
116
112a
114
HOUSING HAS INSERT MOLDED
SOCKET (SHOWN) OR BALL STUD
THAT CAN BE USED IN THE
SAME INJECTION MOLD TOOL.

FIG. 9

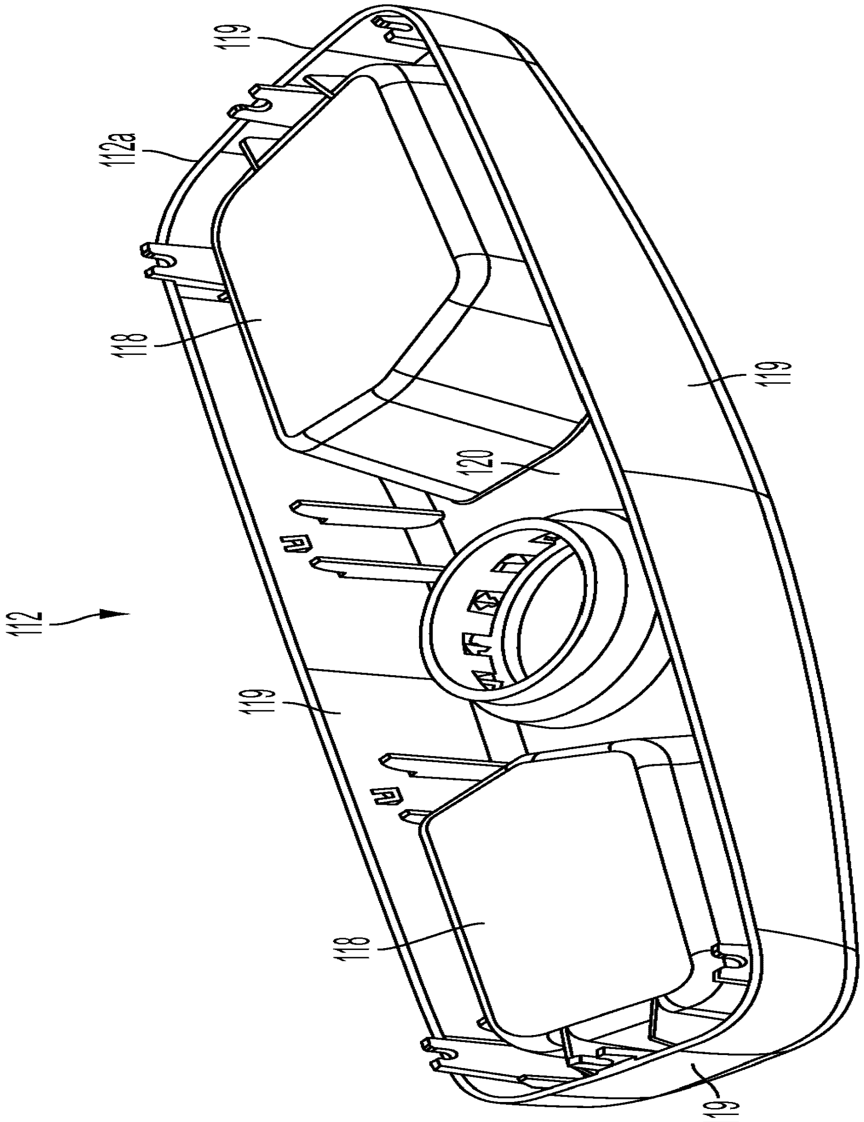


FIG. 10

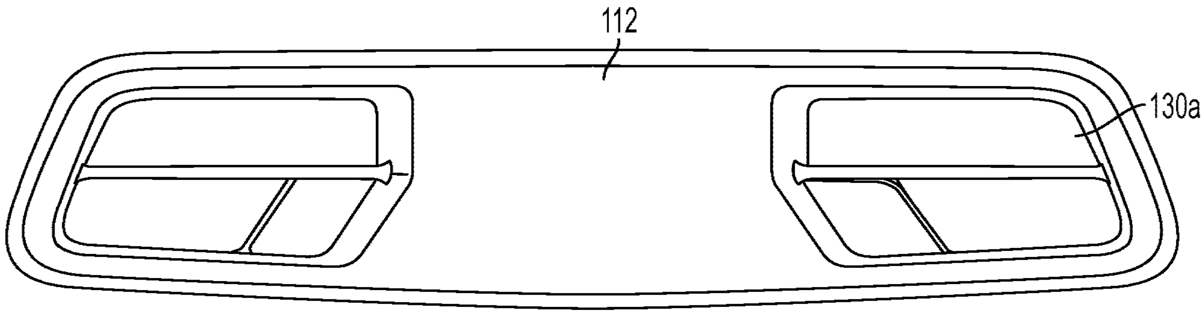


FIG. 11A

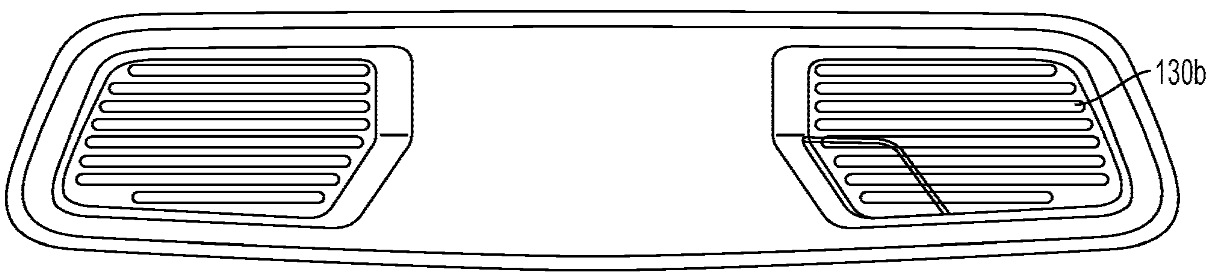


FIG. 11B

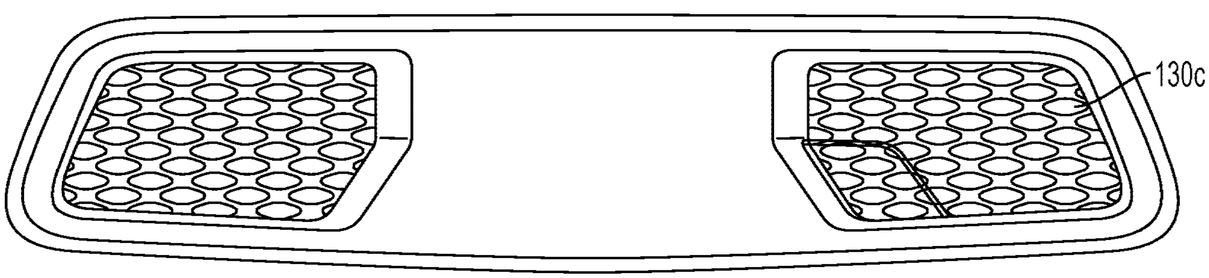


FIG. 11C

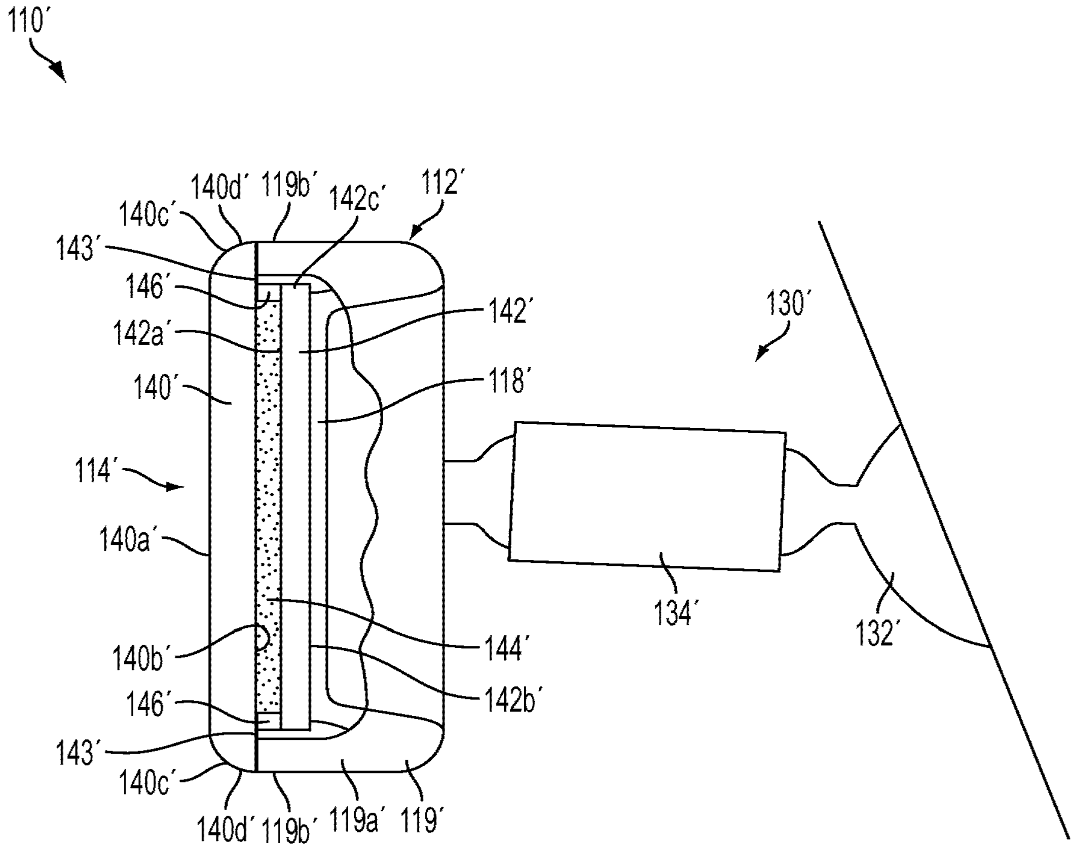

110′
140d′
119b′
112′
140c′
142c′
143′
146′
142′
130′
142a′
140′
118′
114′
140a′
134′
132′
140b′
144′
146′
142b′
143′
140c′
140d′
119b′
119a′
119′

FIG. 12

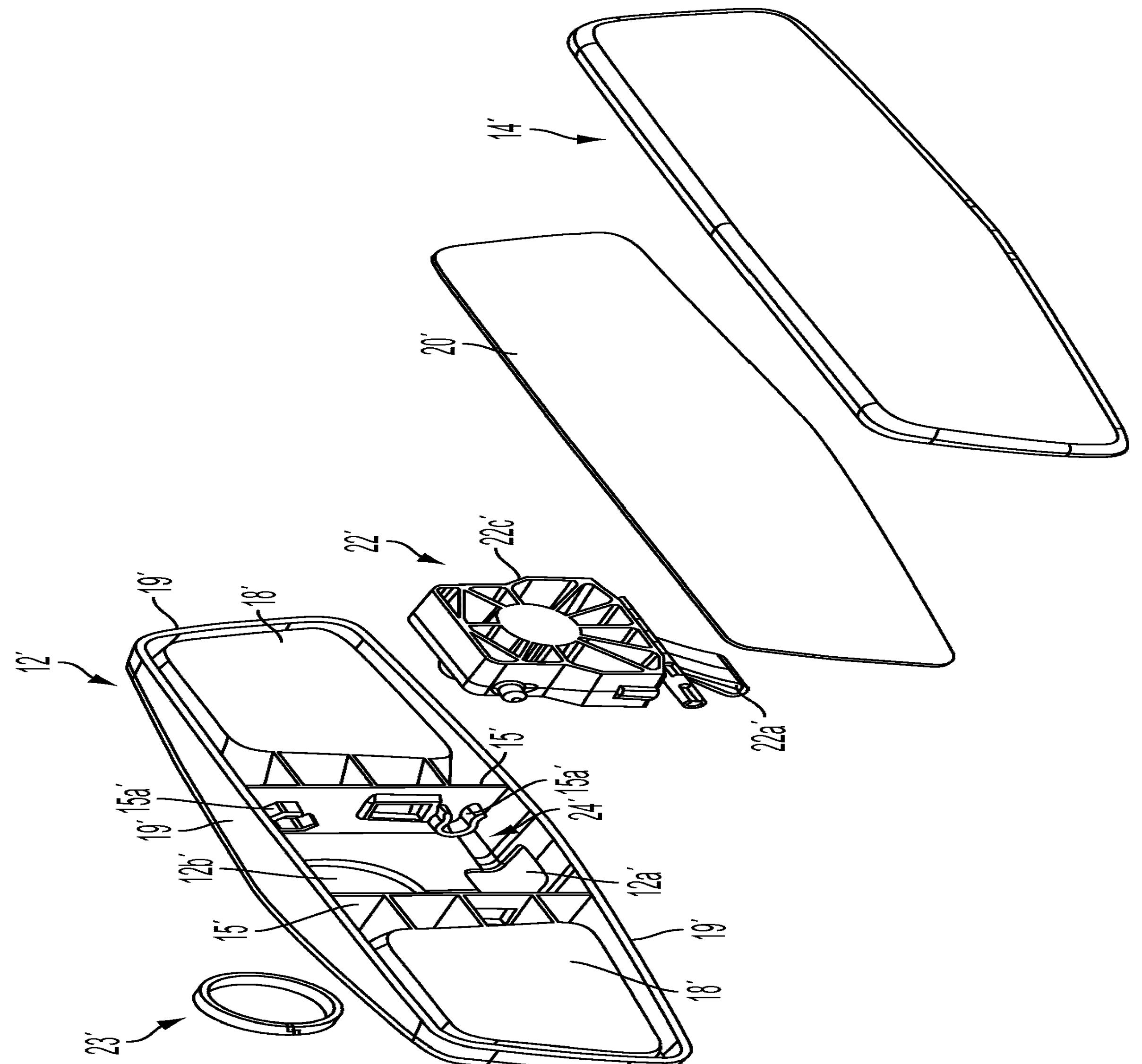


FIG. 13

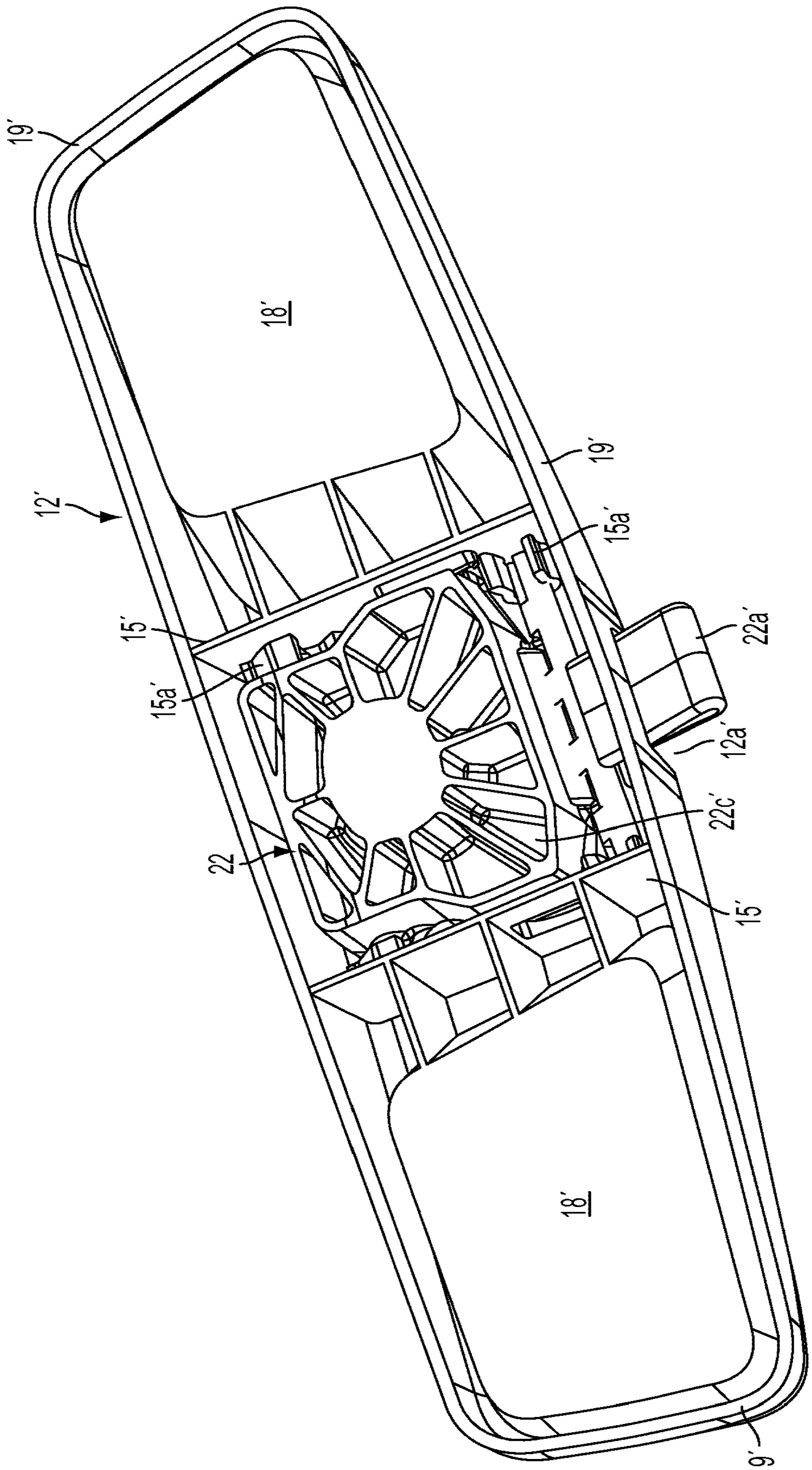


FIG. 14

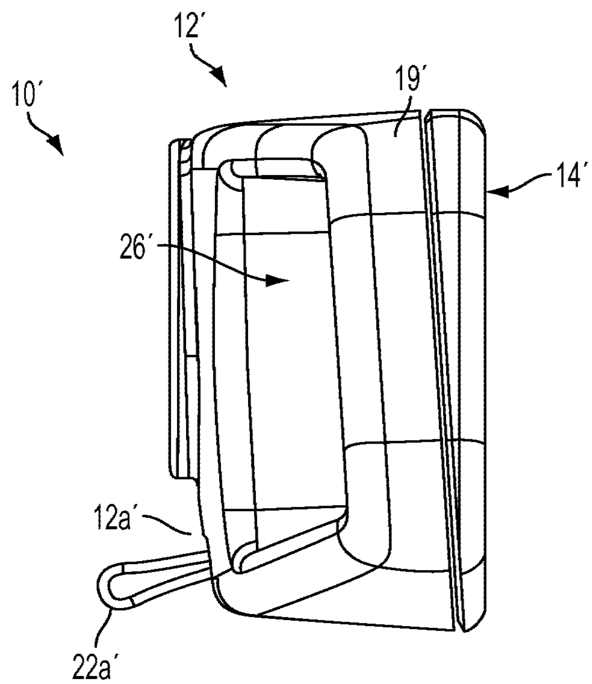


FIG. 15

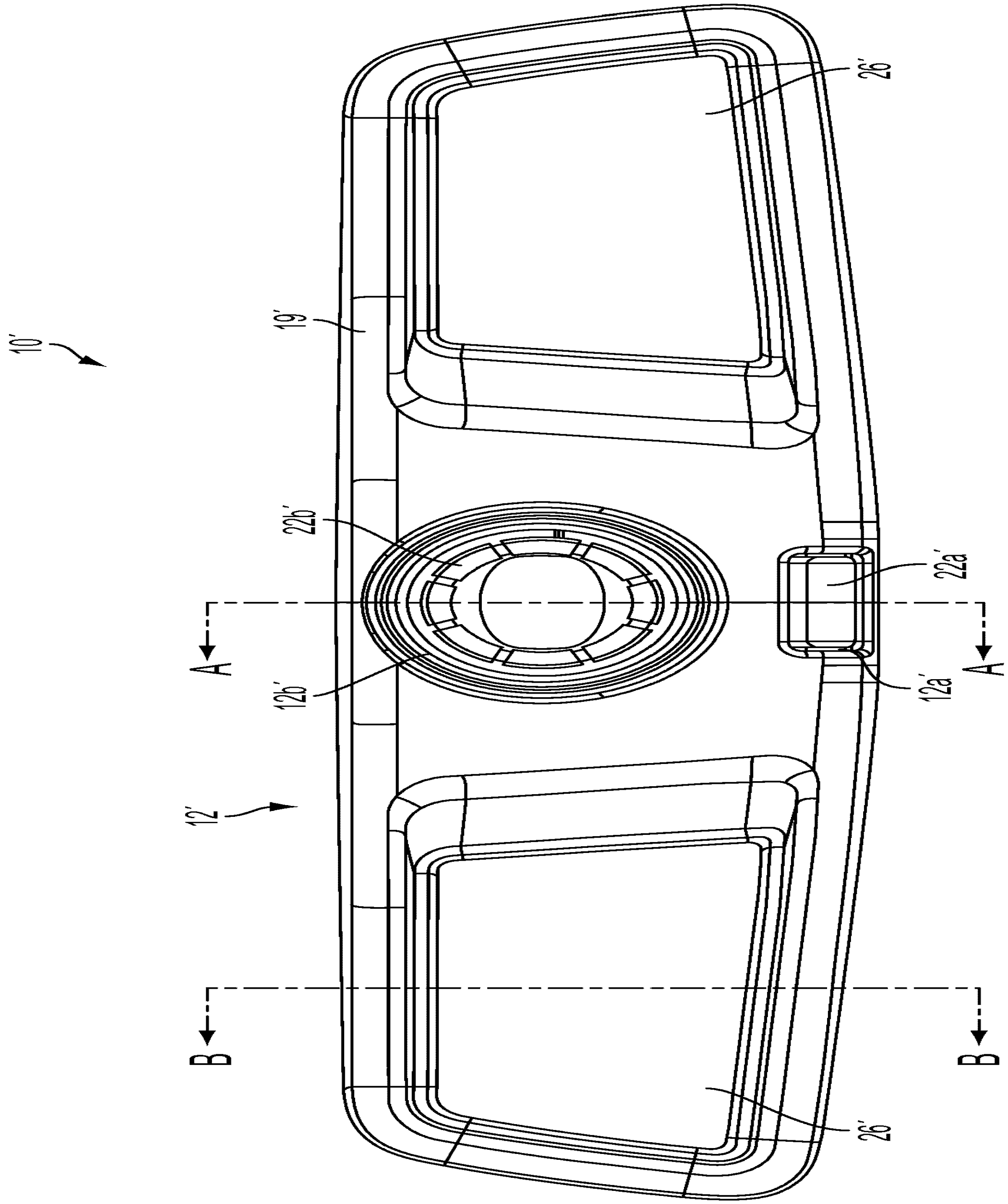


FIG. 16

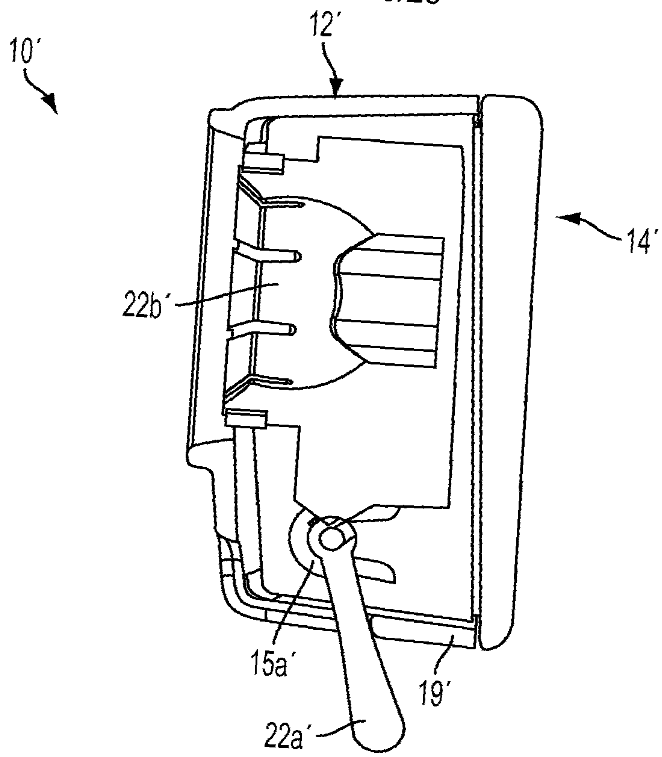


FIG. 16A

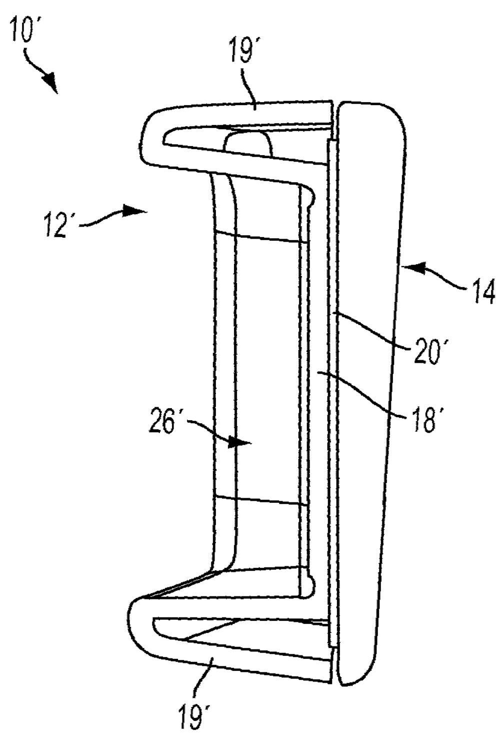


FIG. 16B

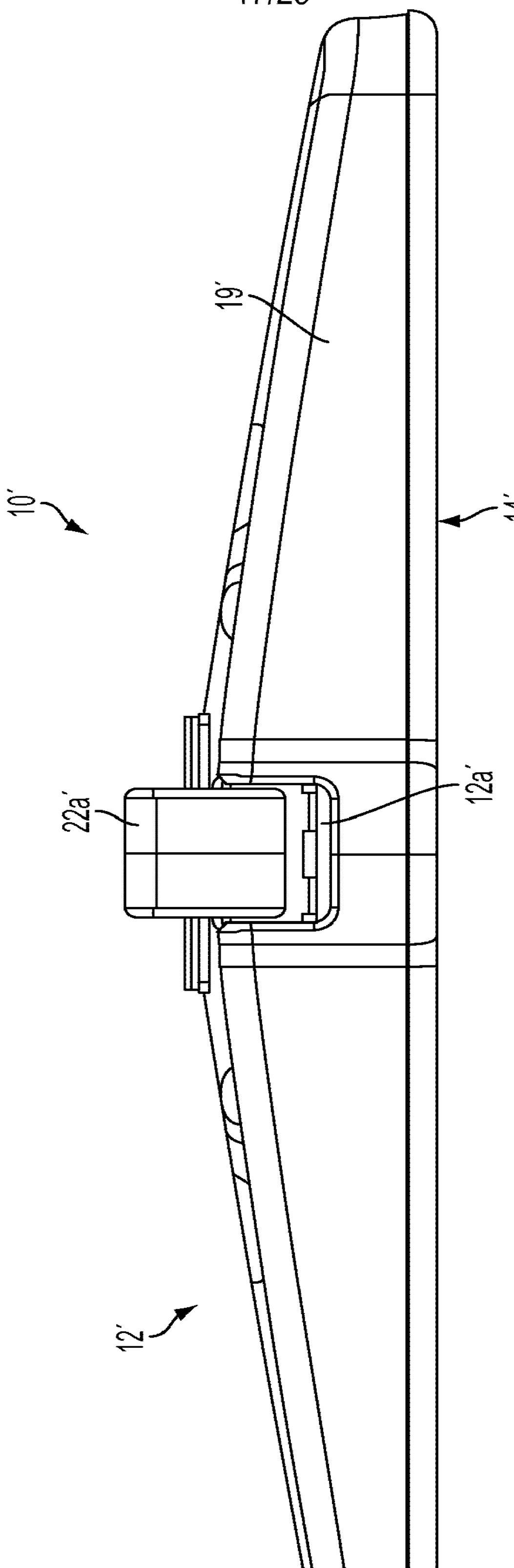


FIG. 17

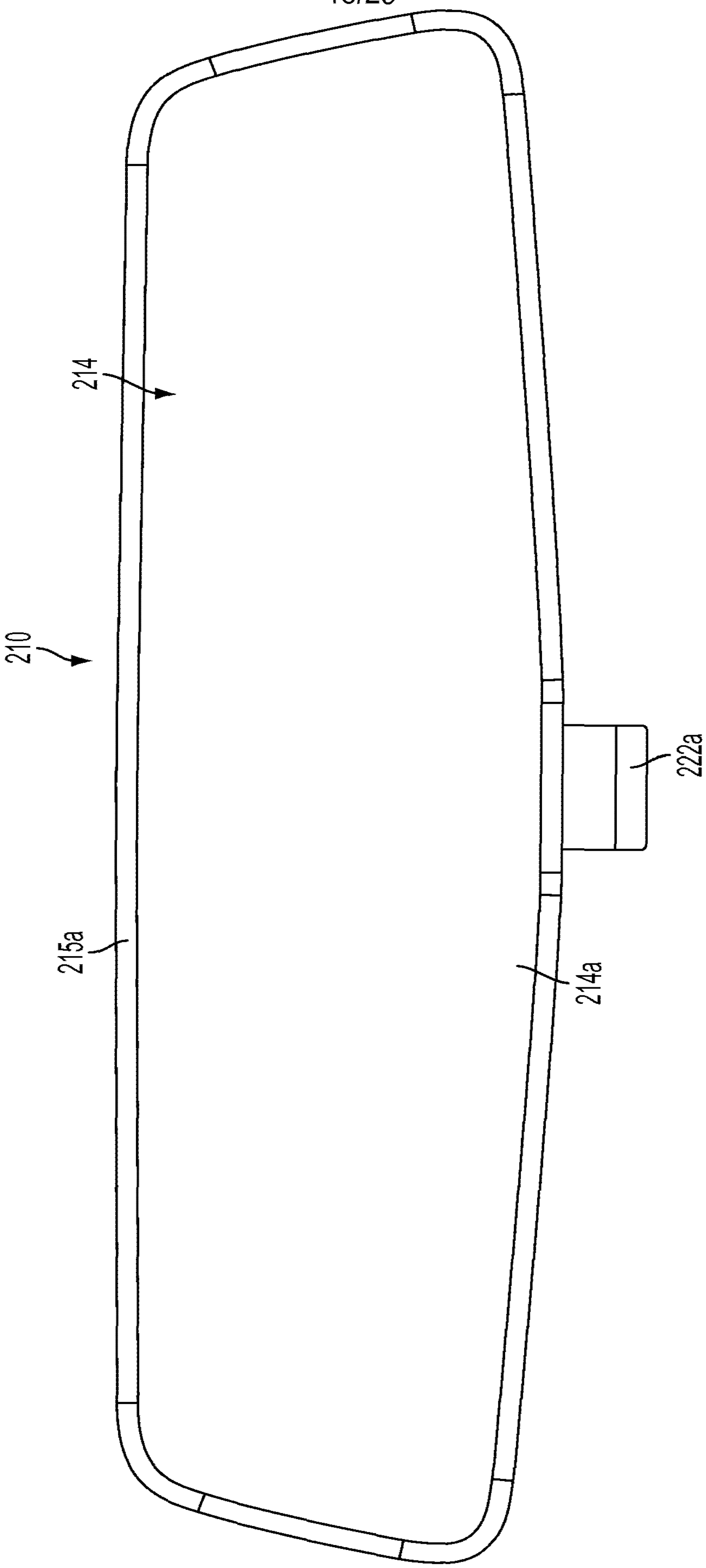


FIG. 18

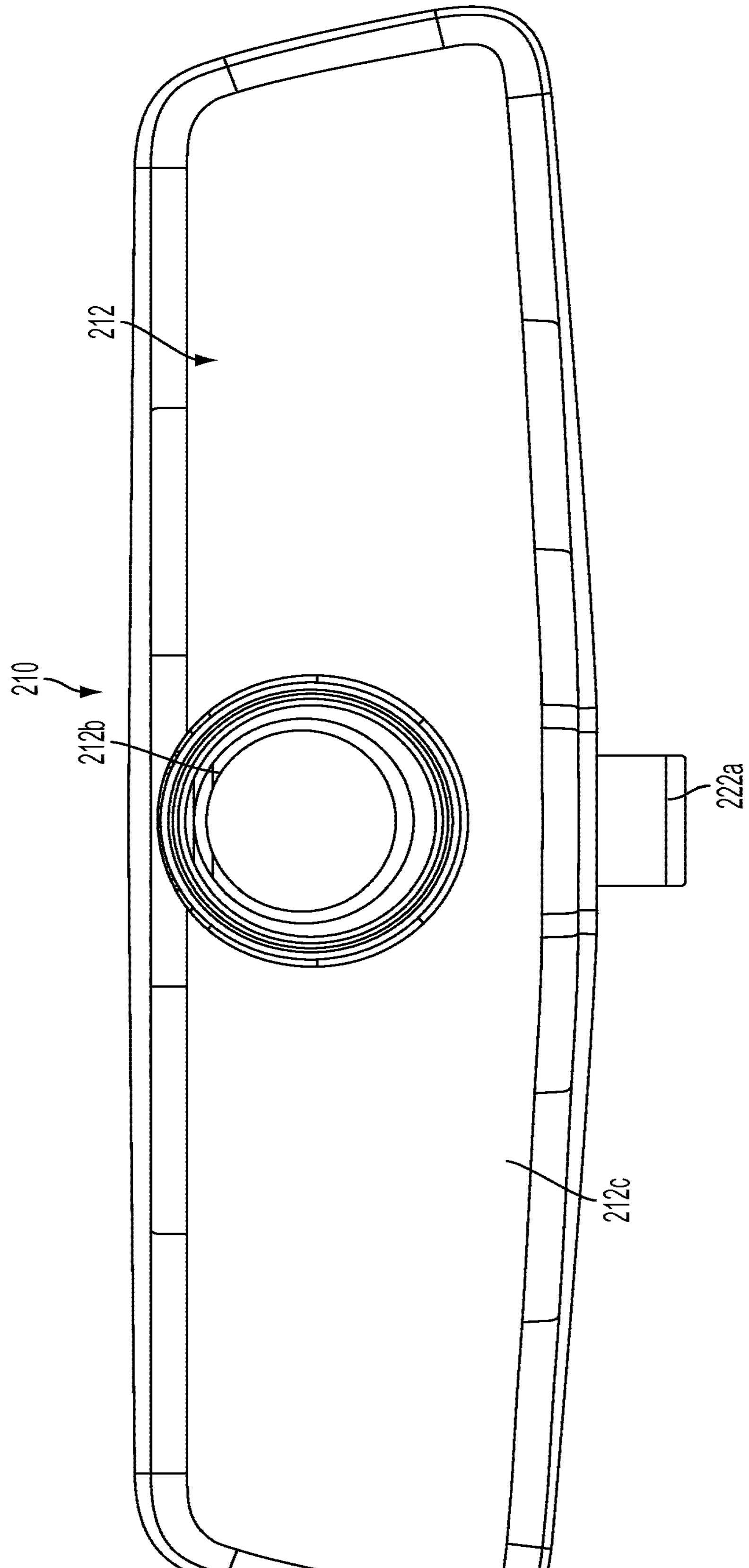


FIG. 19

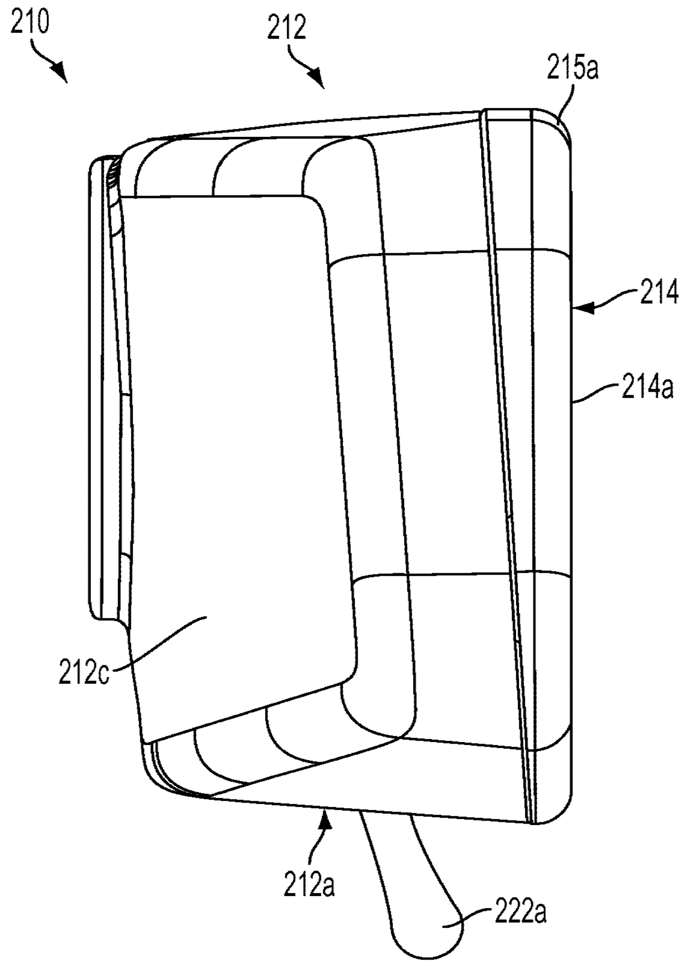


FIG. 20

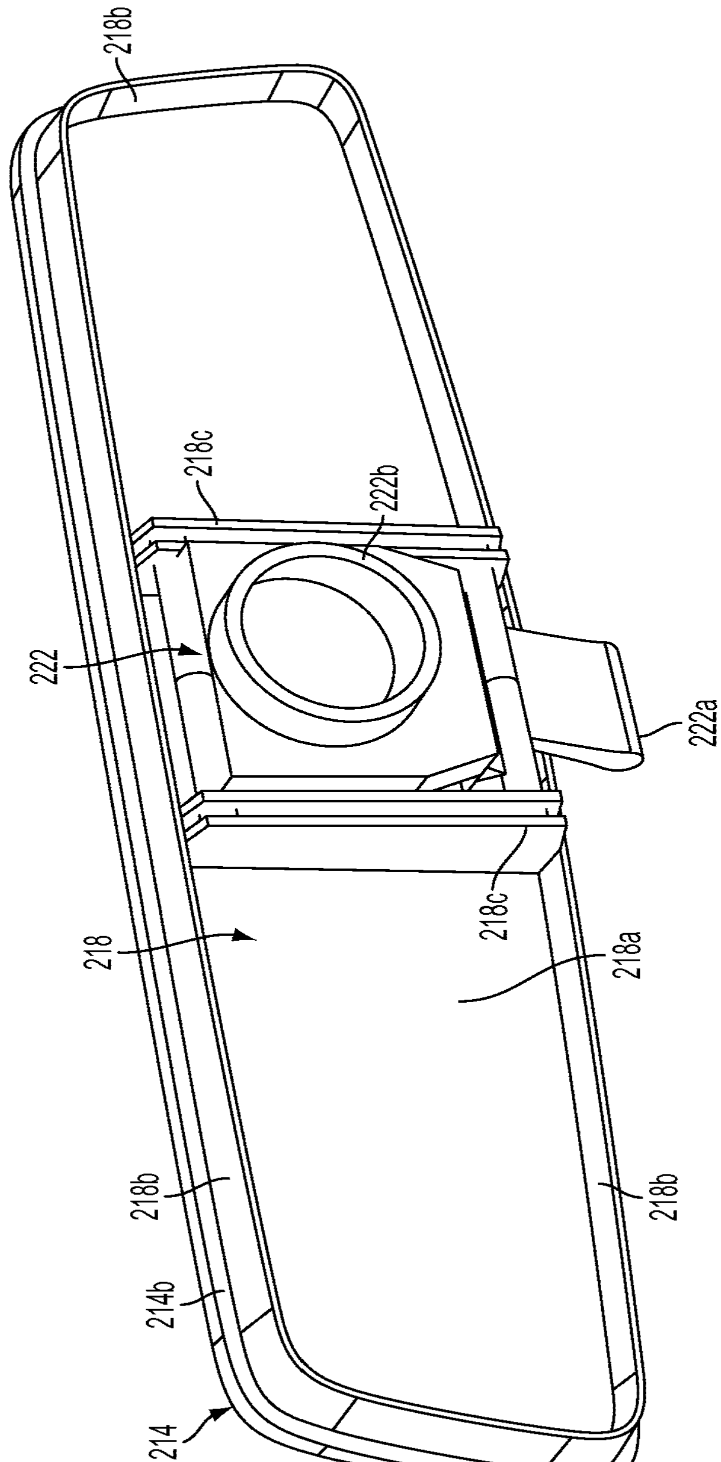


FIG. 21

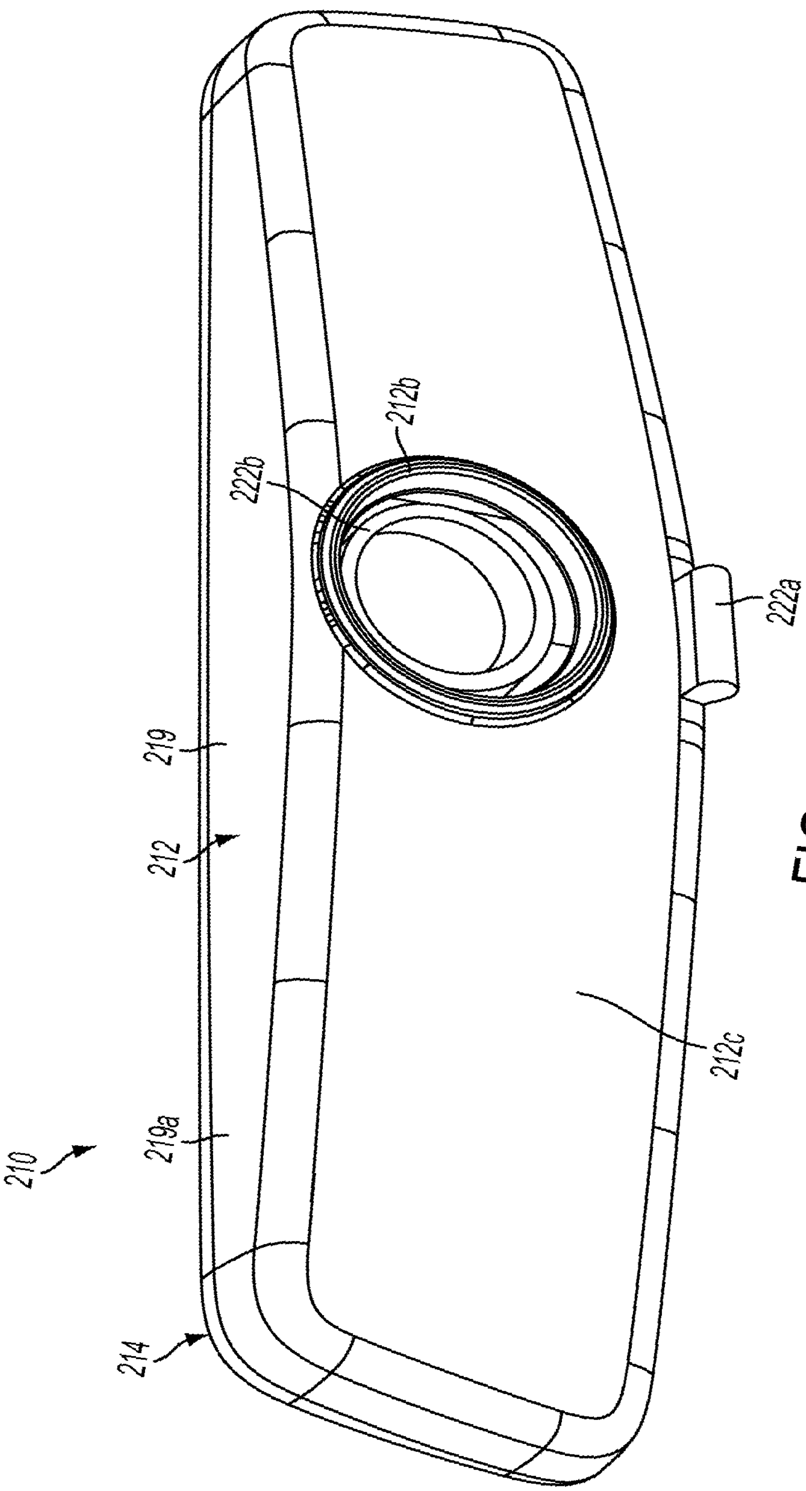


FIG. 22

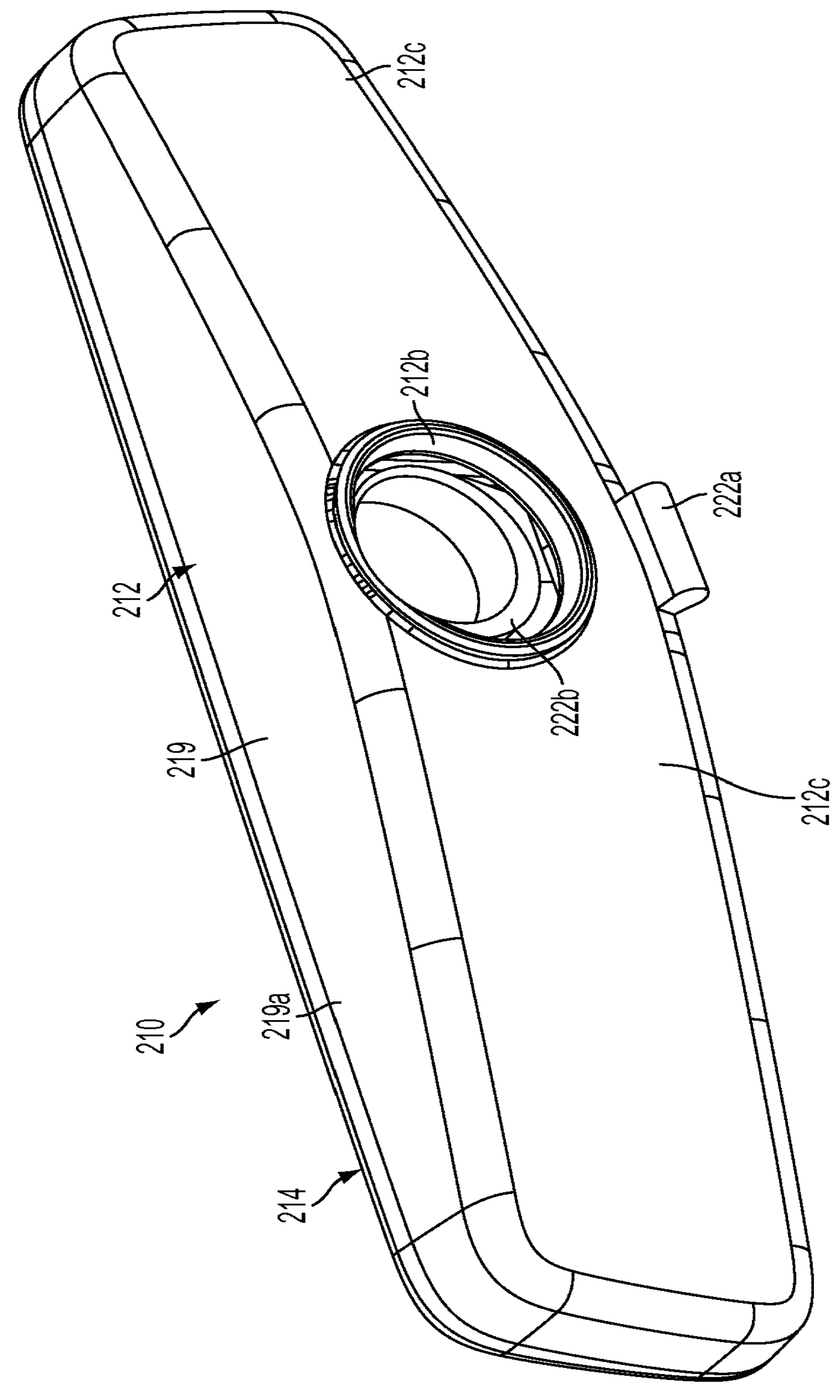


FIG. 23

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2010/032017

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - G02B 5/08 (2010.01)
USPC - 359/267
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC(8) - G02B 5/08, 7/182 (2010.01)
USPC - 359/245, 265, 267, 273, 872

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PatBase

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X ---- Y	US 2003/0007261 A1 (HUTZEL et al) 09 January 2003 (09.01.2003) entire document	1-2, 8-10 ---- 3-7, 17-18
X ---- Y	US 7,249,860 B2 (KULAS et al) 31 July 2007 (31.07.2007) entire document	11-16, 19-21 ---- 3-7, 17-18
A	US 6,111,683 A (CAMMENGA et al) 29 August 2000 (29.08 2000) entire document	1-21

☐ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
03 June 2010	21 JUN 2010

Name and mailing address of the ISA/US
Mail Stop PCT, Attn: ISA/US, Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450
Facsimile No. 571-273-3201

Authorized officer:
Blaine R. Copenheaver
PCT Helpdesk: 571-272-4300
PCT OSP: 571-272-7774

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
14 April 2011 (14.04.2011)

PCT

(10) International Publication Number
WO 2011/044312 A1

(51) International Patent Classification: *B60R 1/08* (2006.01)

(21) International Application Number: PCT/US2010/051741

(22) International Filing Date: 7 October 2010 (07.10.2010)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/249,300 7 October 2009 (07.10.2009) US
61/261,839 17 November 2009 (17.11.2009) US

(71) Applicant *(for all designated States except US)*: **MAGNA MIRRORS OF AMERICA, INC.** [US/US]; 49 W. Third St., Holland, Michigan 49423 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **DE WIND, Darryl, P.** [US/US]; 8428 Hiawatha Drive, West Olive, Michigan 49460 (US). **RAWLINGS, Donald, S.** [US/US]; 7996 A J Court S.E., Caledonia, Michigan 49316 (US). **UKEN, John, T.** [US/US]; 7730 Steele Ave., Jenison, Michigan 49428 (US).

(74) Agent: **FLORY, Timothy, A.**; VAN DYKE, GARDNER, LINN & BURKHART, LLP, 2851 Charlevoix Dr., S.E., Suite 207, Grand Rapids, Michigan 49546 (US).

(81) **Designated States** *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) **Designated States** *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

[Continued on next page]

(54) **Title**: FRAMELESS INTERIOR REARVIEW MIRROR ASSEMBLY

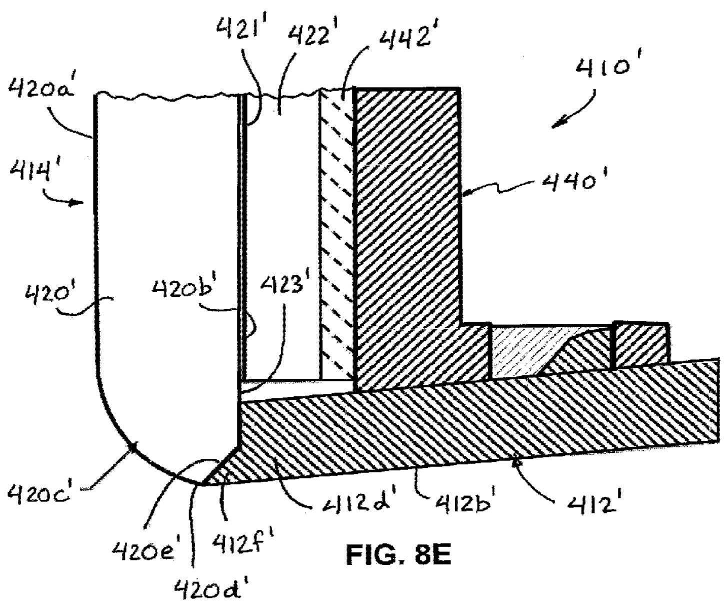


FIG. 8E

(57) Abstract: An interior rearview mirror assembly includes a housing (412', 512) and a mirror reflective element (414', 514) having a glass substrate (420', 514). The housing includes an element (412f', 512d) that protrudes beyond a rear surface (420b', 514b) of the glass substrate and towards the front surface (420a', 514a) of the glass substrate when the reflective element is at least partially received at the housing. The glass substrate includes a slanted rear perimeter edge-portion (420e', 514e) along a perimeter circumference of the rear surface of the glass substrate to at least partially accommodate the element of the housing when the reflective element is at least partially received at the housing. The glass substrate includes a beveled front perimeter (420c', 514c) along a perimeter circumference of the front surface of the glass substrate. The beveled front perimeter of the glass substrate is exposed and viewable by the driver of the vehicle.

WO 2011/044312 A1

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

— *of inventorship (Rule 4.17(iv))*

Published:

— *with international search report (Art. 21(3))*

FRAMELESS INTERIOR REARVIEW MIRROR ASSEMBLY

CROSS REFERENCE TO RELATED APPLICATIONS

The present application 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, which are hereby incorporated herein by reference in their entireties.

FIELD OF THE INVENTION

The present invention relates generally to the field of rearview mirror assemblies for vehicles and, more particularly, to an interior rearview mirror assembly that is adjustably mounted to an interior portion of a vehicle.

BACKGROUND OF THE INVENTION

Typically, an automatically dimming electro-optic interior rearview mirror assembly, such as an electrochromic interior rearview mirror assembly or the like, includes a mirror reflective element that is at least partially received in a casing, sometimes with a bezel portion of the casing snapped to or integral with the rest of the casing/housing so that the bezel portion of the casing overlaps or encompasses a perimeter edge of the reflective element and overlaps on/encroaches onto a portion or perimeter region of an outer or front surface of the reflective element (the surface facing the driver of the vehicle when the mirror assembly is normally mounted in the vehicle). The reflective element is adjustable by the driver to adjust the rearward field of view provided by the mirror reflective element.

SUMMARY OF THE INVENTION

The present invention provides an interior rearview mirror assembly that includes a casing and an electro-optic reflective element (such as an electrochromic reflective element) attached to or adhered to a surface or portion of the casing or bezel, with no bezel portion overlapping or encompassing a perimeter edge or front surface of the reflective element.

According to an aspect of the present invention, an interior rearview mirror assembly for a vehicle includes a mirror holder/casing/housing/shroud/cap and an interior rearview mirror reflective element. The reflective element comprises a glass substrate having a front surface and a rear surface. The reflective element comprises a mirror reflector established at a surface of the mirror reflective element other than the front surface of the glass substrate (and forming or establishing a mirror reflecting surface of the reflective element). The front surface of the glass substrate generally faces the driver of the vehicle when the interior rearview mirror assembly is normally mounted in the vehicle. The mirror holder/casing/

housing/shroud/cap at least partially receives/accommodates the mirror reflective element therein and the mirror holder/casing/ housing/shroud/cap comprises an element that protrudes beyond the rear surface of the glass substrate and towards the front surface of said glass substrate in order to enclose the reflecting surface of the reflective element in the mirror holder/casing/housing/shroud/cap when the mirror reflective element is at least partially received in the mirror holder. The glass substrate has a slanted rear perimeter edge-portion (formed such as by grinding or ablation) along the perimeter circumference of the rear surface of the glass substrate to accommodate the element of the mirror holder/casing/ housing/shroud/cap and the glass substrate has a beveled front perimeter along the perimeter circumference of the front surface of the glass substrate. The beveled circumferential front perimeter is exposed to, is contactable by, and is viewable by, the driver of the vehicle when the interior rearview mirror assembly is normally mounted in the vehicle.

The mirror holder encloses the mirror reflector and the reflecting surface of the mirror reflective element when the mirror reflective element is at least partially received in the mirror holder/casing/housing/shroud/cap. Optionally, the circumferential beveled outboard or front perimeter of the glass substrate may have a radius of curvature of at least about 2.5 mm other than at the generally planar (flat) surface that constitutes the rest of the first or front surface of the glass substrate. Optionally, the beveled outboard or front perimeter of the glass substrate provides a convex-curved transition between the generally planar or flat front surface of the glass substrate and a side wall of the mirror holder/casing/housing/shroud/cap. Optionally, the formed or slanted rear or inboard perimeter edge-portion of the glass substrate is formed or slanted or angled or curved or chamfered to correspond to a formed or slanted or angled or curved or chamfered element established at the mirror holder/casing/housing/shroud/cap.

Optionally, the mirror reflective element may comprise a prismatic mirror reflective element and the reflecting surface of the mirror reflective element comprises the rear surface of the glass substrate. Optionally, the mirror reflective element may comprise an electro-optic reflective element and the glass substrate comprises the front substrate of the electro-optic reflective element and the reflecting surface comprises a surface of a rear substrate of the electro-optic reflective element.

According to another aspect of the present invention, an interior rearview mirror assembly for a vehicle comprises a casing and an electro-optic reflective element. The reflective element comprises a front substrate having a front or first surface (the surface that generally faces the driver of the vehicle when the mirror assembly is normally mounted in the vehicle) and a rear or second surface opposite the front surface, and a rear substrate having a front or third surface and a rear or fourth surface, with an electro-optic medium (such as an electrochromic medium) disposed between the second or rear surface of the front substrate and the third or front surface of the rear substrate and bounded by a perimeter seal. The second surface has a transparent electrically conductive coating established thereat. The front substrate has a substantially opaque perimeter band circumferentially established around and disposed at its periphery border region (such as along a perimeter region of the second surface of the front substrate) to hide or conceal the perimeter seal of the reflective element. The third surface of the rear substrate (i.e., the surface that opposes the second surface of the front substrate and with the electro-optic medium disposed therebetween) may have a reflective mirror reflector coated or established thereat. The rear or fourth surface of the reflective element is attached, such as adhered, to a mounting plate or attachment plate or the like (that may include a pivot connection for attaching to a mounting structure for mounting the mirror assembly at an interior portion of the vehicle), or to a mounting surface or portion of the casing or bezel (where the casing may include a pivot connection for attaching to a mounting structure for mounting the mirror assembly at an interior portion of the vehicle) or the like. When the reflective element is attached at the casing or bezel, the bezel encompasses the perimeter edge of the front substrate of the reflective element, but does extend over or encompass the perimeter region of the front surface of the reflective element.

Optionally, a perimeter portion of the rear substrate may be cutaway and/or the front substrate may overhang or extend beyond a corresponding perimeter portion of the rear substrate, and one or more capacitive switches or sensors may be established at the cutaway or overhang region. The transparent electrically conductive coating at the second surface may be laser etched or otherwise etched or scribed or locally removed to provide a switch portion at the overhang region that is electrically isolated from the rest of the transparent electrically conductive coating at the second surface of the front substrate. An electrical lead or wiring or trace may be electrically connected between circuitry within the mirror assembly and the electrically isolated transparent electrically conductive coating at the overhang region to detect the presence or touch of a person's finger at the switch region or overhang region.

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

FIG. 1 is a front elevation of an interior rearview mirror assembly in accordance with the present invention;

FIG. 2 is an upper plan view of the interior rearview mirror assembly of FIG. 1;

FIG. 3 is a side elevation of the interior rearview mirror assembly of FIG. 1;

FIG. 4 is a sectional view of the interior rearview mirror assembly taken along the line A-A in FIG. 1;

FIG. 5 is an enlarged perspective view of the area B in FIG. 4;

FIG. 6 is a side elevation and partial sectional view of another interior rearview mirror assembly in accordance with the present invention;

FIG. 7 is a front elevation of an electrochromic interior rearview mirror assembly of the present invention;

FIG. 7A is a sectional view of the electrochromic interior rearview mirror assembly, taken along the line A-A in FIG. 7;

FIG. 7B is an enlarged view of the area B in FIG. 7A;

FIGS. 8A-E are enlarged views of the lower edge of other electrochromic interior rearview mirror assemblies of the present invention;

FIG. 9 is a front elevation of a prismatic interior rearview mirror assembly of the present invention;

FIG. 9A is a sectional view of the prismatic interior rearview mirror assembly, taken along the line A-A in FIG. 9;

FIG. 9B is an enlarged view of the area B in FIG. 9A;

FIGS. 10A-E are enlarged views of the lower edge of other prismatic interior rearview mirror assemblies of the present invention;

FIG. 11 is an exploded perspective view of another interior rearview mirror assembly of the present invention;

FIG. 12 is a schematic of a touch sensor system suitable for use in an interior rearview mirror assembly of the present invention;

FIG. 13 is a schematic of a touch sensor system suitable for use in an interior rearview mirror assembly of the present invention;

FIG. 14 is a graph of the voltages applied over time by the system of FIG. 13;

FIG. 15 is a graph of a timer count over time by the system of FIG. 13;

FIG. 16 is a graph of voltage over time for the touch sensor system of FIG. 13;

FIG. 17 is a flow chart of a control process of the user inputs of the interior rearview mirror assembly of FIG. 11;

FIG. 18 is a front elevation of another interior rearview mirror assembly of the present invention;

FIG. 19 is a front elevation of another interior rearview mirror assembly of the present invention; and

FIGS. 20A-N are sectional views of other interior rearview mirror assemblies of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings and the illustrative embodiments depicted therein, an interior rearview mirror assembly 10 for a vehicle includes a mirror casing or housing or shroud or cap or holder 12, a reflective element 14 positioned at a front portion of the mirror casing 12 and a bezel or front casing portion 16 disposed around a periphery of the reflective element. 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 bezel portion 16 receives the reflective element therein and encompasses the perimeter edges of the reflective element 14 and attaches to the non-bezel portion of the mirror casing 12, such as via snapping or otherwise attaching to a forward perimeter edge region 12a of mirror casing 12. As can be seen in FIG. 4, the bezel portion 16 does not overlap or encompass the perimeter regions of the front surface of the reflective element 14, so as to provide flush or generally coplanar surfaces across the front of the bezel portion and the front surface of the reflective element, as discussed below.

Reflective element 14 may comprise an electro-optic (such as electrochromic) reflective element or may comprise a prismatic or wedge-shaped reflective element. Reflective element 14 includes a front substrate 20 having a front or first surface 20a (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 20b opposite the front surface 20a, and a rear substrate 22 having a front or third surface 22a and a rear or fourth surface 22b opposite the front surface 22a, with an electro-optic medium disposed between the second surface 20b and the third surface 22a and bounded by a perimeter seal of the reflective element (such as is known in the electrochromic mirror art). The second surface 20a has a transparent conductive coating established thereat, while the third surface 22a has a conductive coating (such as a metallic reflector coating for a third surface reflector mirror element or such as a transparent conductive coating for a fourth surface reflector mirror element) established thereat.

Reflective element 14 includes an opaque or substantially opaque or hiding perimeter layer or coating or band 23 (FIG. 1) disposed around a perimeter edge region of the front substrate 20 (such as at a perimeter region of the rear or second surface 20b 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/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 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.

The reflective element 14 and mirror casing 12 are adjustable relative to the mounting arm or pivot assembly 18 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 24 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.

In the illustrated embodiment, mounting assembly 18 comprises a single-ball or single-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 single pivot joint. Mounting assembly 18 includes a base portion or mounting base 26 and a mounting arm 28, with the reflective element 14 and mirror casing 12 pivotally mounted at ball end 28a of mounting arm 28 about a 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 double-ball or double-pivot mounting configuration or the like, while remaining within the spirit and scope of the present invention.

In the illustrated embodiment, mounting base 26 is 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. Mounting arm 28 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).

Mirror casing 12 comprises a plastic or polymeric molded casing that may attach to the pivot socket 24 via any suitable manner. The casing may comprise any suitable casing construction, and has a forward perimeter edge or attachment portion 12a for attaching to the bezel portion 16, as discussed below. Optionally, the mirror casing may have at least one generally planar front attachment surface or panel or wall for attaching to the reflective element, such as by utilizing aspects of the mirror assemblies described in PCT Application No. PCT/US2010/032017, filed Apr. 22, 2010, which is hereby incorporated herein by reference in its entirety. Optionally, the mirror casing may include cap portions that may include one or more accessories, 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.

Bezel portion 16 comprises a plastic or polymeric molded bezel portion that has a rearward perimeter attachment portion 16a (that opposes the mirror casing when the bezel portion is attached to the mirror casing and that faces generally forwardly in the forward direction of travel of the vehicle when the mirror assembly is normally mounted in the vehicle) that attaches to the forward or front edge region 12a of the mirror casing 12 via any suitable manner, such as via a snap connection or welding or screwing or heat staking or adhering or the like. As can be seen in FIGS. 4 and 5, bezel portion 16 includes a perimeter portion or element 16b that has an outer curved front surface 16c that provides a smooth or curved transition surface (such as a convex-curved transition surface) between a side wall 16d of the perimeter portion 16b of bezel portion 16 (which is generally coplanar or generally flush with the side wall 12b of the mirror casing 12 when the bezel portion 16 is attached to the mirror casing) and the front surface 20a of the reflective element 14. Thus, the bezel portion 16 does not encompass the front surface 20a of the reflective element such that the entire front surface 20a of the reflective element 14 is exposed and viewable by the driver of a vehicle when the mirror assembly is normally mounted in the vehicle.

In the illustrated embodiment, the radius of curvature of the curved surface 16c of bezel portion 16 is about 2.5 mm, but may be greater than or less than this dimension depending on the particular application of the reflective element and mirror casing of the mirror assembly (such as, for example, a radius of curvature of about 3 mm or thereabouts). Typically, it is desired to have at least a 2.5 mm radius of curvature at the perimeter edges of a mirror assembly (typically at a bezel of a conventional mirror assembly) to meet the minimum safety standards for head impact with the mirror, such as during a sudden stop or collision of the equipped vehicle. Homologation radius approval may be achieved using a continuation of the glass plane into the bezel radius.

As shown in FIG. 4, the bezel portion 16 may be formed with a generally planar attachment panel or surface 16e that is disposed rearward of the perimeter bezel portion 16b. For example, the attachment panel 16e may extend at least substantially across the length and width dimensions of the perimeter portion 16b of bezel portion 16 to provide an attachment panel for attachment of the reflective element 14 to the bezel portion 16. The reflective element may be received into the bezel portion (such as in a partial pocket formed by the perimeter portion and the attachment panel) and attached or adhered (such as via a two-sided tape 29 or the like) or snapped to the attachment panel, whereby the front surface of the reflective element is generally coplanar or flush with the front surface of the perimeter bezel portion. Optionally, the bezel portion may comprise an injected molded plastic or polymeric bezel portion, with the attachment panel 16e integrally or unitarily molded with the perimeter portion 16b of the bezel portion, or the attachment panel may be formed separately from and attached to the perimeter portion, or the bezel portion may comprise a stamped metallic bezel portion or may be an otherwise formed plastic or polymeric or metallic bezel portion, while remaining within the spirit and scope of the present invention.

The reflective element 14 thus may be readily received in the bezel portion and attached to the front surface of the attachment panel 16e of bezel portion 16. Optionally, for example, the reflective element 14 may be attached via an adhesive tape, such as a double-sided adhesive tape disposed between the rear surface 22b of reflective element 14 and the front surface of the attachment panel 16e of bezel portion 16. The reflective element 14 thus may be fixedly attached to the bezel portion and the bezel portion and reflective element sub-assembly may be attached to the mirror casing as a unit and may be pivoted with the mirror casing 12 relative to the mounting assembly 18 to adjust the rearward field of view to the driver of the vehicle. When the reflective element 14 is attached to the attachment surface of the attachment panel 16e of bezel portion 16, the perimeter forward edges or regions of the perimeter portion 16b of bezel portion 16 are generally flush or coplanar with the front surface 20a of reflective element 14, and when the bezel portion 16 is attached to the forward edge portions 12a of mirror casing 12, the side wall 16d of bezel portion is generally flush or coplanar with the side wall 12b of mirror casing 12. The rear glass substrate of the reflective element thus may be attached to the attachment panel using a back plate construction similar to attachment of an exterior rearview mirror reflective element to an exterior rearview mirror back plate (and utilizing aspects known in the exterior rearview mirror art).

When the glass reflective element rear substrate is attached to the attachment panel of the bezel portion, the attachment panel functions like an attachment plate or back plate of an exterior rearview mirror assembly and provides impact resistance and enhanced image stability to the reflective element. Optionally, it is envisioned that a ball stud or ball member or pivot member may be attached to or formed with the bezel portion and attachment panel to further enhance the image stability provided by the mirror reflective element when the mirror assembly is normally mounted in the vehicle and when the vehicle is driven along a road. In such an application, the reflective element may be directly attached to the attachment panel and ball stud configuration and thus reduces vibration of the reflective element during vehicle operation.

Optionally, it is envisioned that the bezel portion and the mirror casing may be unitarily or integrally formed, such as via injection molding or the like. The mirror reflective element may then be received in the front opening or bezel portion of the unitary mirror casing and bezel and may be attached to an attachment panel of the mirror casing and bezel. Optionally, the mirror casing and bezel may be formed utilizing aspects of the mirror assemblies described in PCT Application No. PCT/US2010/032017, filed Apr. 22, 2010, which is hereby incorporated herein by reference in its entirety, and may have at least one generally planar front attachment surface or panel or wall for attaching to the reflective element when the reflective element is received in or through the front opening or bezel portion of the mirror casing and bezel structure.

Although shown and described as being adhesively attached to the attachment surface of the bezel portion, it is envisioned that the reflective element may be otherwise attached to the bezel portion, while remaining within the spirit and scope of the present invention. For example, the reflective element may include or may be adhered to a back plate structure that includes attachment elements for connecting to corresponding attachment elements of the bezel portion or mirror casing. For example, the back plate may include flexible tabs extending therefrom that flex to engage and snap to corresponding slots and tabs at the bezel portion and/or mirror casing to secure the reflective element to the bezel portion and/or mirror casing. The reflective element thus may be attached to the bezel portion and/or mirror casing via other suitable attachment means while the bezel portion does not encompass or overlap the perimeter edge region of the front surface of the reflective element.

Electrical connection to the reflective element (such as to the transparent electrically conductive coating at the second surface of the front substrate and to the electrically conductive coating at the third surface of the rear substrate) may be made via connectors or contacts established between circuitry of the mirror assembly and the respective electrically conductive coatings. Because the bezel portion does not overlap or encompass the front surface of the reflective element, the bezel portion substantially abuts the perimeter edge dimension of the front substrate of the reflective element to provide a finished appearance to the mirror assembly, and thus an electrode clip may not be suitable for electrically connecting to the transparent conductive coating at the second surface of the front substrate or for electrically connecting to the conductive coating or coatings at the third surface of the rear substrate. Thus, it is envisioned that electrical connection to the transparent electrically conductive coating at the second surface of the front substrate may be made via an electrical contact or connector contacting the rear surface of the front substrate at a portion where the rear substrate is removed or offset, and such contact may be enhanced or established via a conductive epoxy or the like, and may utilize aspects of the mirror assemblies described in U.S. Pat. Nos. 7,626,749; 7,274,501; 7,255,451; 7,195,381; 7,184,190; and/or 6,690,268, and/or 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, and/or PCT Application No. PCT/US2010/029173, filed Mar. 30, 2010, which are all hereby incorporated herein by reference in their entireties. The electrical connection to the conductive coating or coatings at the third surface of the rear substrate may be made via any suitable means, such as an electrical contact and/or conductive epoxy and/or a wraparound coating and/or the like, such as by utilizing aspects of the above referenced patents and patent applications.

Optionally, mirror assembly 10 may include at least one user actuatable input 30 for controlling at least one accessory of the mirror assembly and/or vehicle. In the illustrated embodiment (and as shown in FIG. 5), the mirror assembly 10 includes a circuit element 32, such as a printed circuit board or substrate or the like, disposed at a rear surface of the attachment panel 16e of bezel portion 16. As can be seen with reference to FIG. 5, the user actuatable input 30 may comprise a capacitive switch or sensor disposed or established at a perimeter region of the reflective element. In such an application, a perimeter portion of the rear substrate 22 may be cutaway or removed so that the front substrate is exposed or accessible from the rear of the reflective element at an overhang or cutaway or switch region 34 or the front substrate 20 may have a cross dimension (such as a height dimension) that is greater than a corresponding cross dimension of the rear substrate so as to establish the overhang or cutaway or switch region 34, such as at a lower, central region of the reflective element as shown in FIGS. 1 and 5 (although clearly the overhang or cutaway region may be provided at any other location at the reflective element while remaining within the spirit and scope of the present invention). The perimeter seal may be disposed around the shape of the switch area and the opaque perimeter band may be established to cover or conceal or hide the seal around the switch area.

The transparent electrically conductive coating (preferably indium tin oxide (ITO) or the like) at the rear or second surface 20b of the front substrate 20 may have a portion at the overhang region 34 that is electrically isolated (such as via laser etching at the boundary of the overhang region or around one or more switch or sensor locations at the overhang region) from the rest of the coating at the principal viewing area of the reflective element. Thus, the transparent electrically conductively coated rear surface 20b of the front substrate 20 at the overhang region 34 may function as part of a capacitive sensor. For example, an electrical lead 36 may be electrically connected between the circuit element 32 and the transparent electrically conductive coating at the rear surface 20b of front substrate 20. Thus, the circuitry may detect the presence or touch of a person's finger at the front surface 20a of the front substrate 20 at the switch region 34 and may activate/deactivate/control one or more accessories of the mirror assembly and/or vehicle responsive to such a detection. Thus, the transparent electrically conductive coating (such as ITO or the like) established at and across the rear of the front mirror glass substrate may be used to create half of a capacitive switch with the operator's finger completing the other half of the switch or capacitor. The switch or sensor area is electrically isolated from the rest of the transparent electrically conductive coating at the rear of the front mirror glass substrate, such as by using a laser etch boundary or isolation line or delineation line or the like. The capacitive touch sensor may function like any known touch sensor or capacitive sensor or may utilize aspects of the capacitive sensors and sensing systems discussed below.

Optionally, and as shown in FIG. 1, the switch area may have an icon 36 established thereat (such as via laser etching through or at least partially through the opaque coating or band at the switch area) so that a user may readily view and recognize the function of the switch. Optionally, and desirably, the switch icon may be illuminated or backlit, such as by using an illumination source 38 (such as a light emitting diode or the like) at the circuit element 32. The color of the icon may change responsive to actuation of the switch or sensor. For example, for an electrochromic (EC) function control (which allows the driver to manually activate or deactivate the automatic dimming function of the electrochromic mirror), the color of the icon may change (such as from red (off) to blue (on) or the like) when the EC function is toggled using the capacitive switch. Optionally, the switch icon may be one color (such as, for example, blue) at all times and a separate illumination source or light emitting diode (LED) or the like may be turned on and off at another location, and may be viewable by the driver of the vehicle looking through the mirror reflective element (and through the partially transmitting, partially reflecting transflective mirror reflector established at the third surface or front surface of the rear substrate). The indicator icon could be any shape or logo while remaining within the spirit and scope of the present invention.

Optionally, and desirably, the mirror assembly includes one or more photo-sensors, such as an ambient light sensor and a glare light sensor and/or the like. The rearward facing photo-sensor, such as a glare sensor, is disposed behind the reflective element and receives light through the mirror reflective element and transflective mirror reflector. Thus, the sensor senses light through the glass mirror substrates and transflective metallic mirror reflector and is not disposed at the bezel or chin area of the mirror assembly.

Optionally, the mirror assembly may include other accessories, such as, for example, a compass module with a display-on-demand (DoD) display that is viewable by the driver of the vehicle looking through the mirror reflective element and through the partially transmitting, partially reflecting transflective mirror reflector established at the third surface or front surface of the rear substrate. The calibration button functions could be programmed using the touch switch and an on-board microprocessor or the like or by an added flex button or input at the rear of the mirror housing, or a hole for a reset pin to be guided through or the like.

Therefore, the present invention provides a frameless mirror assembly that has a reflective element adhered or attached to a front or mounting surface of a bezel portion or mirror casing, with no mirror casing or bezel portion encompassing the perimeter edge region of the front surface of the mirror reflective element. For mirror applications with one or more mirror-based accessories, the accessory or accessories may be received in or disposed at or in the mirror casing and/or may be disposed at the mounting structure of the mirror assembly. The flush front surface of the reflective element and bezel portion provides a frameless and more modern appearance to the mirror assembly. Also, the opaque perimeter border band and bezel portion may contrast or match to further enhance the appearance, depending on the application and desired appearance of the mirror assembly. For example, the opaque border band may comprise a metallic appearance or may be light absorbing and thus may have a dark color, while the bezel portion may be a dark or black colored plastic or may be chrome plated or otherwise colored to provide the desired or selected appearance of the mirror assembly.

Optionally, an interior rearview mirror assembly of the present invention may have a mirror casing (which may have a bezel portion) that encompasses a perimeter edge dimension of the rear substrate of an electro-optic mirror reflective element, and that abuts at or is in close proximity to the rear surface of the front substrate, such as by utilizing aspects of the mirror assemblies described in U.S. Pat. No. 7,255,451 and/or PCT Application No. PCT/US2010/032017, filed Apr. 22, 2010, which are hereby incorporated herein by reference in their entireties. The front substrate has a curved outer or front perimeter edge to provide a smooth continuous convex-curved transition between the generally planar front surface of the front substrate and the generally planar exterior surface of the mirror casing. Thus, the interior rearview mirror assembly provides a frameless interior rearview mirror assembly, with no mirror casing or bezel portion encompassing and encroaching onto the front surface of the front substrate of the mirror reflective element.

For example, and with reference to FIG. 6, an interior rearview mirror assembly 110 includes a mirror casing or housing or shroud or cap or holder 112, a reflective element 114 positioned at a front portion of the mirror casing 112 with a front casing portion 112a disposed around a periphery of the rear substrate 122 of the reflective element 114. Mirror assembly 110 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 118, such as described above. The front casing portion 112a (which may be part of or joined with a mirror attachment plate or backing plate or the like that is disposed at and attached at a rear surface or portion of the mirror reflective element) receives the rear substrate 122 of the reflective element therein and encompasses the perimeter edge 122c of the rear substrate 122 of the reflective element 114 (i.e., the circumferential edge surface adjoining, connecting and between the third or front surface of the rear substrate and the fourth or rear surface of the rear substrate). As can be seen in FIG. 6, the front casing portion 112 abuts or is in close proximity to the rear surface 120b of the front substrate 120 and does not overlap or encompass the perimeter edges of the front substrate 120 and does not overlap or encompass the perimeter regions of the front surface of the reflective element 114, and the front substrate 120 includes a curved or rounded surface or beveled or contoured outboard or front perimeter or curvature 120c at the front perimeter edge and side edge dimension to provide a smooth continuous transition between the generally planar principal front surface 120a of the front substrate 120 and the generally planar or beveled or contoured or curved exterior surface 112b of the front casing portion 112a of mirror casing 112, as discussed below.

Reflective element 114 may comprise an electro-optic (such as electrochromic) reflective element or may comprise a prismatic or wedge-shaped reflective element. Reflective element 114 includes a front substrate 120 having a front or first surface 120a (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 120b opposite the front surface 120a, and a rear substrate 122 having a front or third surface 122a and a rear or fourth surface 122b opposite the front surface 122a, with an electro-optic medium 124 disposed between the second surface 120b and the third surface 122a and bounded by a perimeter seal 126 of the reflective element (such as is known in the electrochromic mirror art). The second surface 120a has a transparent conductive coating established thereat, while the third surface 122a has a conductive coating (such as a metallic reflector coating for a third surface reflector mirror element or such as a transparent conductive coating for a fourth surface reflector mirror element) established thereat.

Reflective element 114 includes an opaque or substantially opaque or hiding perimeter layer or coating or band 123 (FIG. 1) disposed around a perimeter edge region of the front substrate 120 (such as at a perimeter region of the rear or second surface 120b 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 (such as specularly reflective) or not reflective and may utilize aspects of the perimeter bands and mirror assemblies described in U.S. Pat. Nos. 7,626,749; 7,274,501; 7,184,190; 7,255,451; and/or 5,066,112, 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 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.

Optionally, the circumferential perimeter border layer or band may be established via any suitable means, such as screen printing or vacuum deposition or the like (preferably by sputter deposition and utilization of a mask as is known in the sputter deposition art). Optionally, the perimeter or border band (either specularly reflecting or non-reflecting or the like) may be established at the front surface of the front substrate (such as over the curved perimeter edge and a perimeter region of the front surface of the front substrate). Optionally, the front substrate may be frosted or diffused at the perimeter region so that the perimeter seal and mirror casing are concealed or rendered covert to a person viewing the mirror assembly and reflective element when the mirror assembly is normally mounted in a vehicle.

The reflective element 114 and mirror casing 112 are adjustable relative to the mounting arm or pivot assembly 118 to adjust the driver's rearward field of view when the mirror assembly is normally mounted at or in the vehicle. In the illustrated embodiment, mounting assembly 118 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 118 includes a base portion or mounting base 128 and a mounting arm 130, with the mounting arm 130 pivotally mounted at the mounting base 128 at a base or first ball pivot joint and the reflective element 114 and mirror casing 112 pivotally mounted at mounting arm 130 about a mirror or second ball pivot joint. 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.

Mirror casing 112 comprises a plastic or polymeric molded casing that may attach to the mounting assembly 118 via any suitable manner. The casing may comprise any suitable casing construction, and has a forward perimeter edge or receiving portion 112a for receiving the rear substrate 122 of the mirror reflective element 114 therein, as discussed below. Optionally, the mirror casing may have at least one generally planar front attachment surface or panel or wall for attaching to the reflective element, such as by utilizing aspects of the mirror assemblies described in PCT Application No. PCT/US2010/032017, filed Apr. 22, 2010, which is hereby incorporated herein by reference in its entirety. Optionally, the mirror casing may include cap portions that may include one or more accessories, 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.

As can be seen in FIG. 6, front substrate 120 includes a perimeter portion or element that has an outer curved front bevel or edge or glass surface 120c (that may be ground or otherwise formed or established) that is formed around the perimeter of a generally planar main or principal front surface 120a and that provides a smooth or curved transition surface between the generally planar main or principal front surface 120a of the reflective element 114 and the exterior surface 112b of the front casing portion 112a of mirror casing 112 (which is generally coplanar or generally flush with the rear perimeter edge dimension 120d of front substrate 120 when the mirror reflective element 114 is received in front casing portion 112a of mirror casing 112). The beveled portion or beveled outboard or front perimeter 120c of front substrate 120 has a bevel radius of curvature of at least about 2.5 mm, such as 2.5 mm or 3.0 mm or thereabouts, and may be formed via any suitable beveling operation, such as a beveling operation involving the likes of diamond wheel grinding of the outboard or front perimeter of the glass substrate followed by a successive finer grind polish to reestablish a water clear glass like transparent bevel that, to the driver's eye, is substantially indistinguishable from the planar principal glass surface of the front substrate being viewed by the driver. The front casing portion 112a abuts or is in close proximity to the rear surface 120b of front substrate 120 to encompass the rear substrate 122 and the perimeter seal 126, and the perimeter band 123 hides or conceals the perimeter seal 126 from view by a person viewing the reflective element when the mirror assembly is normally mounted in a vehicle.

In the illustrated embodiment, the radius of curvature of the beveled outboard or front perimeter 120c of front substrate 120 is about 2.5 mm, but may be greater than or less than this dimension depending on the particular application of the reflective element and mirror casing of the mirror assembly. Typically, it is desired to have at least a 2.5 mm radius of curvature at the perimeter edges of a mirror assembly (typically at a bezel of a conventional mirror assembly) to meet the minimum safety standards for head impact with the mirror, such as during a sudden stop or collision of the equipped vehicle.

Thus, the bevel or contour or curvature or form of the curved edges or beveled outboard or front perimeter 120c of the front substrate 120 and the bevel or contour or curvature or form of surface 112b of the mirror casing 112 may generally align or match to provide a generally continuous surface or contour or curvature at the junction of the front substrate and the mirror casing. Any interface between the front substrate and the mirror casing may be reduced or minimized, such as by a close fit arrangement of the front substrate and mirror casing and/or by the glass front substrate slightly nesting into a the mirror casing (such as via a slight lip at the mirror casing that may overlap a slight portion of the side perimeter edge of mirror front substrate), or such as by affirmatively filling any gap between the front substrate and mirror casing with a gap closing or gap filling material or means.

Therefore, the mirror casing 112 receives or accommodates the rear substrate 122 of the reflective element therein and does not encompass or encroach onto the circumferential perimeter edges of the front substrate (i.e., the edge surface adjoining, connecting and between the first or front surface of the front substrate and the second or rear surface of the front substrate) or the front surface 120a of the reflective element such that the entire front surface 120a of the reflective element 114 is exposed and viewable by the driver of a vehicle when the mirror assembly is normally mounted in the vehicle. The convex-curved transition surface or beveled perimeter 120c of the front substrate 120 provides a smooth continuous curved transition between the generally planar front surface 120a of the front substrate 120 and the generally planar or curved or contoured or beveled exterior surface 112b of the mirror casing 112.

For vehicular interior rearview mirror assemblies, ECE Regulation No. 46, which is hereby incorporated herein by reference in its entirety, requires that an automotive or vehicular interior rearview mirror assembly have the edge of the reflecting surface enclosed in a protective housing (or holder, etc.) which, on its perimeter, must have a radius of curvature greater than or equal to 2.5 mm at all points and in all directions. If the reflecting surface projects beyond the protective housing, the radius of curvature on the edge of the projecting part must be not less than 2.5 mm and the reflecting surface must return into the protective housing under a force of 50 N applied to the point of greatest projection, relative to the protective housing, in a horizontal direction, approximately parallel to the longitudinal median plane of the vehicle.

The present invention satisfies such requirements by having the reflecting surface (such as the third surface or fourth surface reflecting surface of an electrochromic reflective element) received in the mirror housing or protective housing so that an outboard portion of the mirror housing or projecting portion or lip or protrusion or structure of or at the mirror housing or protective housing encloses the reflecting surface therein (see, for example, FIG. 8E, which illustrates an electro-optic mirror assembly, or FIG. 9B, which illustrates a prismatic mirror assembly), with the beveled front or outer or outboard edge or perimeter of the front substrate (that may be first impacted by an occupant of the vehicle during a vehicle collision) of the mirror having on its perimeter a radius of curvature greater than or equal to 2.5 mm (such as 3 mm or thereabouts) at all points and in all directions (such as shown, for example, in FIGS. 8E, 9B and 10A-E). Such a novel approach for an interior rearview mirror assembly provides an enhanced aesthetically pleasing appearance and may provide increased reflective/viewing area at the mirror assembly, since the mirror assembly does not include a conventional bezel portion or the like that overlaps and encroaches onto the perimeter region of the front surface of the front substrate of the reflective element. The mirror assembly of the present invention may also provide for a smaller mirror assembly and thus increased forward vision of the driver of the vehicle around the mirror (such as an increase of, for example, about 15-25 percent around the interior mirror assembly) while providing a given rearward field of view to the driver of the vehicle (and thus may provide a mass reduction (such as of, for example, about 10-12 percent) as compared to conventional mirror assemblies). Also, the polished glass edge or beveled outboard or front perimeter of the mirror reflective element of the present invention may provide a stronger reflective element substrate (such as about 65 percent stronger) as compared to a conventional cut edge glass substrate due to the removal or reduction of edge stress points and/or micro-fractures. The present invention may provide these enhancements in appearance and durability and size/weight, all while satisfying the requirements of the ECE Regulation No. 46.

In a conventional electrochromic mirror reflective element assembly, an electrochromic medium is disposed or sandwiched between a front substrate and rear substrate with a mirror reflector coating or layer established at or disposed at the front or rear surface of the rear substrate. The front substrate, around its perimeter, has an outboard leading edge and an inboard edge, where the outboard edge is the one that is generally towards the driver of the vehicle when the mirror assembly is normally mounted in the vehicle. In conventional interior rearview mirror assemblies, the outboard leading edge of the front substrate is typically encased or encompassed by a bezel portion of a mirror casing or housing or shroud or holder. For the mirror assembly of the present invention, because in particular the leading outboard edge of the reflective element may be directly contactable by a driver or occupant, the leading outboard edge of the reflective element is beveled so as to have a radius of curvature of at least about 2.5 mm, and, as indicated above, is typically diamond ground/polished so as to have a water clear glass like transparent appearance to the driver of the vehicle. Furthermore, the inboard edge of the reflective element may also be ground or formed, such as shown, for example, in FIG. 8E, so as to accommodate a portion of the mirror casing or housing or shroud or holder or frame that encloses the edge of the reflecting surface (that in the case of a laminate electrochromic mirror is typically the leading outboard edge of the rear substrate, commonly referred to as the perimeter edge of the third surface of the laminate electrochromic mirror reflective element assembly). The reflecting surface of the reflective element thus is received or disposed in or enclosed by the mirror housing or casing or holder or the like (and disposed rearward or inward of the outer end or protrusion or lip of the mirror casing or housing or shroud or holder or cap), with the outboard leading edge of the reflective element beveled to the desired or appropriate radius of curvature.

Optionally, and with reference to FIGS. 7, 7A and 7B, an interior electrochromic rearview mirror assembly 210 may have a mirror casing 212 that receives the rear substrate 222 of a reflective element 214 therein and does not encompass the perimeter edges of the front substrate 220 or the front surface 220a of the reflective element, such that the entire front surface 220a of the reflective element 214 is exposed and viewable by the driver of a vehicle when the mirror assembly is normally mounted in the vehicle, such as in a similar manner as discussed above. The front surface 220a of front substrate 220 includes a perimeter portion or element that has a beveled outboard or front perimeter or outer curved front edge or surface or bevel 220c (that may be ground or otherwise formed or established) that provides a smooth or convex-curved transition surface between the front surface 220a of the reflective element 214 and the exterior surface 212b of the front casing portion 212a of mirror casing 212 (which is generally coplanar or generally flush with the rear perimeter edge dimension 220d of front substrate 220 when the mirror reflective element 214 is received in front casing portion 212a of mirror casing 212). The reflective element 214 includes a mirror reflector 221 (such as 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 222a of rear substrate 222 (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 a perimeter seal, but the mirror reflector could be disposed at the rear surface 222b of rear substrate 222 (commonly referred to as the fourth surface of the reflective element), while remaining within the spirit and scope of the present invention.

In the illustrated embodiment, the mirror assembly 210 includes a backing plate or attachment plate 240, which may be adhered or otherwise attached at the rear surface of the rear substrate 222, such as at an anti-scatter tape 242 or the like adhered to the rear surface of the rear substrate in a known manner. As best shown in FIG. 7B, attachment plate 240 includes a generally planar attachment portion 240a that is attached at tape 242 and a perimeter flange or tab 240b that extends rearwardly from attachment portion 240a and is generally parallel to the inner surface 212c of the front portion 212a of mirror casing 212 when the rear substrate 220 and attachment plate 240 are received in mirror casing 212 (optionally, the attachment plate may be formed or established as part of the mirror casing or housing, or the mirror casing or housing or cap portion may be attached to the attachment plate via any suitable means, 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). In the illustrated embodiment, the flange 240b of attachment plate 240 may be adhered or otherwise attached to or at the inner surface 212c of front portion 212a of mirror casing 212 to retain the attachment plate 240 and reflective element 214 relative to the mirror casing 212. Optionally, the housing may be attached to the attachment plate flange via any other suitable means, such as via sonic welding, solvents, laser welding and/or the like.

When so retained, a forward or outer edge or lip 212d of mirror casing 212 may be at or near or in contact with the rear surface 220b of front substrate 220 at the perimeter region of the front substrate. Optionally, an opaque or darkened layer or concealing or hiding perimeter layer 223 (such as a reflective layer or chrome layer or non-reflective layer or the like) may be disposed at the perimeter region of the rear surface of the front substrate to conceal or render covert the mirror casing 212 and the perimeter seal of the reflective element 214). The adhesive may comprise any suitable adhesive, and may provide a quick set or partial cure that holds the mirror casing to the attachment plate during the curing of the adhesive (or optionally, fixturing or a second rapid set, rapid cure adhesive may be disposed at the interface between the mirror casing and the attachment plate) to hold the attachment plate and mirror casing together until the adhesive is fully cured. Thus, the front casing portion 212a abuts or is in close proximity to the rear surface 220b of front substrate 220 (such as with a gap of less than about 1 mm or less than about 0.5 mm or less than about 0.25 mm), and the mirror casing 212 receives and/or encompasses the rear substrate 222 and the perimeter seal 226. As can be seen in FIG. 7B, the reflecting surface 221 is received in the mirror housing, with the edge of the front substrate of the mirror having on its perimeter a radius of curvature greater than or equal to 2.5 mm (such as 3 mm or thereabouts) at all points and in all directions, and thus the mirror assembly satisfies the requirements of ECE Regulation No. 46, incorporated by reference above, and the perimeter band hides or conceals the edge or lip 212d of mirror casing 212 and the perimeter seal from view by a person viewing the reflective element when the mirror assembly is normally mounted in a vehicle.

Optionally, and as shown in FIG. 8A, the attachment plate 340 of a mirror assembly 310 may have a notch or opening or aperture 340c established at or through flange 340b and the mirror casing 312 may have a tab or retaining element 312e protruding inboard therefrom. Thus, when the attachment plate 340 (and the rear substrate 322 and electrochromic medium 324 of the reflective element 314) is received in mirror casing 312 a sufficient amount, the retaining element 312e is received in aperture 340c to snap or lock or retain the attachment plate 340 and reflective element 314 relative to mirror casing 312 (with the outer edge 312d of mirror casing 312 being at or near or in contact with or spaced from the rear surface 320b of front substrate 320 of mirror reflective element 314, such as in a similar manner as described above). In the illustrated embodiment of FIG. 8A, the reflective element 314 includes a fourth surface mirror reflector 321 disposed at the rear surface 322b of rear substrate 322 (such as an environmentally stable coating or layer such as a coating or layer of silicon aluminum or other suitable coatings or layers, 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), but the mirror reflector could be disposed at the front surface 322a of rear substrate 322, while remaining within the spirit and scope of the present invention. The mirror assembly 310 may be otherwise similar in construction to mirror assembly 210, discussed above, such that a detailed discussion of the mirror assemblies need not be repeated herein.

Optionally, the outer end or edge of the mirror casing may be formed or constructed to attach to or abut against or conform with the rear surface of the front substrate of the reflective element. For example, and as shown in FIG. 8B, the mirror casing 312' may have an overmolded end or front end or region 312d', with an elastomeric or resilient or spongy or soft rim portion 312f' (such as an overmolded santoprene material or the like) molded over end region 312d' to provide a cushion and/or seal between the end region 312d' and the rear surface 320b of front substrate 320 of reflective element 314. The resilient or soft portion 312f' may comprise any suitable softer or lower durometer hardness material as compared to the harder plastic mirror casing 312'. The overmolded portion 312f' of the front casing portion 312d' thus abuts or contacts (and may compress against) the rear surface 320b of front substrate 320 to seal against the rear surface 320b and provide a sealed gap-less transition between the mirror casing and the curved edge or surface or beveled outboard or front perimeter 320c of front substrate 320 of reflective element 314. The overmolded resilient portion may provide a resilient seal between the reflective element and the mirror casing or housing and may function to absorb or reduce shock or vibration at the reflective element. The mirror assembly 310' may be otherwise similar in construction to mirror assemblies 210, 310 discussed above, such that a detailed discussion of the mirror assemblies need not be repeated herein.

Optionally, and with reference to FIG. 8C, a mirror assembly 310" may include a mirror casing 312" that has an adhesive layer 313 disposed or dispensed at its outer edge or end region 312d" to adhere to the second or rear surface 320b of front substrate 320 of reflective element 314 when the attachment plate 340 is attached or snapped to the mirror casing 312". The adhesive may comprise any suitable adhesive, and may provide a quick set or partial cure that holds the mirror casing to the glass surface of the front substrate during the curing of the adhesive (or optionally, fixturing or a second rapid set, rapid cure adhesive may be disposed at the interface between the mirror casing and the glass) to hold the substrate and mirror casing together until the adhesive 313 is fully cured. Optionally, and with reference to FIG. 8D, a mirror assembly 410 may include a mirror casing 412 that has a notch or chamfer 412f formed at its outer end region 412d and the notch may be filled with a gap filler material 413 (such as a soft elastomeric material or an adhesive or the like) disposed between the notched end region of the mirror casing and the rear surface 420b of the front substrate 420 of the mirror reflective element 414. The front casing portions thus may abut or contact the rear surface of the front substrate with the adhesive or gap filler material disposed thereat and/or therebetween to seal the mirror casing at and against the rear surface of the front substrate and to provide a sealed gap-less transition between the outer surface of the mirror casing 412 and the beveled outboard or front perimeter or curved edge or surface 420c of the front substrate 420 of the reflective element 414. The mirror assemblies 310" and 410 may be otherwise similar in construction to mirror assemblies 210, 310, 310' discussed above, such that a detailed discussion of the mirror assemblies need not be repeated herein.

Optionally, and with reference to FIG. 8E, a mirror assembly 410' may include a mirror reflective element 414' adhered to or attached to a mirror casing 412', such as via an adhesive tape 442' disposed between the mirror reflective element and an attachment portion or surface 440 of the mirror assembly (such as an attachment portion that is formed as part of the mirror casing or that is attached to the mirror casing or the like). In the illustrated embodiment, the mirror casing 412' has a slanting edge configuration, such as a bevel or chamfer-like configuration or protrusion configuration 412f' formed at its outer end or front portion or region 412d', and the mirror reflective element 414' may include a front substrate 420' that has a formed or slanting inboard perimeter or slanting edge configuration or rear perimeter edge-portion 420e', such as a bevel or chamfer-like configuration or notch or recess or curvature or the like, established at the perimeter region of the rear surface 420b' of the mirror substrate. The slanted rear perimeter edge-portion 420e' of the substrate 420' and the slanted outer portion 412f' at mirror casing 412' correspond to one another or generally engage or mate with one another and allow the rear portion of the front substrate 420' to engage and nest or partially nest in or at the end region 412d' of mirror casing 412' when the attachment plate 440' is attached to mirror casing 412', such as in a similar manner as described above, with the rear substrate 422' and reflecting surface 421' disposed in or enclosed in the protective housing or mirror casing 412'. The front surface 420a' of front substrate 420' includes a beveled outboard or front perimeter or outer curved front edge or surface or bevel 420c' (that may be ground or otherwise formed or established) that provides a smooth or convex-curved transition surface between the front surface 420a' of the reflective element 414' and the exterior surface 412b' of the end formation 412f' of the mirror casing 412' (which is generally coplanar or generally flush with the rear perimeter edge dimension 420d' of front substrate 420' when the mirror reflective element 414' is partially received in the mirror casing 412' and when the formed inboard perimeter 420e' is received in or aligned with or mated with the formed end region 412d' of mirror casing 412').

As used herein, the term "slanted" or "slanting" for the slanted rear perimeter of the substrate and/or slanted outer element at the mirror casing is intended to encompass a straight slant or a curved slant (such as a convex curvature or concave curvature or multi-radius curvature) or any other form established at the rear perimeter of the glass substrate or the outer element at the mirror housing or casing. Such a slanting rear perimeter at the glass substrate can be formed, for example, by grinding (such as by using a glass-grinding diamond wheel or the like) the conventional straight edge of a substrate that conventionally connects or adjoins the second or rear surface of the substrate to the first or front surface of the substrate when a glass shape in the form of a typical interior rearview mirror is cut from a larger flat glass sheet that typically has a thickness in the range of about 1.1 mm thickness to about 2.3 mm thickness (typically having a thickness in the range of about 1.1 mm to about 1.6 mm or thereabouts) when the glass substrate is the front substrate of an electrochromic mirror construction.

Thus, when the reflective element is attached at or disposed at the mirror casing or housing or holder or shroud or cap or element, the edge of the reflecting surface 421' (at the front surface of the rear substrate of the reflective element) is enclosed in the protective housing 412' (or holder, etc.) and has, on its perimeter (at the beveled outboard leading perimeter edge or region 420c'), a radius of curvature greater than or equal to 2.5 mm at all points and in all directions. This is shown in FIG. 8E where the lip or protrusion 412f' of the formed outboard end 412d' of protective housing 412' extends or protrudes outward beyond the reflecting surface 421' so that the edge of the reflecting surface 421' is enclosed by and recessed in the mirror housing or casing and the lip or protrusion protruding therefrom. The reflecting surface is received within the mirror housing or protective housing and does not project beyond the end region 412d' of the protective housing. Optionally, an adhesive or gap filler may be disposed between the chamfered rear surface 420b' of front substrate 420' and the chamfered end region 412d' of mirror casing 412', such as in a similar manner as described above. The bevel 420c' of front substrate 420' provides a smooth curved transition between the generally planar principal surface 420a' of front substrate 420' and the outer surface 412b' of the mirror casing or housing 412', and optionally, the outer surface of the protruding end region of the mirror casing may be curved to correspond to or be generally flush with or coplanar with the curved surface of the bevel of the front substrate to provide a smooth transition between the mirror casing surface and the generally planar principal surface of the front substrate of the mirror reflective element. Optionally, the mirror assembly 410' may include a concealing layer or border layer or coating 423' along the perimeter of the rear surface 420b' of the front substrate 420' (and the concealing layer may be disposed over the perimeter region of the generally planar rear surface and over the chamfered or formed rear or inboard perimeter region of the mirror substrate) to conceal or render covert or hide the outer or forward edge or lip of the mirror casing and the perimeter seal from view by a person viewing the reflective element when the mirror assembly is normally mounted in a vehicle. The mirror assembly 410' may be otherwise similar in construction to mirror assemblies 210, 310, 310', 310", 410 discussed above, such that a detailed discussion of the mirror assemblies need not be repeated herein.

Thus, the present invention provides a mirror casing that partially receives an electrochromic reflective element therein (such as receiving the rear substrate and electrochromic medium and reflecting surface and the like in the mirror housing or casing), with a front substrate of the reflective element extending beyond the rear substrate along the periphery of the reflective element and with a rear surface of the front substrate at its periphery engaging or abutting or approaching the outer end region of the mirror casing. The front substrate includes a curved or rounded perimeter edge about the periphery of the front surface to satisfy regulation requirements and to provide a smooth transition between the generally planar front surface of the front substrate and the outer surface of the mirror casing. In the electrochromic mirror assemblies discussed above, the reflecting surface is received in the mirror housing, with the edge of the front substrate of the mirror having on its perimeter a radius of curvature greater than or equal to about 2.5 mm (such as about 3 mm or thereabouts) at all points and in all directions, and thus the mirror assemblies satisfy the requirements of ECE Regulation No. 46, incorporated by reference above, and the perimeter band may hide or conceal the outer or forward edge or lip of the mirror casing and the perimeter seal from view by a person viewing the reflective element when the mirror assembly is normally mounted in a vehicle.

Optionally, an interior prismatic mirror assembly of the present invention may include a prismatic reflective element that has rounded or curved perimeter edges to provide a smooth transition between the generally planar front surface of the prismatic reflective element and the outer surface of the mirror casing (such as by utilizing aspects of the mirror assemblies described in PCT Application No. PCT/US2010/032017, filed Apr. 22, 2010, which is hereby incorporated herein by reference in its entirety). For example, and with reference to FIGS. 9, 9A and 9B, an interior prismatic mirror assembly 510 includes a mirror casing 512 and a prismatic reflective element 514 (having a prism or wedge-shaped glass substrate with a mirror reflector coating or layer or reflecting surface 521 disposed at its rear surface 514b and optionally with a perimeter layer or coating or band or concealing layer disposed about the perimeter to conceal or render cover the presence of the mirror casing to a person viewing the front surface 514a of the prismatic reflective element 514 of the mirror assembly). The perimeter edge of the prismatic reflective element 514 comprises a rounded or curved perimeter edge 514c to provide a smooth convex-curved transition between the generally planar front surface 514a of the reflective element and the outer surface 512b of the mirror casing 512, such as in a similar manner as described above and such as in a similar manner as described in PCT Application No. PCT/US2010/032017, filed Apr. 22, 2010, which is hereby incorporated herein by reference in its entirety. In the illustrated embodiment, the mirror casing 512 is formed with an attachment plate 540 that is attached or adhered at the rear surface 514b of reflective element 514, such as at an anti-scatter tape 542 or the like disposed at and/or adhered to the rear surface of the reflective element, such as in a known manner. The mirror casing and attachment plate may be unitarily or integrally formed or molded together, such as by utilizing aspects of the mirror assemblies described in PCT Application No. PCT/US2010/032017, filed Apr. 22, 2010, which is hereby incorporated herein by reference in its entirety.

Optionally, and as shown in FIG. 9B, the outer end region of mirror casing 512 may include a protrusion or lip 512d that protrudes outwardly from the attachment surface of the attachment plate portion 540 of mirror casing 512, and the rear surface 514b of reflective element 514 may have a chamfer or notch or rear perimeter edge-portion 514e around its rear perimeter to accommodate the protrusion 512d when the reflective element 514 is attached or adhered to the mirror casing 512. The protrusion at the outer end or edge region of the mirror casing may be rounded to avoid having a sharp edge at the outer surface of the perimeter of the mirror casing, but optionally, other shapes may be established at the outer edge region of the mirror casing while remaining within the spirit and scope of the present invention. Optionally, the protrusion at the outer end or edge region of the mirror casing or protective housing may be formed to engage with the chamfered rear perimeter edge-portion of the reflective element (such as shown and described above with respect to FIG. 8E). The reflective element 514' may have a perimeter band or concealing layer about the perimeter region of its rear surface 514b' so that the mirror casing 512' and chamfered perimeter region 514e' are not discernible or viewable to a person viewing the front surface 514a' of reflective element 514' when the mirror assembly 510' is normally mounted in a vehicle. As can be seen in FIG. 9B, the reflecting surface 521 is received in the mirror housing (and inboard of or enclosed by the protrusion at the forward end of the mirror housing), with the edge of the prismatic mirror substrate of the mirror having on its perimeter a radius of curvature greater than or equal to about 2.5 mm (such as about 3 mm or thereabouts) at all points and in all directions.

Thus, the present invention provides a mirror casing that partially receives a prismatic reflective element therein (such as receiving a rear portion of the prism or substrate and reflecting surface in the mirror housing or casing), with a front portion of the reflective element extending beyond reflecting surface along the periphery of the reflective element and with a rear surface of the prism or substrate at its periphery engaging or abutting or approaching the outer end region of the mirror casing. The prism or substrate includes a curved or rounded perimeter edge or bevel about the periphery of the front surface to satisfy regulation requirements and to provide a smooth transition between the generally planar front surface of the mirror substrate and the outer surface of the mirror casing. In the prismatic mirror assembly discussed above, the reflecting surface is received in the mirror housing, with the edge of the prism or substrate of the mirror having on its perimeter a radius of curvature greater than or equal to about 2.5 mm (such as about 3 mm or thereabouts) at all points and in all directions, and thus the mirror assemblies satisfy the requirements of ECE Regulation No. 46, incorporated by reference above, and a perimeter band may hide or conceal the outer or forward edge or lip of the mirror casing from view by a person viewing the reflective element when the mirror assembly is normally mounted in a vehicle.

Referring now to FIG. 10A, a mirror assembly 510' includes a mirror reflective element 514' that has its reflecting surface 521' at the rear surface 514b' of the reflective element received in the mirror casing 512', with the mirror casing 512' including a protrusion or lip 512d' that protrudes beyond the reflecting surface or reflector 521', such as in a similar manner as described above. Optionally, and as shown in FIG. 10A, the outer perimeter edge 514d' (at the outboard perimeter region of the curved perimeter region or bevel 514c') of the reflective element 514' may extend outwardly beyond or outboard of the protrusion or lip 512d' of mirror casing 512', or may be generally flush with the protrusion or lip of the mirror casing or protective housing, depending on the particular application and desired appearance of the mirror assembly. Optionally, and as also shown in FIG. 10A, the mirror reflective element 514' of mirror assembly 510' may be adhered to the mirror casing 512' (or to an attachment plate or the like that may be attached to or part of the mirror casing or protective housing) via a layer of urethane adhesive 542' or other suitable adhesive disposed between the rear surface 514b' of reflective element 514' and the attachment surface 540' of mirror casing 512'. The urethane adhesive may comprise a thermosetting moisture cured hot melt urethane adhesive or other suitable adhesive (such as a UV cured adhesive or the like) and may be disposed as a relatively thick layer between the rear surface 514a' of reflective element 514' and the attachment surface 540' of mirror casing 512' (or to a separate attachment plate of the mirror assembly or the like). The urethane adhesive may be applied to the attachment surface of the mirror casing or to the rear surface of the reflective element. The application of the urethane adhesive may obviate placement constraints and requirements typically implemented for accurate application of a foam adhesive or the like, and may reduce the costs associated with attaching the reflective element to the mirror casing or attachment plate.

For example, and with reference to FIG. 10B, a mirror assembly 610 may include a mirror casing 612 with a chamfered or angled outer edge region or element 612d, with the angle of the chamfered edge region 612d of mirror casing 612 generally corresponding with a large angle or chamfer or rear perimeter edge-portion 614e of a chamfered or angled rear surface 614b of prismatic reflective element 614. Optionally, and with reference to FIG. 10C, a mirror assembly 610' may have a mirror casing 612' with a curved or rounded end or edge region 612d' and a prismatic reflective element 614' with a curved or rounded notch or recess or rear perimeter edge-portion 614e' established at its rear surface 614b' and around the perimeter region of the reflective element. The chamfered region of the reflective element may be slightly spaced from or may abut against the chamfered edge region of the mirror casing or protective housing, and optionally the mirror assembly may include an adhesive or sealant or resilient element disposed between the chamfered region of the reflective element and the chamfered edge region of the mirror casing or protective housing. Optionally, the outboard perimeter edge 614d, 614d' at the rear of the curved bevel 614c, 614c' of the reflective element 614, 614' may be outboard of the outer surface of the mirror casing 612, 612' (such as shown in FIGS. 10B and 10C) or the outboard perimeter edge at the rear of the curved bevel may be generally flush with the outer surface of the mirror casing. The chamfered or recessed region at the periphery of the rear surface of the reflective element may have the reflector coating removed therefrom during the forming or grinding process, and thus, a person (such as the driver of the vehicle when normally operating the vehicle) may see a darkened ring around the periphery of the reflective element due to the viewability of the end region of the mirror casing through the reflective element when the reflector coating is removed from the perimeter region of the reflective element. Optionally, a coating process may be performed after the chamfer or recess is formed at the rear of the reflective element to provide a reflective coating or layer or a concealing coating or layer around the perimeter of the rear surface of the reflective element, depending on the particular application and desired appearance of the mirror assembly.

Optionally, the outer end or edge of the mirror casing may be formed or constructed to attach to or abut against or conform with the rear surface of the reflective element. For example, and as shown in FIG. 10D, the mirror casing 712 of a prismatic mirror assembly 710 may have an overmolded end or front region 712d, with an elastomeric or resilient rim portion 712f (such as an overmolded santoprene material or the like) molded over end region 712d to provide a cushion and/or seal between the end region 712d and the rear surface 714b of reflective element 714. The resilient or soft portion 712f may comprise any suitable softer or lower durometer hardness material as compared to the harder plastic mirror casing 712. The overmolded portion 712f of the front casing portion 712d thus abuts or contacts (and may compress against) the rear surface 714b of reflective element 714 to seal against the rear surface 714d and provide a sealed gap-less transition between the mirror casing and the curved edge or surface 714c of reflective element 714. Optionally, and as shown in FIG. 10D, the rear surface 714d of reflective element 714 may have a chamfer or notch or rear perimeter edge-portion 714e formed at its perimeter region and the overmolded portion 712f may have a protrusion or portion 712g that conforms with the notched or chamfered portion or rear perimeter edge-portion 714e of rear surface 714b of reflective element 714 to engage the rear surface of the reflective element when the reflective element is attached at the mirror casing. The chamfered region of the reflective element may be slightly spaced from or may abut against the chamfered resilient portion at the end region of the mirror casing or protective housing, and optionally the mirror assembly may include an adhesive or sealant or resilient element disposed between the chamfered region of the reflective element and the chamfered resilient portion at the end region of the mirror casing or protective housing. Optionally, the outboard perimeter edge 714d at the rear of the curved bevel 714c of the reflective element 714 may be outboard of the outer surface of the resilient element 712f and/or the mirror casing 712 (such as shown in FIG. 10D) or the outboard perimeter edge at the rear of the curved bevel may be generally flush with the outer surface of the resilient element and/or of the mirror casing.

Optionally, and as shown in FIG. 10E, the mirror casing 812 of a mirror assembly 810 may extend outboard of the perimeter edge of the reflective element 814, with a protrusion or lip 812d extending partially around and along the perimeter edge 814d of the reflective element 814 (with the bevel 814c of reflective element 814 being inboard of the protrusion or lip 812d), which may include a chamfer or notch or rear perimeter edge-portion 814e formed at its perimeter region at its rear surface 814b. In such an embodiment, the prismatic reflective element may be cut smaller to fit within the perimeter lip 812d of mirror casing 812, and the thickness of the prismatic reflective element may be reduced, since a full radius may not be required, thus achieving a reduced weight for the mirror assembly. The chamfered region or rear perimeter edge-portion of the reflective element may be slightly spaced from or may abut against the protrusion at the end region of the mirror casing or protective housing, and optionally the mirror assembly may include an adhesive or sealant or resilient element disposed between the chamfered region of the reflective element and the protrusion at the end region of the mirror casing or protective housing. The mirror assemblies 710', 810 may be otherwise similar in construction to mirror assemblies 510, 310', 610, 710 discussed above, such that a detailed discussion of the mirror assemblies need not be repeated herein.

In the prismatic mirror embodiments discussed above, the reflecting surface is received in the mirror housing, with the edge of the prismatic mirror substrate of the mirror having on its perimeter a radius of curvature greater than or equal to about 2.5 mm (such as about 3 mm or thereabouts) at all points and in all directions. The present invention provides a mirror casing that partially receives a prismatic reflective element therein (such as receiving a rear portion of the prism or substrate and reflecting surface in the mirror housing or casing), with a front portion of the reflective element extending beyond reflecting surface along the periphery of the reflective element and with a rear surface of the prism or substrate at its periphery engaging or abutting or approaching the outer end region of the mirror casing. The prism or substrate includes a curved or rounded perimeter edge or bevel about the periphery of the front surface to satisfy regulation requirements and to provide a smooth convex-curved transition between the generally planar front surface of the mirror substrate and the outer surface of the mirror casing. In the prismatic mirror assembly discussed above, the reflecting surface is received in the mirror housing (and rearward of the outer end of the mirror casing and/or a protrusion protruding from the mirror casing), with the edge of the prism or substrate of the mirror having on its perimeter a radius of curvature greater than or equal to about 2.5 mm (such as about 3 mm or thereabouts) at all points and in all directions, and thus the mirror assemblies satisfy the requirements of ECE Regulation No. 46, incorporated by reference above, and optionally a perimeter band may be disposed at the perimeter region of the rear surface of the reflective element substrate to hide or conceal the outer or forward edge or lip or protrusion of the mirror casing from view by a person viewing the reflective element when the mirror assembly is normally mounted in a vehicle.

The interior rearview mirror assemblies of the present invention thus provide enhanced aesthetically pleasing appearances and may provide increased reflective/viewing areas at the mirror assemblies, since the mirror assemblies do not include a bezel portion or the like that overlaps the perimeter region of the front surface of the front substrate of the reflective element. The mirror assemblies of the present invention may also provide for smaller mirror assemblies and thus increased forward vision around the mirrors (such as, for example, an increase of about 15-25 percent around the interior mirror assembly) while providing a given rearward field of view to the driver of the vehicle (and thus may provide a mass reduction (such as, for example, of about 10-12 percent) as compared to conventional mirror assemblies), due to the frameless or non-bezel construction and/or due to the inclusion of capacitive sensors/buttons/inputs at and behind the reflective element instead of separate buttons at a chin portion of the bezel or mirror casing. For example, for two mirror assemblies providing a given rearward field of view or reflector size, the mirror assembly of the present invention (without any bezel or buttons outside of the reflecting surface or viewing area of the mirror assembly) may provide an overall mirror size decrease of about 3,000 square millimeters (which may provide about a 24 percent reduction in the mirror size). Also, the present invention provides unique styling resulting from the prismatic glass reflecting surface being bonded directly to the mirror case, thereby resulting in a one piece mirror head assembly. Also, the polished glass edge of the mirror reflective element of the present invention may provide a stronger reflective element substrate (such as about 65 percent stronger) as compared to a conventional cut edge glass substrate due to the removal or reduction of edge stress points and/or micro-fractures. The present invention may provide these enhancements in appearance and durability and size/weight, all while satisfying the requirements of the ECE Regulation No. 46. Although the substrates of the mirror assemblies discussed herein are described as glass substrates, clearly, the mirror substrates may be formed of a polymeric resin material, such as a transparent water clear optical plastic, such as a polycarbonate material or acrylic material or the like, while remaining within the spirit and scope of the present invention. In such polymeric substrate applications, the beveled front perimeter and slanted rear perimeter edge-portion can be established during the forming of the polymeric substrate, such as by injection molding in a suitably constructed and designed injection molding tool, such as in a manner known in the injection molding art.

Optionally, other means may be implemented to provide a mirror assembly with a circumferential curved or beveled front perimeter at the mirror reflective element. For example, and with reference to FIG. 20A, an interior prismatic mirror assembly may include a typical prismatic interior rearview mirror glass reflective element 1114, which may be enclosed or encased or encapsulated within a see-through clear plastic encapsulation 1115 (such as a clear plastic optical grade acrylic or PMMA or optical grade polycarbonate to provide a water clear encapsulation), which may be configured with curved or rounded or beveled outer or front perimeter regions. For example, a conventional interior prismatic mirror element may be loaded into an injection mold and an optical grade polymeric resin may be integrally molded around the mirror element. Optionally, the encapsulation may be selected to have a degree of resilience or impact resistance to enhance the safety features of the mirror assembly. The encapsulation 1115 is configured to attach to the remainder of the mirror casing or housing or the like, such as via insertion of mounting flanges or tabs 1115a of encapsulation 1115 into a receiving or attaching portion of the mirror casing or housing or attachment plate or the like. Optionally, and as shown in FIG. 20B, an optically clear or transparent plastic encapsulation or cover 1117 may be disposed over the front surface of a reflective element substrate 1119 (which may be prism-shaped). The encapsulation or cover 1117 may have a wedge-shaped or prism-shaped cover portion 1117a at and over the front surface of the substrate 1119, and may have a rounded or curved or beveled outer or front perimeter regions 1117b and attachment portions or flanges 1117c for attaching to the mirror casing or housing or attachment plate 1121 or the like. Optionally, and as exemplified in FIG. 20C, a mirror reflective element 1119' (which may comprise a prismatic reflective element or an electro-optic reflective element) may be disposed within a clear plastic cover element 1117', which is curved or formed or configured to encompass or encapsulate the perimeter of the reflective element and to attach to the outboard or forward end region of the mirror casing or holder 1121'. Although shown as spaced from the reflective element 1119', the plastic cover element 1117' may be disposed at and in contact with the front surface of the reflective element and/or may be optically coupled with the front surface of the reflective element, such as via a suitable optical adhesive or the like disposed between the cover element and the front surface of the reflective element. Optionally, and desirably, the curved or beveled front perimeter 1117b' of cover element 1117' may have a concealing layer or finish or the like (such as a film or paint or the like) disposed at either the front or rear surface of the cover element 1117' to conceal or render covert the presence of the perimeter of the reflective element and the mirror casing or housing or holder to a driver of the vehicle when the mirror assembly is normally mounted at the vehicle.

Optionally, and with reference to FIG. 20D, a prismatic reflective element 1123 may have a prism-shaped substrate with notches or recesses 1123a established at the front perimeter regions of the substrate, and a mirror housing or holder or casing or bezel 1125 may be formed to have forward lips or flanges 1125a that are received in notches or recesses 1123a when reflective element 1123 is received in the mirror holder, whereby the mirror holder 1125 has a curved front perimeter 1125b to provide a smooth convex-curved transition from the outer surface of the side portions 1125c of the mirror holder to the generally planar front surface 1123b of the reflective element 1123.

Optionally, and as exemplified in FIG. 20E, a cast glass prismatic reflective element 1127 has a rounded or curved or beveled front perimeter 1127a at the perimeter of its front surface 1127b and has its rear surface 1127c recessed, whereby side perimeter portions or protrusions 1127d extend rearwardly from the rear surface 1127c toward the mirror housing or attachment plate or holder 1129. The rear surface 1127c of reflective element 1127 is adhered to the plastic housing or attachment plate or holder 1129 via a layer of adhesive 1131 or the like. Thus, the cast prism has its reflecting surface (the rear surface 1127c) contained or enclosed within the perimeter of the glass substrate by the rearward extending perimeter portion 1127d of the glass substrate or prism 1127. The curved front perimeter 1127b provides a smooth curved transition from the outer surface of the side portions 1129a of the mirror holder 1129 to the generally planar front surface 1127b of the reflective element 1127.

Optionally, and with reference to FIG. 20F, a prismatic reflective element 1133 is circumscribed or encased or surrounded along its perimeter by a soft or resilient element 1135, which may be attached to or overmolded at the plastic mirror casing or holder or attachment plate 1137. The resilient element 1135 may comprise a soft material, such as a material having less than a 50 Shore A durometer hardness, such as a rubber, silicone or thermoplastic elastomer (TPE) or the like. The soft or resilient element 1135 may have a rounded or beveled front perimeter 1135a (such as shown in FIG. 20F), and may provide a smooth curved transition between the outer surface of the side portions 1137a of the mirror holder 1137 to the generally planar front surface 1133a of the mirror reflective element substrate 1133. The resilient element 1135 may be overmolded at or over or along an element or protrusion 1137b of the mirror holder 1137. Optionally, the perimeter edge 1133b of the reflective element 1133 may be formed or shaped or contoured to engage or be received at the formed or shaped or contoured inner perimeter surface 1135b of resilient element 1135. Optionally, a resilient element 1135' (FIG. 20G) may be disposed at a reflective element 1133' and may have a smaller radius curved front perimeter 1135a' than the embodiments discussed above due to the softer quality of the resilient element (such as less than a 50 Shore A durometer hardness or the like) disposed around the perimeter edge region 1133b' of the reflective element 1133'. Optionally, and as shown in FIG. 20H, the mirror casing or holder 1137" may be formed to receive the reflective element substrate 1133" therein, with the mirror casing or holder 1137" having a rounded or curved or beveled front perimeter 1137a" that may slightly overlap a portion of the perimeter edge region 1133b" of the reflective element to provide a smooth convex-curved transition between the outer surface of the mirror holder to the generally planar front surface 1133a" of the mirror reflective element substrate 1133". Optionally, such configurations may be suitable for use with an electro-optic reflective element, such as an electrochromic reflective element, whereby the resilient element or mirror holder or casing may be disposed along the perimeter of the front substrate of the reflective element.

Optionally, and as exemplified in FIG. 20I, a mirror reflective element 1139 may be disposed at or received at or in a receiving portion 1141f of a mirror holder or casing 1141, where the mirror holder 1141 has a curved or beveled front perimeter 1141a that extends forwardly from an attaching portion 1141b of the mirror holder 1141 an amount so that the outer front portion 1141c of the front perimeter 1141a is generally at or coplanar with or flush with the front surface 1139a of the reflective element. The glass substrate 1139 may be cut, with an optionally polished perimeter edge and with a tight fit with the holder and with the perimeter edge 1139b of the substrate 1139 being at or engaging or contacting the inner perimeter surface 1141d of the mirror holder 1141. Optionally, the mirror holder or casing 1141 may be formed as a unitary housing or casing for the mirror assembly (as shown in FIG. 20I). Optionally, a mirror reflective element 1139' may be retained or held or received at a receiving portion 1141f' of a mirror holder or attachment element or casing portion 1141' (FIG. 20J) that may include attachment portions 1141e' for attaching the mirror holder or casing portion 1141' to a rear housing or casing or cap 1143' or the like of the mirror assembly (such as via a snap fit or fastenerless attachment or other suitable attachment means). Optionally, the mirror holder or attachment element 1141' may comprise a clear plastic attachment plate and the housing or casing or cap 1143' may comprise a black plastic (or other color or clear) element, depending on the particular application and desired appearance of the mirror assembly. Optionally, and as shown in FIG. 20K, the mirror substrate 1139" may have its front perimeter region 1139c" ground and/or polished to provide a slight radius at the front perimeter, and with the polished or radiused front perimeter region 1139c" providing a smooth curved transition between the outer surface of the mirror holder 1141" to the generally planar front surface 1139a" of the mirror reflective element substrate 1139". Optionally, the mirror holder or attachment element 1141" may comprise a clear plastic attachment plate and the housing or casing or cap 1143" may comprise a black plastic (or other color or clear) element, depending on the particular application and desired appearance of the mirror assembly. Such configurations may be suitable for use with either a prismatic reflective element or an electro-optic reflective element, such as an electrochromic reflective element.

Optionally, and as exemplified in FIG. 20L, an electro-optic reflective element 1145 may be disposed at or received in a mirror holder or housing or casing 1147, and the mirror holder 1147 may have a curved outboard end portion or element 1147a that provides a smooth convex-curved transition between the outer surface of the mirror holder 1147 to the generally planar front surface 1145a of the front substrate 1145b of the electro-optic mirror reflective element 1145. The mirror holder is formed with a recess or groove or notch 1147b established at its inner surface to receive and support or retain the perimeter region of the rear substrate 1145c of the reflective element 1145 therein, so that the reflective element is retained at the mirror holder. The curved outboard end portion or element 1147a of mirror holder 1147 may curve or extend inboard toward the perimeter edge 1145d of the front substrate 1145b, which may have a smaller cross dimension than the rear substrate 1145c, as can be seen with reference to FIG. 20L. Optionally, and with reference to FIG. 20M, the curved outboard end portion or element 1147a' of the mirror holder 1147' may have an angled or slanted or otherwise formed or shaped perimeter 1147c', which may be formed to correspond to a slanted or angled or otherwise formed or shaped perimeter edge 1145d' of the front substrate 1145b' of the reflective element 1145'. Optionally, and as can be seen in FIG.

20M, the mirror holder 1147' may not include a groove or notch for receiving the perimeter regions of the rear substrate.

Optionally, and as exemplified in FIG. 20N, a mirror reflective element 1149 has a glass substrate 1149a that may be received at or in a mirror holder or housing or casing 1151, with a gasket or retaining element 1153 disposed along the perimeter edge 1149b of the substrate 1149a and received in a groove or notch or channel 1149c at the perimeter edge 1149b of the substrate 1149a and received in a groove or notch or channel 1151a of the mirror holder 1151. The glass substrate 1149a thus may be held or retained at the mirror holder 1151 via the gasket or retaining element 1153. The mirror holder 1151 includes a curved or beveled front perimeter 1151b that provides a smooth convex-curved transition between the outer surface of the mirror holder 1151 to the generally planar front surface 1149d of the mirror substrate 1149a. Such configurations may be suitable for use with either a prismatic reflective element or an electro-optic reflective element, such as an electrochromic reflective element, where the retaining element or gasket 1153 may be disposed along the perimeter of the front substrate and/or the rear substrate to retain the substrate or substrates and the reflective element relative to the mirror holder.

Optionally, and with reference to FIG. 11, an interior rearview mirror assembly 910 for a vehicle includes a casing 912, a reflective element 914 (such as a prismatic reflecting element comprising a prismatic or wedge-shaped substrate with a mirror reflector coating or layer disposed at its rear surface) positioned at a front portion of the casing 912. Mirror assembly 910 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 918 (such as a channel mount assembly 918a and a toggle assembly 918b, such as known in the art or such as a toggle device of the types described in U.S. Pat. Nos. 6,318,870 and/or 7,249,860, and/or U.S. patent application Ser. No. 12/558,892, filed Sep. 14, 2009 and published Apr. 8, 2010 as U.S. Pat. Pub. No. US-2010-0085653, which are hereby incorporated herein by reference in their entireties). The reflective element 914 attaches to the mounting surfaces or portions 940 of the mirror casing 912, such as via an adhesive or tape 944.

Mirror assembly 910 includes a circuit element 932 (such as a printed circuit board or the like) with one or more electrical user input devices 933, such as capacitive switches or inputs or the like, as discussed below. A button or input element or appliqué 946 is disposed behind the mirror reflective element 914 and between the mirror reflective element 914 and the circuit element 932 and user input devices 933. The mirror reflective element 914 may have apertures or windows 914a established at a display region 914b of reflective element, where the mirror reflector coating or layer is partially or wholly removed from the surface of the reflective element (such as the rear surface of a prismatic reflective element) so that a person viewing the front surface of the reflective element can view the appliqué disposed behind the reflective element.

The user input devices 933 comprise touch sensor devices, such as capacitive touch sensor devices or the like, disposed at the circuit element 932 and generally aligned with icons or the like representative of the function of the devices and established on the appliqué 946. Thus, when a user touches his or her finger to the front surface of the reflective element at a particular one of the icons (or approaches the front surface of the reflective element at or near a particular one of the icons), the respective sensor device 933 disposed at that icon detects the presence or touch of the finger and is actuated to actuate or control the particular function or operation associated with the icon and user input or sensor device.

Optionally, the touch sensor mirror 910 may use projected capacitive sensors (which may replace mechanical switches traditionally mounted in the "chin" of the mirror below the reflector). Such projected capacitive sensors work by sensing a change in capacitance when the user's finger comes in close proximity to the sensor. Capacitive sensors are known and typically comprise a capacitor having two conductors with a given surface area separated by an insulator of a given thickness. In a typical capacitor, these two conductors are parallel plates separated by an insulator forming a "sandwich". One lead of the capacitor is electrically connected to one plate and the other lead is connected to the other plate. When an electric current flows through the capacitor, a positive electrical charge accumulates on one plate and a corresponding negative charge accumulates on the other plate. The attraction between the positive and negative charges allows a certain amount of charge to be accumulated on the plates for a given applied voltage. If the layer of insulation between the plates is reduced in thickness, the attraction between the charges increases and allows more charge to accumulate for a given applied voltage. Likewise, if the plate surface area is increased, an additional amount of charge can be accumulated at a given applied voltage.

This ability for the capacitor to accumulate charge is defined as capacitance. In a simple capacitor, capacitance is proportional to the area of the plates and inversely proportional to the distance between the plates. Another factor that determines capacitance is the dielectric constant of the insulator between the plates. The dielectric constant is a measure of the tendency for an insulating material to electrically polarize in the presence of an electric field. A higher dielectric constant results in greater electric field intensity between the plates and therefore increases the ability for the capacitor to hold a charge.

For a given capacitance, the voltage across the capacitor is proportional to the amount of charge on the plates of the capacitor: $Q = C \cdot V$ (Equation 1), where Q is the charge in coulombs, V is the voltage in volts, and C is the capacitance in farads. The current through a capacitor is equal to the rate of change of the charge Q relative to time, i.e., the derivative of Q with respect to t: $I = dQ/dt$ (Equation 2), where I is the current in amperes (amps) or coulombs per second. Taking the derivative of both sides of Equation 1 relative to time results in the following relationship: $I = dQ/dt = C \cdot dV/dt$ (Equation 3). In other words, the current through a capacitor of a given capacitance is proportional to the rate of change of voltage across the capacitor.

Capacitance can be measured in several ways. One way is to place a given amount of charge on the capacitor and measure the resulting voltage across the capacitor. Another way is to charge the capacitor with a given current and measure the time it takes for the capacitor to reach a given voltage. Still another way is to increase the voltage across the capacitor at a given rate and measure the resulting current flow.

A capacitor is often wired in series with a resistor to form an RC network. When a voltage V_0 is applied across the network, a current will flow through the resistor and charge the capacitor. If the capacitor starts in a discharged state, the voltage across the capacitor will start at zero and increase according to the following equation: $V_t = V_0 (1 - e^{-t/RC})$ (Equation 4). When $t = RC$, the capacitor will have charged to about 63.2 percent of full charge. This time interval is known as the RC time constant and is often designated as τ (lower case tau). If the resistance R in the network is known, the capacitance can be calculated by measuring the time T that it takes for the capacitor to charge to 63.2 percent of the applied voltage. The capacitance can then be calculated as follows: $C = T/R$ (Equation 5), where R is the resistance of the resistor in ohms, T is the time in seconds and C is the capacitance in farads. The time required to charge to 63.2 percent of the applied voltage is therefore proportional to the capacitance.

The capacitive touch sensor consists of a plate made of metal or some other conductive material, covered with an insulating layer. This plate forms one half of a capacitor, with the other half being the nearest conductive object electrically connected to ground. Normally, the nearest such object is not very close to the plate and the resulting capacitance is relatively low. When the user brings his or her finger close to the sensor (such as by approaching or touching the front surface of the mirror reflective element at the sensor location), the capacitance increases due to the fact that the user's body is electrically conductive and the distance between the user's finger and the sensing plate is relatively small compared to the previous condition. The user's body is relatively large and can accumulate a significant charge and therefore is practically a "ground" in this case.

There are several ways for a touch sensor to measure capacitance. One way is to set up a relaxation oscillator, where the frequency of the oscillator is inversely proportional to the capacitance. The cycles of the oscillator are counted for a fixed time interval, and the resulting count is used as an indication of capacitance. Such an oscillator can be implemented using an inverter with a Schmitt trigger input. Such Schmitt triggers are known and provide hysteresis on the input, with the high trigger or threshold being higher than the low trigger or threshold. Thus, the voltage has to increase beyond a certain point before a change is made to the high state and then the voltage has to decrease to below another lower threshold before a change is made to the other state.

Another way to measure the capacitance is to use an RC network and measure the time constant. First, the capacitor is discharged, and then allowed to charge through the resistor. The time it takes for the capacitor to charge to a given voltage threshold is then measured.

Such a sensor 950 can be implemented with a common microcontroller 952 with a resistor 954 as an additional component (such as shown FIG. 12). In such an application, instead of using 63.2 percent of the applied voltage as a threshold, half of the supply voltage may be used instead. This is because on modern CMOS microcontrollers, the logic threshold is approximately half of the supply voltage. In either case, the time it takes the capacitor to charge to a particular threshold voltage is proportional to the capacitance, and therefore the capacitance can be reliably measured. The grounded plate 956a of the capacitor 956 in FIG. 12 represents the presence (or absence) of the user's finger over the sensing element or plate 956b.

Due to the introduction of electrical noise from the environment, the measure of capacitance may vary slightly from one reading to the next. Therefore, it is desirable to take the average of several readings of the capacitance to effectively filter out this noise. In the case of using an oscillator, this is typically done automatically due to the fact that several cycles are counted over a time interval. The resulting count is a reflection of the average frequency during the count interval. In the case of the latter approach, the process of measuring the time to charge the capacitor is repeated for several time intervals and the resulting time measurements are summed together. The two approaches may be similar, except in the former case the time interval is fixed and the number of cycles is variable, and in the second case the number of cycles is fixed and the time interval is variable.

Although an increase in capacitance occurs when the user places his or her finger at or on the touch sensor, the absolute value of that capacitance is not easily predictable. Furthermore, the change in capacitance that occurs when the sensor is touched may be relatively small compared to changes that may occur due to changes in humidity, temperature, product build variations, presence of nearby objects and/or the like. Therefore, it is desirable for the sensor to be able to detect small but abrupt or relatively rapid changes in capacitance while ignoring large changes that occur relatively slowly over a period of time.

To detect an abrupt change in capacitance, each reading is compared to an average of a relatively large number of previous readings (the detection average), composing a sort of "inertial reference". The detection average is not to be confused with the average used to filter out noise mentioned in the previous section. The noise filtering average is used as a low-pass filter to remove electrical noise and interference, and the detection average is used as a basis for a high-pass filter to eliminate or reduce the effects of slow changes in capacitance so such slow changes won't be confused as a touch. In the former case, the average is taken as the reading, while in the latter case (the detection average), the detection average is a quantity to which we are to compare that reading. Subsequently, when referring to a reading, the reference is typically to an averaged reading.

For example, a system may take the sum (or average) of 16 counts in order to filter out the noise to determine the value that the system will accept as an indication of the capacitance at a particular moment. This is the current reading. The system may then keep an average of the last 16 of those readings to determine the detection reference. This average (A) can be calculated as a running average as follows: $A_i = (A_{i-1} \cdot 15 + R_i) / 16$ (Equation 6), where A_i is the average after the current interval, A_{i-1} is the average after the previous interval, and R_i is the current reading. In this example, R is weighted 1/16 in the running average. This weighting can be adjusted to change how quickly the system responds to changing conditions. However, if the system responds too quickly, touch sensitivity will be reduced.

Even though an attempt has been made to filter out most of the noise in the capacitance readings, there may still be some noise present. However, the change in capacitance due to a touch should be higher than this remaining noise level. In order to detect a touch, the system may set a threshold that is below the change in value caused by a touch, but still above this remaining noise level. This threshold is a quantity that is added to the running average calculated above. While the detection reference average changes over time, the threshold quantity is usually fixed and determined by experimentation and testing. Although the overall capacitance reading may change substantially over time, the magnitude of the small change due to a touch will remain relatively consistent.

When the sensor is in operation, the capacitance readings are continually compared to the sum of the detection average and the threshold value. If the reading does not exceed this sum, the detection average is updated according to Equation 6 above. If the reading exceeds the sum of the detection average and the threshold value, a touch event is triggered.

In order to simulate continued pressing of a button, the detection average is not adjusted as long as a touch event is triggered. This causes the sensor output to remain in a triggered state as long as the user's finger is at or on or near to the sensor and may prevent the detection average from adjusting to the presence of the finger. This allows the system to incorporate "nested input states" on the input or button. Once the readings fall below the trigger level, updating of the detection average resumes.

In some cases, the remaining noise in the readings may cause a slight overlap between readings that may occur during a touch and those that may occur when the sensor is not touched. If this is the case, it may not be possible to set a reliable threshold to detect a touch, as too low a threshold would allow false triggering, and too high a threshold would result in vacillation between touched and untouched states while the user's finger is still present. To address this, the detection threshold may incorporate some hysteresis, where the threshold level used to detect a touch is higher than the threshold level used to detect when the touch ends or when the user releases and moves their finger from the sensor or sensor region.

Referring now to FIGS. 13-17, a capacitive sensor system 1010 includes a capacitor sensor plate 1012, which may be disposed at or behind an input region of a reflective element of an interior rearview mirror assembly (where the other portion or "plate" of the capacitor would be a user's finger that approaches or contacts or touches the mirror reflective element at or near the input region in front of the capacitor sensor plate 1012). The capacitive sensor system 1010 includes a pair of comparators 1014, 1016 and a set/reset latch or switch 1018, and a frequency counter or timer 1020 and interval counter or timer 1022. As can be seen in FIG. 13, the comparators 1014, 1016 output to the set/reset latch 1018 and if the voltage V2 in is greater than about 2/3 Vcc, then the output goes to low on the D output of set/resent latch 1018, and if the voltage in is less than about 1/3 Vcc, then the output goes to high on the D output. When the voltage V1 (the output of the set/reset latch 1018) goes high, it charges the capacitor through the resistor 1024, and the voltage V2 continues to ramp up (with the rate of the ramp up of V2 being determined by the resistor (which is fixed) and the capacitance at the capacitor 1012 (which may be variable depending on if its touched or not). Thus, when a user touches the capacitor (or touches the mirror reflective element at or in front of the capacitor plate), the capacitance increases and the rate of ramping of the voltage V2 is reduced so the rate at which the voltage V2 increases is reduced. The voltage V2 feeds back to the comparators and the system, and when voltage V2 changes between 1/3 Vcc and 2/3 Vcc, the output D of the set/reset latch 1018 changes accordingly. The output D of the set/reset latch 1018 is fed into the frequency counter 1020, which counts or increments every time the voltage V1 pulses (every time V1 goes from low to high). The increments or count total of frequency counter 1020 are checked and determined at the end of each given time interval (as determined by the interval counter 1022, so that the system executes or determines whether or not there is a touch or presence at the sensors at regular intervals), and this counter is reset after each cycle. The step function and ramping function of the voltages V1 and V2 are shown in FIG. 14. When the increments of the frequency counter 1020 are determined at the end of the time interval to be below a threshold amount (or reduced from an average level by a threshold amount), such as can be seen with reference to FIG. 15, then the system determines that the capacitance has increased, such as do to a user touching the mirror reflective element at the user input region.

As shown in FIG. 17, the process flow 1030 for the capacitive sensor system 1010 starts at 1032 and initializes variables, registers and interrupts at 1034 and waits to stabilize at 1036 (and during these steps the system may obtain or determine a baseline capacitance reading for the sensor). The system then enters a "do nothing loop" at 1038 and waits during the counting period (as counted by the interval counter or timer 1022) until the timer interval is completed. At the end of the counter or timer interval, the system runs an interrupt process at 1040 and disables the timers at 1042 to prevent the interval counter or timer from counting another time interval during the processing of the frequency counter readings. The system reads the frequency counter 1020 at 1044 and determines at 1046 whether or not the counter value is less than the value of the average value minus a given or predetermined threshold value. If the counter value is not less than the average minus threshold value, then the system clears the output state at 1048 and calculates at 1050 the average by adding the previous average plus the difference between the current counter value and the previous average divided by some given number (such as 16 in the illustrated embodiment). The system then resets and enables both counters or timers 1020 and 1022 at 1052 and returns from the interrupt (to the do-nothing loop) at 1054. If the counter value is less than the average minus threshold value, then the system determines that there was a touch at the sensor plate and sets the output state at 1056 accordingly (which generates a signal indicative of a touch at a particular button region or input region at the mirror reflective element). The system then resets and enables both counters or timers 1020 and 1022 at 1052 and returns from the interrupt (to the do-nothing loop) at 1054.

Optionally, and desirably, the mirror assembly may have graphics or icons for the user inputs or sensors disposed at or viewable at the mirror reflective element, such as at a lower region of the reflective element. For example, the graphics or icons may be established at an appliqué or element that is disposed behind the reflective element and viewable through the reflective element, such as viewable through a transflective mirror reflector or viewable through a window or aperture established at the mirror reflector by ablating or removing some or all of the mirror reflector coating at the user input region (or masking the user input region during deposition of the mirror reflector coating).

Optionally, for an electro-optic reflective element, such as an electrochromic reflective element, the graphics or icons may be disposed behind the rear or fourth surface of the rear substrate, and may be substantially hidden or non-viewable behind a transflective or Display-on-Demand (DoD) mirror reflector coating, so as to be visible when an illumination source or the like at the user input is powered (such as to backlight the graphic or icon). The capacitive switches or touch sensors may be located below the rear glass substrate (such as in a similar manner as shown in FIG. 5), since the capacitive switches may not operate behind or through the front and rear substrates and the electrochromic medium established therebetween, and the capacitive switches or touch sensors may be disposed behind the concealing perimeter band (such as a reflective band, such as a chrome band or the like, or such as a non-reflecting or light absorbing band or the like) that hides or conceals or renders covert the perimeter seal of the electro-optic reflective element or cell.

The perimeter band may be laser etched or ablated or otherwise removed or reduced at the user input region or regions to allow a user to view or discern or recognize the switch areas. Optionally, some of the laser etched area or areas at the perimeter band may be backlit so the user would recognize that the backlit area is the switch or user input area (the area that the user is to touch to actuate the desired feature), and the graphics above the backlit area is not the switch or user input area. Optionally, the backlighting may be direct backlighting, such as via an illumination source (such as a light emitting diode) disposed behind each area, and optionally with a diffuser in front of the illumination source to provide a generally uniform appearance of the backlit region. Optionally, the backlighting may comprise indirect backlighting, such as via a thin light guide film that would be side-lit with one or more illumination sources (such as one or more light emitting diodes or the like) that are disposed outside or remote from the switch area (such an indirect backlighting approach may facilitate backlighting of multiple switch areas with one or more common illumination sources, with the light piping or light guiding film or element directing the illumination emitted by the illumination source or sources toward the switch area or areas). Optionally, the switches and/or illumination sources may be disposed at the perimeter concealing layer or band and the etched area or areas of the perimeter concealing layer or band may be electrically connected to a circuit or a separate circuit like a flexible printed circuit (FPC) or standard printed circuit board (PCB) or the like, or the perimeter layer or band may comprise decoration and the switch itself may be on the circuit or FPC or PCB or the like.

Optionally, a coating, such as a transparent conductive layer or coating, such as an indium tin oxide (ITO) coating or the like), may be disposed at or on the front or first surface of the front substrate of the electro-optic reflective element or cell (such as with masked or laser-etched areas to singulate or electrically isolate one or more switch areas). Such electrically isolated switch areas at the first surface of the reflective element or cell may allow the active switch area to be in front of the graphics or icons that may be disposed at or in the dimming area of the variable reflectant electro-optic reflective element or cell. The transparent conductive layer or coating may wrap around or overcoat or overlay the bottom perimeter edge dimension of the front substrate and may be electrically connected to a circuit or circuit element or electrical connector, such as via a conductive epoxy or conductive adhesive or the like (such as by utilizing aspects of the mirror assemblies described in U.S. Pat. Nos. 7,274,501; 7,255,451; 7,184,190; and/or 6,690,268, which are hereby incorporated herein by reference in their entireties.

Optionally, in order to limit or avoid accidental actuations of one or more of the 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 capacitive switch that is disposed at 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 dimming 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, 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).

Optionally, when a touch or presence is detected at two or more buttons at the same time, but there is no detection of a touch or presence at the rest of the reflective element (such a double touch may be an erroneous double actuation of the inputs by the user when the user likely intended to actuate only one of two adjacent inputs or buttons), the system may implement a priority or hierarchy in determining which button or input to actuate in response to such a detection. For example, the system may process the detections and determine which input had a stronger reading or stronger detection of a touch and actuate or control the accessory according to that input or switch or button. Optionally, if the readings are generally or approximately the same strength or intensity or value (such as within a threshold tolerance or difference), the system may operate on a priority basis, and may actuate or control the accessory in accordance with a higher priority input over a lower priority input or the like.

Optionally, for touch sensitive inputs or applications or switches, the mirror assembly or user input or system may, when activated, provide a positive feedback (such as activation of an illumination source or the like, or such as via an audible signal, such as a chime or the like, or a tactile or haptic signal, or a rumble device or signal or the like) to the user so that the user is made aware that the input was successfully activated. For example, the system may include a haptic feedback to the touch sensor switches at and behind the mirror reflective element. Thus, when a user touches one of the user input regions to actuate the touch sensor or switch, the mirror may vibrate slightly to confirm to the user that the touch was detected and the switch was actuated. Such a haptic feedback feature may utilize aspects of U.S. patent application Ser. No. 12/091,525, filed Apr. 25, 2008 and published Jan. 15, 2009 as U.S. Pat. Pub. No. US-2009-0015736, which is hereby incorporated herein by reference in its entirety.

Thus, the present invention provides an interior rearview mirror assembly with a touch sensor element or switch disposed behind a glass substrate of the mirror reflective element of the mirror assembly. The capacitive "plate" or sensing element of the touch sensor may be established via electrical isolation of input regions of the transparent conductive coating established at a second or rear surface of a front substrate of an electro-optic mirror reflective element or via electrical isolation of one or more input regions of a mirror reflector coating or layer established at a rear surface of a prismatic glass substrate of a prismatic mirror reflective element. For example, and with reference to FIG. 18, the buttons or input regions 914a' of a mirror assembly 910' may be etched or otherwise established at the reflective element 914' (such as by etching or laser etching or ablating an isolation line 915' through the conductive coating of the glass substrate to electrically isolate the individual buttons or input regions 914a' from the rest of the conductive coating disposed at the rear surface of the mirror substrate at the viewing area or reflecting area of the mirror assembly. For the prismatic mirror reflective element application of FIG. 18, the input regions 914a' are established by electrically isolating portions of the reflector coating or layer disposed over the rear surface of the prismatic substrate, and thus provide reflection of light incident thereon so that the presence of the user inputs does not take away from the reflective area of the mirror reflective element. Optionally, one or more icons 914b' may be viewable at the input regions by removing or etching or ablating portions of the mirror reflector coating so that the appliqué may be viewable through the reflective element at those areas. Optionally, and as can be seen with reference to FIG. 19, the input regions 914a" of a mirror assembly 910" may have the reflector coating of the reflective element 914" removed thereat (such as by etching or ablating the mirror reflector or by masking during deposition of the mirror reflector) so that the appliqué 946" (and icons or indicia established thereat) is viewable through the reflective element at the input regions 914a". In such an application, the input regions 914a" may have only a portion of the mirror reflector removed thereat or may have a transparent electrically conductive layer or coating established thereat or the input regions may be established via electrically isolating portions of a conductive concealing layer established at a perimeter region of the rear surface of the reflective element so that an electrically conductive portion or layer or coating is disposed at the input regions to act as the capacitive sensing element or plate of the touch sensors or user inputs.

Optionally, the user inputs of the mirror assembly may comprise other types of switches or sensors for controlling or activating/deactivating one or more electrical accessories or devices of or associated with the mirror assembly. The mirror assembly may comprise any type of switches or sensors, such as touch or proximity sensing switches, such as touch or proximity switches of the types described above, or the inputs may comprise other types of switches or sensors, such as those described in U.S. Pat. No. 7,253,723 and/or U.S.

patent application Ser. No. 12/414,190, filed Mar. 30, 2009 and published Oct. 1, 2009 as U.S. Pat. Pub. No. US-2009-0243824, which are hereby incorporated herein by reference in their entireties, or such as fabric-made position detectors, such as those described in U.S. Pat. Nos. 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. For example, the inputs may comprise a touch or proximity sensor of the types commercially available from TouchSensor Technologies, LLC of Wheaton, IL. The touch or proximity sensor may be operable to generate an electric field and to detect the presence of a conductive mass entering the field. When a voltage is applied to the sensor, the sensor generates the electric field, which emanates through any dielectric material, such as plastic or the like, at or near the sensor. When a conductive mass (such as a person's finger or the like, or metal or the like) enters the electric field, the sensor may detect a change in the field and may indicate such a detection. Other types of switches or buttons or inputs or sensors may be incorporated to provide the desired function, without affecting the scope of the present invention.

As discussed above, the mirror assembly comprises an electro-optic or electrochromic mirror assembly and 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. 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. 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. 7,274,501; 7,255,451; 7,195,381; 7,184,190; 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. 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, 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.

Optionally, the mirror assembly may include user interface inputs, such as buttons or switches or touch or proximity sensors or the like, with which a user may adjust or control one or more accessories, such as via the principles described in 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.

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.

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.

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.

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.

Such a video display screen device or module may comprise any 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 display (LCD), preferably a thin film transistor (TFT) multi-pixel liquid crystal display (such as discussed below), or the screen may comprise a multi-pixel organic electroluminescent display or a multi-pixel light emitting diode (LED), such as an organic light emitting diode (OLED) or inorganic light emitting diode display or the like, or a passive reflective and/or backlit pixelated display, or an electroluminescent (EL) display, or a vacuum fluorescent (VF) display or the like. For example, the video display screen may comprise a video screen of the types disclosed in U.S. Pat. Nos. 7,370,983; 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. 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. 09/585,379, filed Jun. 1, 2000, now abandoned; and/or Ser. No. 10/207,291, filed Jul. 29, 2002, now abandoned, which are hereby incorporated herein by reference in their entireties.

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.

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.

Optionally, the mirror assembly may include or may be associated with a compass sensor and circuitry for a compass system that detects and displays the vehicle directional heading to a driver of the vehicle. 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 magneto-responsive sensor elements (such as a Hall sensor or multiple Hall 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 ASIC chip, such as utilizing principles described in U.S. Pat. Nos. 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. The ASIC chip may be small (preferably less than approximately a two square centimeter area, more preferably less than approximately a 1.5 square centimeter area, and most preferably less than approximately a one square centimeter area or thereabouts) and readily packagable into the mirror assembly (or a feed from such a compass-on-a-chip may be provided to the mirror assembly from a compass-on-a-chip packaged elsewhere in the vehicle cabin remote from the mirror assembly such as in an instrument panel portion or in roof console portion). Such large scale integration onto the likes of the silicon substrate/chip can allow a compass functionality to be provided by a relatively small chip, and with appropriate pin out or electrical leads provided as is common in the electrical art.

Optionally, a compass chip or compass module may be disposed at an upper end of the mounting base of a mirror assembly, such as at an upper or connecting end of a wire management element connected to or extending from the mounting base of the mirror assembly, such as by utilizing aspects of the mirror systems described in U.S. patent application Ser. No. 12/578,732, filed Oct. 14, 2009 and published Apr. 22, 2010 as U.S. Pat. Pub. No. US-2010-0097469, which is hereby incorporated herein by reference in its entirety. The wire management system may include a wire management element or channel or cover element, such as by utilizing aspects of the wire management systems or elements described in U.S. Pat. No. 7,510, 287 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.

The compass chip may be in communication with a compass display, which may provide a display region at the reflective element, and which includes ports or portions, which may comprise icons, characters or letters or the like representative of only the cardinal directional points, such as, for example, the characters N, S, E, W, formed or etched in the reflective film coating of the reflective element (and forming a transparent window therein), such as via techniques such as disclosed in commonly assigned U.S. Pat. Nos. 4,882,565 and/or 7,004,593, which are hereby incorporated by reference herein in their entireties. Optionally, however, reflective element may comprise a transflective or display on demand (DOD) reflective element, and the compass display may be a display on demand (DOD) type of display, such as disclosed in commonly assigned U.S. Pat. Nos. 7,195,381; 6,690,268; 5,668,663 and 5,724,187, which are hereby incorporated by reference herein in their entireties, without affecting the scope of the present invention.

Optionally, the compass system and compass circuitry may utilize 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 sensor or sensors may be positioned at and within a base portion or mounting base of the mirror assembly so that the sensor/sensors is/are substantially fixedly positioned within the vehicle, or may be attached or positioned within the mirror casing. Note that the magneto-responsive sensor used with the mirror assembly may comprise a magneto-responsive sensor, such as a magneto-resistive sensor, such as the types disclosed in U.S. Pat. Nos. 5,255,442; 5,632,092; 5,802,727; 6,173,501; 6,427,349; and/or 6,513,252 (which are hereby incorporated herein by reference in their entireties), or a magneto-inductive sensor, such as described in U.S. Pat. No. 5,878,370 (which is hereby incorporated herein by reference in its entirety), or a magneto-impedance sensor, such as the types described in PCT Publication No. WO 2004/076971 A2, published Sep. 10, 2004 (which is hereby incorporated herein by reference in its entirety), or a Hall-effect sensor, such as the types described in U.S. Pat. Nos. 6,278,271; 5,942,895 and/or 6,184,679 (which are hereby incorporated herein by reference in their entireties). The sensor circuitry and/or the circuitry in the mirror housing and associated with the sensor may include processing circuitry. For example, a printed circuit board may include processing circuitry which may include compensation methods, such as those described in U.S. Pat. Nos. 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 6,642,851, which are all hereby incorporated herein by reference in their entireties. 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, 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.

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; and 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.

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 with the disclosures of the referenced patents and patent applications being hereby incorporated herein by reference in their entireties).

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, 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.

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.

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 interior rearview mirror assembly for a vehicle, said interior rearview mirror assembly comprising:

a housing;

a mirror reflective element, wherein said reflective element comprises a glass substrate having a generally planar front surface and a generally planar rear surface;

wherein said generally planar front surface of said glass substrate generally faces a driver of the vehicle when said interior rearview mirror assembly is normally mounted in the vehicle;

wherein said mirror reflective element comprises a mirror reflector established at a surface of said mirror reflective element other than said front surface of said glass substrate;

wherein said housing at least partially receives said mirror reflective element and wherein said housing comprises an element that protrudes beyond said rear surface of said glass substrate and towards said front surface of said glass substrate when said mirror reflective element is at least partially received at said housing;

wherein said glass substrate comprises a slanted rear perimeter edge-portion along a perimeter circumference of said rear surface of said glass substrate;

wherein said glass substrate has a beveled front perimeter along a perimeter circumference of said front surface of said glass substrate; and

wherein said beveled front perimeter of said glass substrate is exposed to, is contactable by and is viewable by the driver of the vehicle when said interior rearview mirror assembly is normally mounted in the vehicle.

2. The interior rearview mirror assembly of claim 1, wherein said slanted rear perimeter edge-portion of said glass substrate is at least one of angled and curved to correspond to a correspondingly angled or curved form established at said element of said housing.

3. The interior rearview mirror assembly of claim 2, wherein said angled or curved form established at said element of said housing comprises a resilient element disposed at an outboard region of said housing.

4. The interior rearview mirror assembly of claim 2, wherein said angled or curved form established at said element of said housing is formed by molding said element as a part of said housing.

5. The interior rearview mirror assembly of claim 1, wherein said beveled front perimeter of said glass substrate has a radius of curvature of at least about 2.5 mm.

6. The interior rearview mirror assembly of claim 1, wherein said beveled front perimeter of said glass substrate provides a convex-curved transition between said generally planar front surface of said glass substrate and an outer surface of said element.

7. The interior rearview mirror assembly of claim 1, wherein said housing encloses said mirror reflector of said mirror reflective element when said mirror reflective element is at least partially received at said housing.

8. The interior rearview mirror assembly of claim 1, wherein said mirror reflective element comprises a prismatic mirror reflective element and wherein said mirror reflector is established at said generally planar rear surface of said glass substrate.

9. The interior rearview mirror assembly of claim 1, wherein said mirror reflective element comprises an electro-optic reflective element having a front substrate and a rear substrate with an electro-optic medium disposed therebetween and bounded by a perimeter seal, and wherein said glass substrate comprises said front substrate of said electro-optic reflective element, and wherein said mirror reflector is established at a surface of said rear substrate of said electro-optic reflective element.

10. The interior rearview mirror assembly of claim 9, wherein said mirror reflector is established at a front surface of said rear substrate, said front surface of said rear substrate opposing said electro-optic medium.

11. The interior rearview mirror assembly of claim 10, wherein said housing houses a perimeter edge dimension of said rear substrate of said reflective element, and wherein said beveled front perimeter of said front substrate transitions between said front surface of said front substrate of said reflective element and an outer surface of said element.

12. The interior rearview mirror assembly of claim 9, wherein said rear surface of said front substrate has a transparent electrically conductive coating disposed thereat, and wherein a perimeter portion of said front substrate extends beyond a corresponding perimeter portion of said rear substrate to establish a switch region, and wherein a switch portion of said transparent electrically conductive coating at said switch region is electrically isolated from the rest of said transparent electrically conductive coating at said rear surface of said front substrate.

13. The interior rearview mirror assembly of claim 12, wherein an electrical lead is electrically connected between circuitry accommodated within said housing and said electrically isolated switch portion of said transparent electrically conductive coating, and wherein said circuitry is operable to detect the presence or touch of a person's finger at said switch region.

14. The interior rearview mirror assembly of claim 1, wherein said glass substrate has a substantially opaque perimeter band established around a perimeter region of said glass substrate to hide or conceal at least said element from view by the driver of the vehicle normally viewing said front surface of said mirror reflective element when said interior rearview mirror assembly is normally mounted in the vehicle.

15. The interior rearview mirror assembly of claim 1, wherein said rear surface of said glass substrate has an electrically conductive coating disposed thereat, and wherein a switch portion of said electrically conductive coating is electrically isolated from the rest of said electrically conductive coating at said rear surface of said glass substrate, and wherein circuitry of said interior rearview mirror assembly is operable to detect the presence or touch of a person's finger at said switch portion.

16. An interior rearview mirror assembly for a vehicle, said interior rearview mirror assembly comprising:

a mirror casing;

an electro-optic reflective element, wherein said reflective element comprises a front substrate and a rear substrate with an electro-optic medium disposed therebetween and bounded by a perimeter seal;

wherein said front substrate has a first surface that generally faces the driver of the vehicle when the mirror assembly is normally mounted in the vehicle and a second surface opposite said first surface, and wherein said rear substrate has a third surface and a fourth surface opposite said third surface, said second and third surfaces opposing said electro-optic medium;

wherein said second surface has a transparent electrically conductive coating established thereat;

wherein said front substrate has a substantially opaque perimeter band established around a perimeter region of said second surface of said front substrate to hide or conceal said perimeter seal of said reflective element;

wherein said third surface has a reflective mirror reflector established thereat;

wherein a perimeter portion of said front substrate extends beyond a corresponding perimeter portion of said rear substrate to establish a switch region, and wherein a switch portion of said transparent electrically conductive coating at said switch region is electrically isolated from the rest of said transparent electrically conductive coating at said second surface of said front substrate; and

wherein an electrical lead is electrically connected between circuitry within said mirror casing and said electrically isolated switch portion of said transparent electrically conductive coating, and wherein said circuitry is operable to detect the presence or touch of a person's finger at said switch region.

17. The interior rearview mirror assembly of claim 16, further comprising a bezel portion encompassing a perimeter edge dimension of said reflective element, wherein said bezel portion does not encompass or overlap said first surface of said front substrate.

18. The interior rearview mirror assembly of claim 17, wherein said fourth surface of said reflective element is attached to a mounting portion of said bezel portion.

19. The interior rearview mirror assembly of claim 17, wherein said bezel portion comprises an outer curved surface that provides a curved transition between said first surface of said front substrate and a side wall of said mirror casing.

20. The interior rearview mirror assembly of claim 16, wherein said reflective mirror reflector comprises a partially transmitting and partially reflecting transflective mirror reflector.

21. The interior rearview mirror assembly of claim 20, wherein said electro-optic reflective element comprises an electrochromic reflective element having an electrochromic medium disposed between said front substrate and said rear substrate and bounded by said perimeter seal.

22. The interior rearview mirror assembly of claim 16, wherein said mirror casing encompasses a perimeter edge dimension of said rear substrate of said reflective element, and wherein said front substrate of said reflective element has a curved or rounded front perimeter edge and wherein said curved or rounded front perimeter edge transitions between said first surface of said front substrate of said reflective element and an exterior surface of said mirror casing.

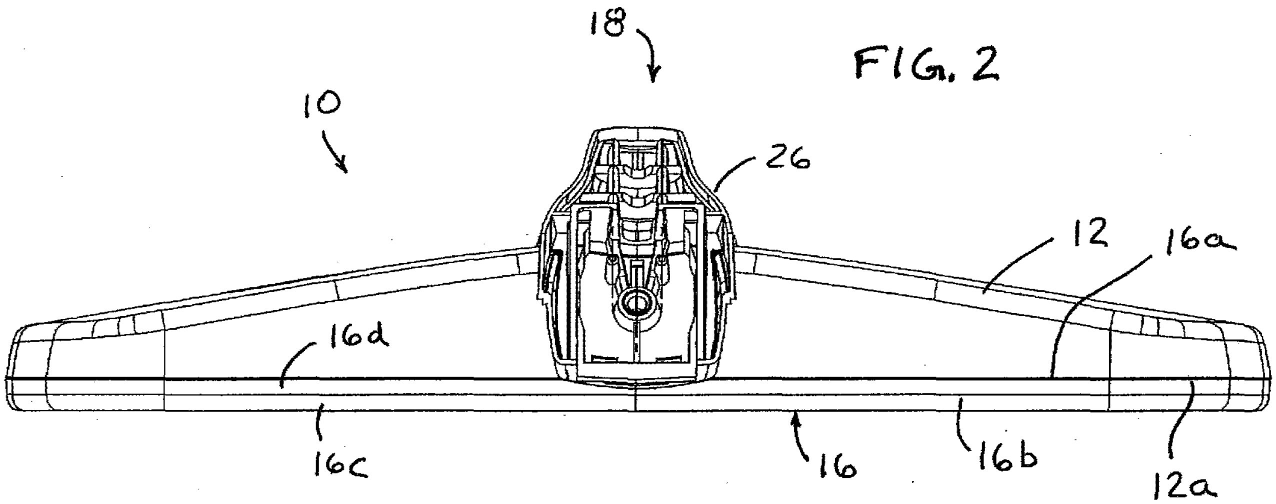


FIG. 2

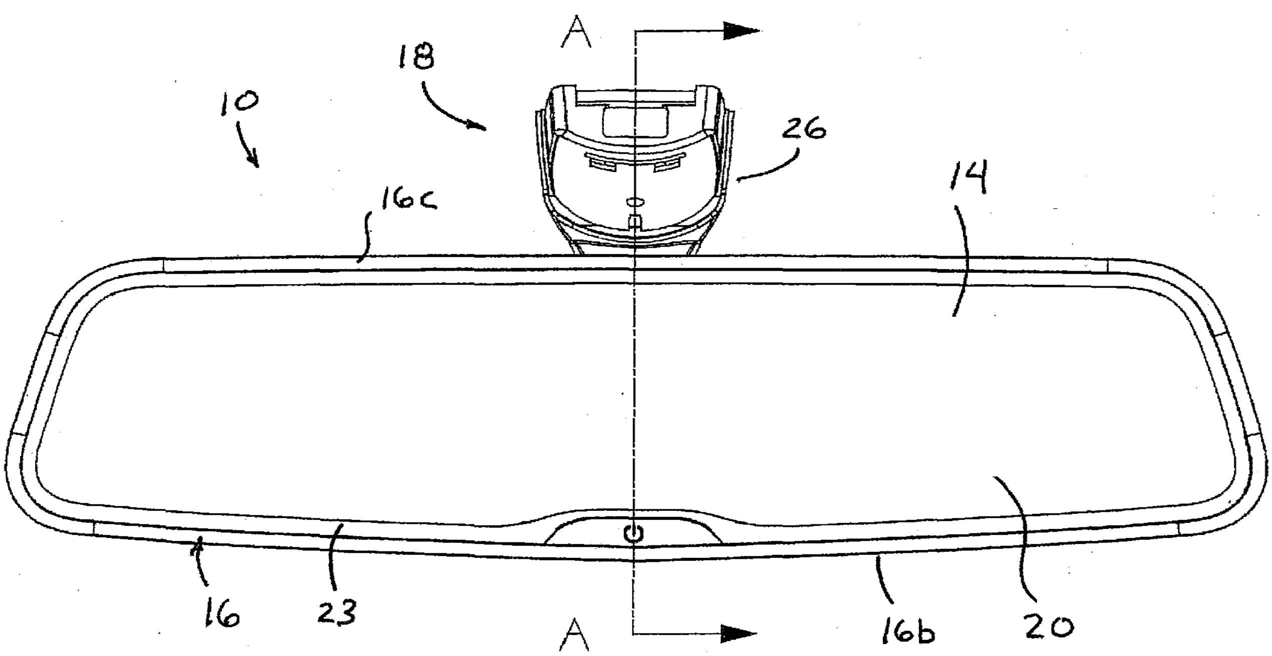


FIG. 1

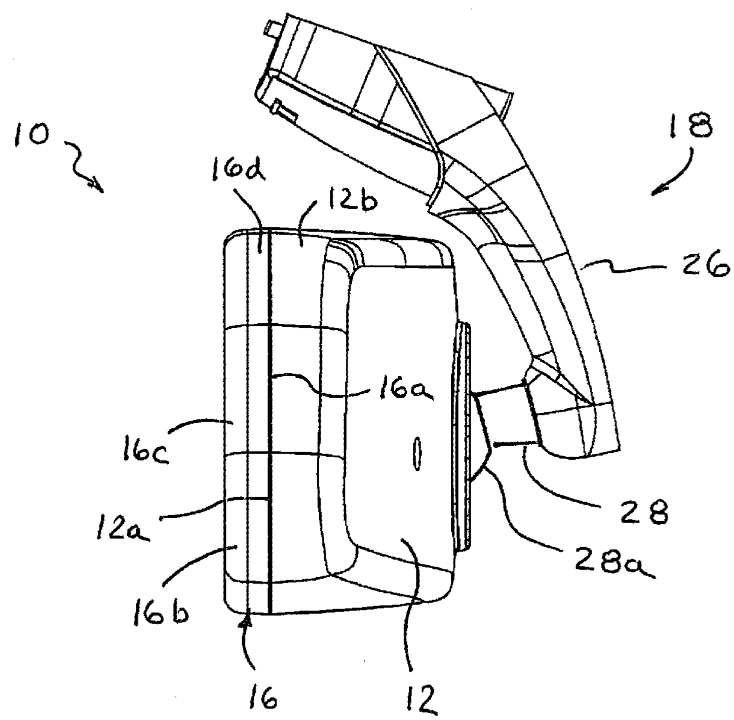
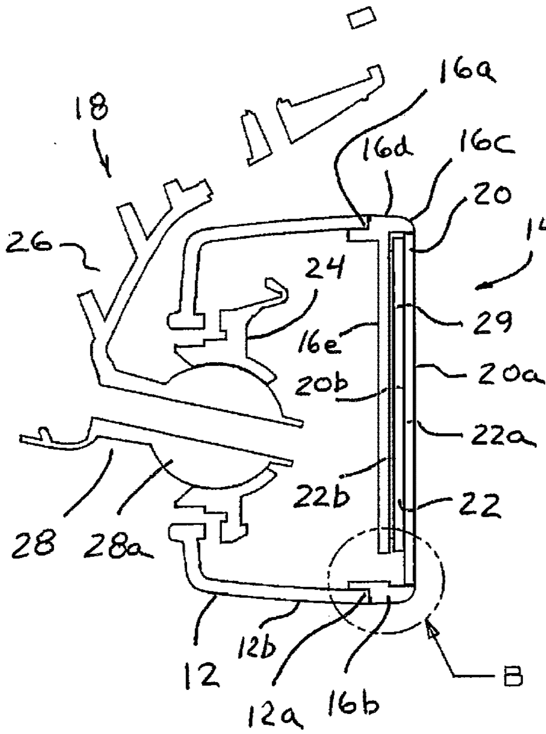


FIG. 3

FIG. 4


18
26
24
16a
16d
16c
20
14
29
16e
20a
20b
22a
22b
22
28
28a
12
12b
12a
16b
B

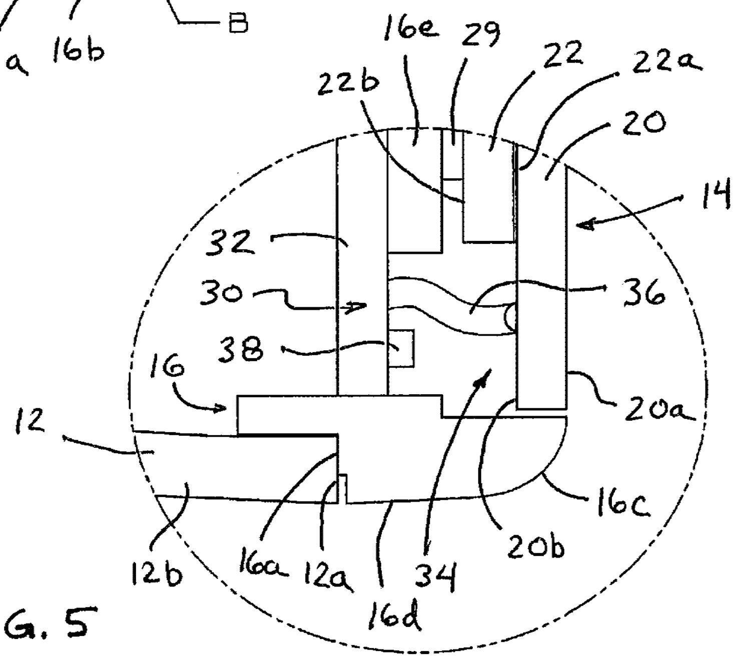
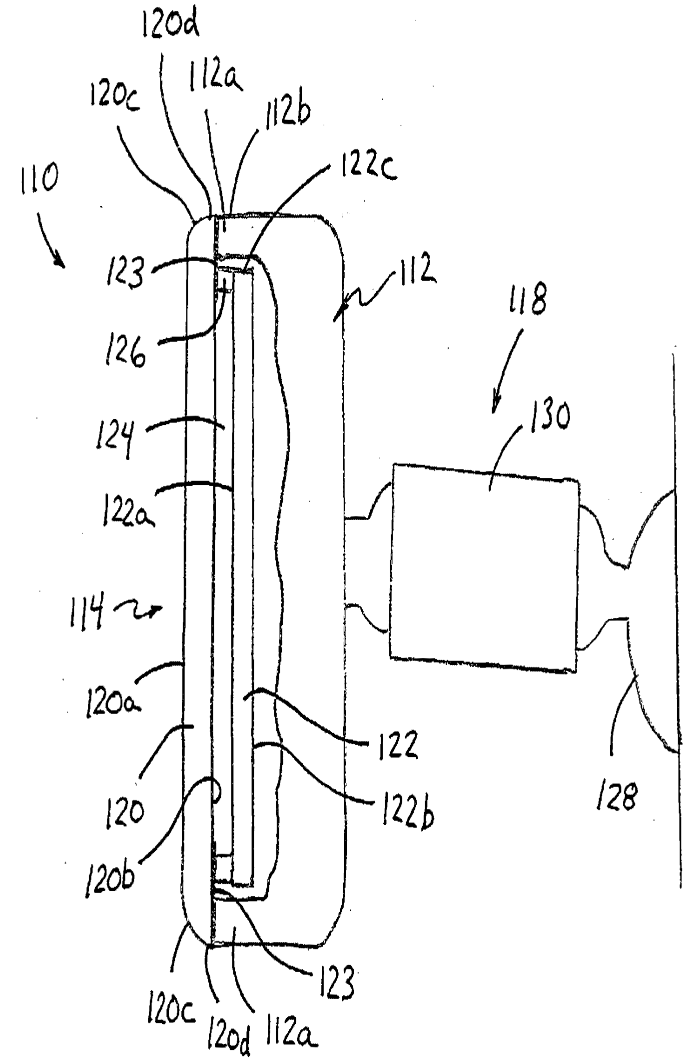

16e
29
22
22a
22b
20
14
32
30
36
38
16
12
20a
16c
12b
16a
12a
16d
34
20b

FIG. 5



110
120d
120c
112a
112b
122c
123
126
112
118
124
122a
130
114
120a
122
120
122b
128
120b
123
120c
120d
112a

FIG. 6

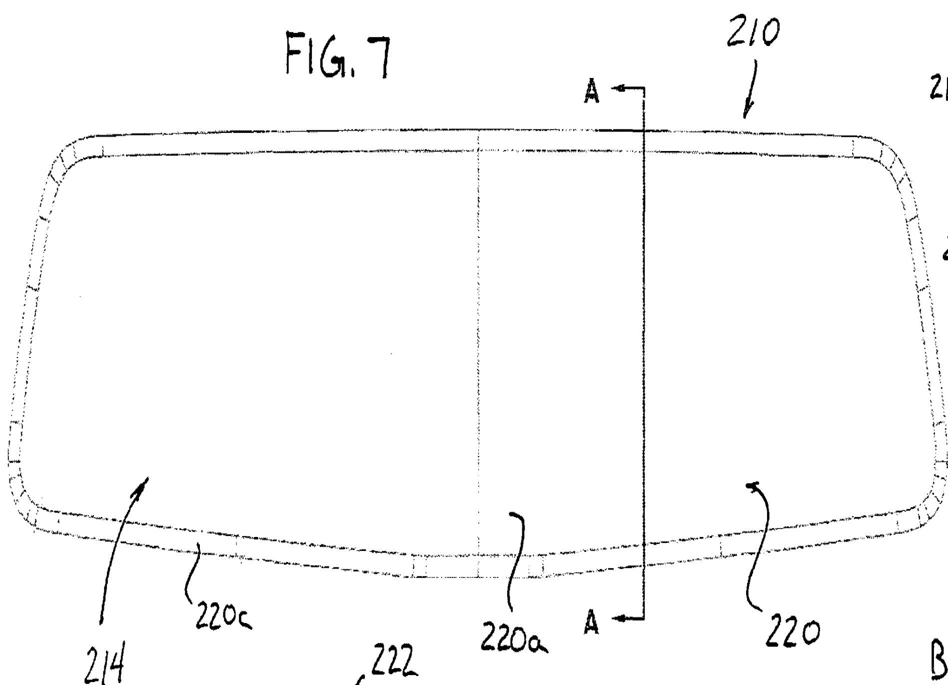


FIG. 7

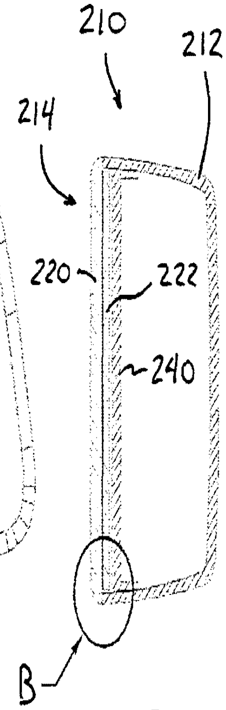


FIG. 7A

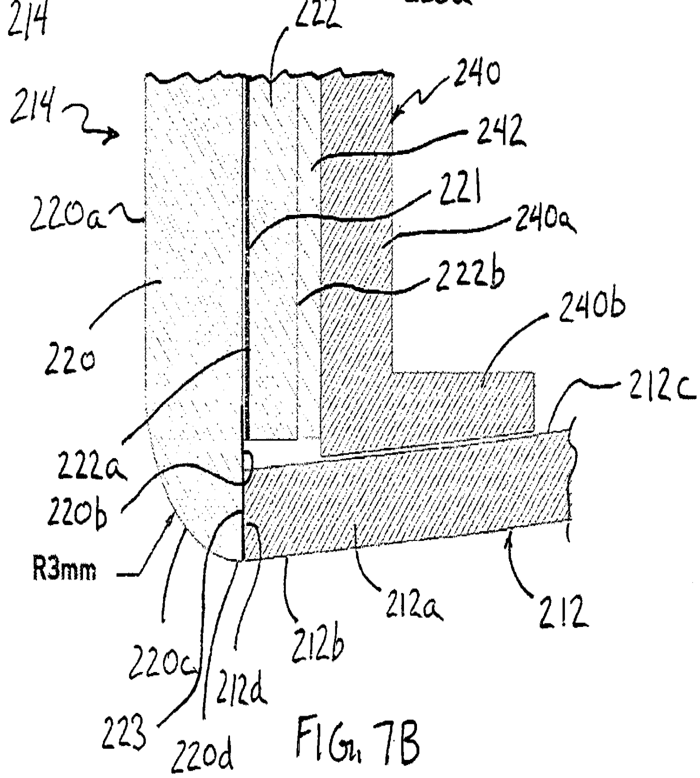


FIG. 7B

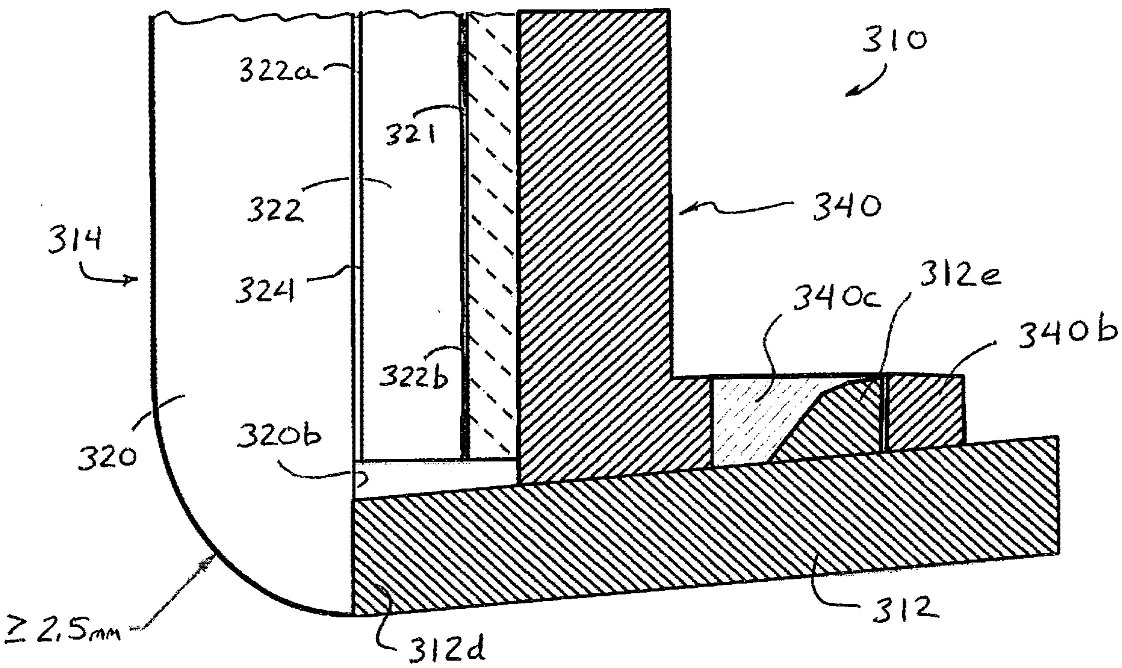

310
322a
321
322
340
314
324
340c
312e
340b
322b
320b
320
≥ 2.5mm
312
312d

FIG. 8A

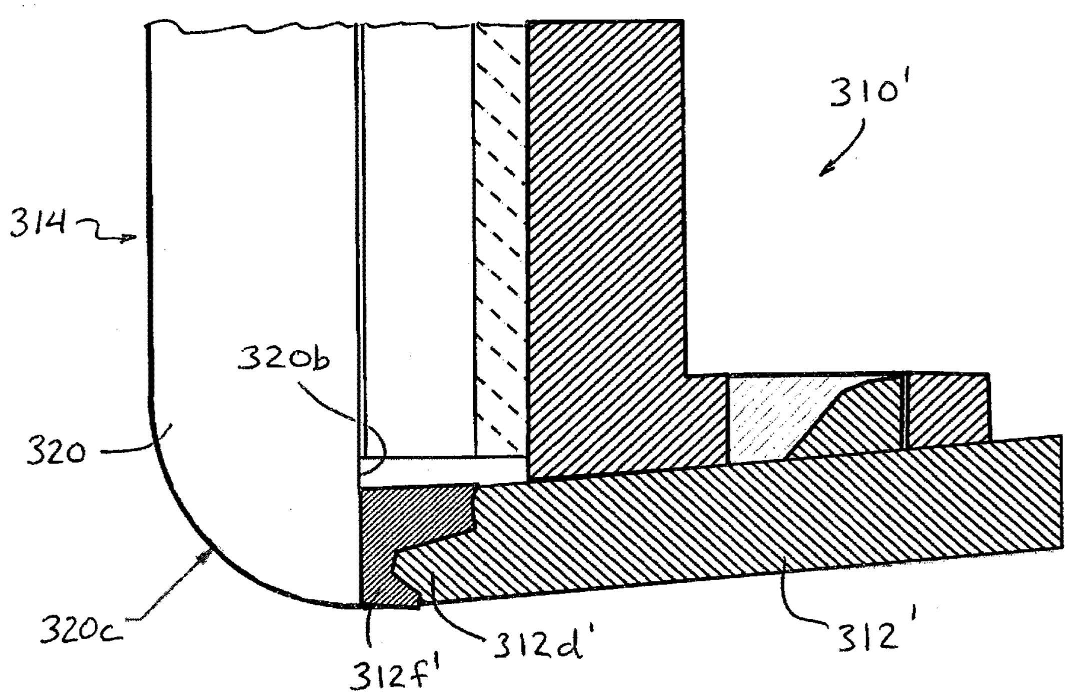

310'
314
320b
320
320c
312f'
312d'
312'

FIG. 8B

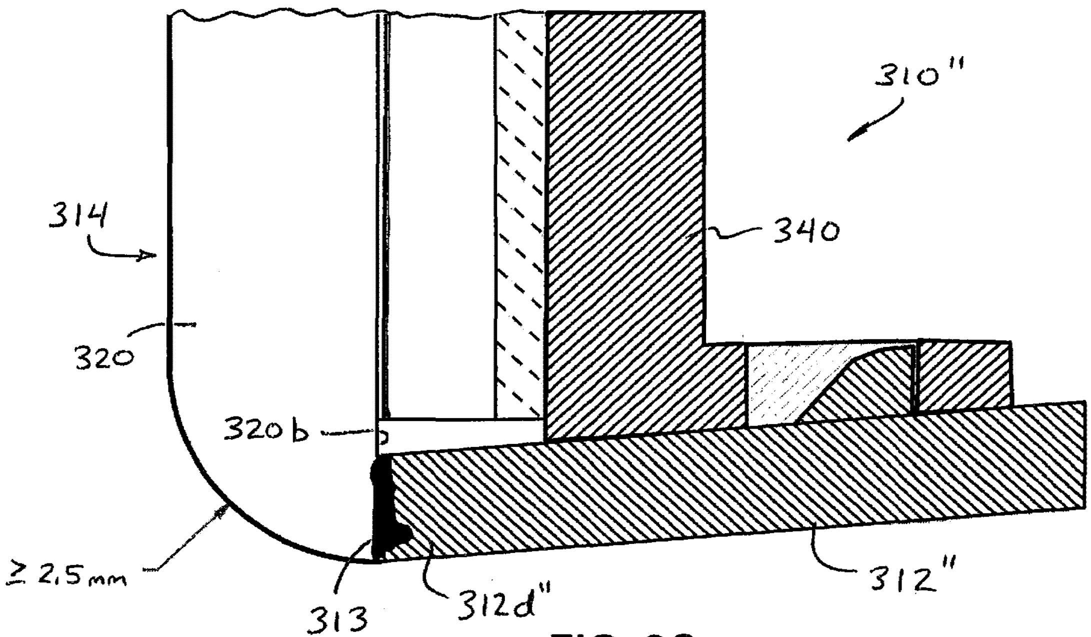

310"
314
340
320
320b
≥ 2.5mm
313
312d"
312"

FIG. 8C

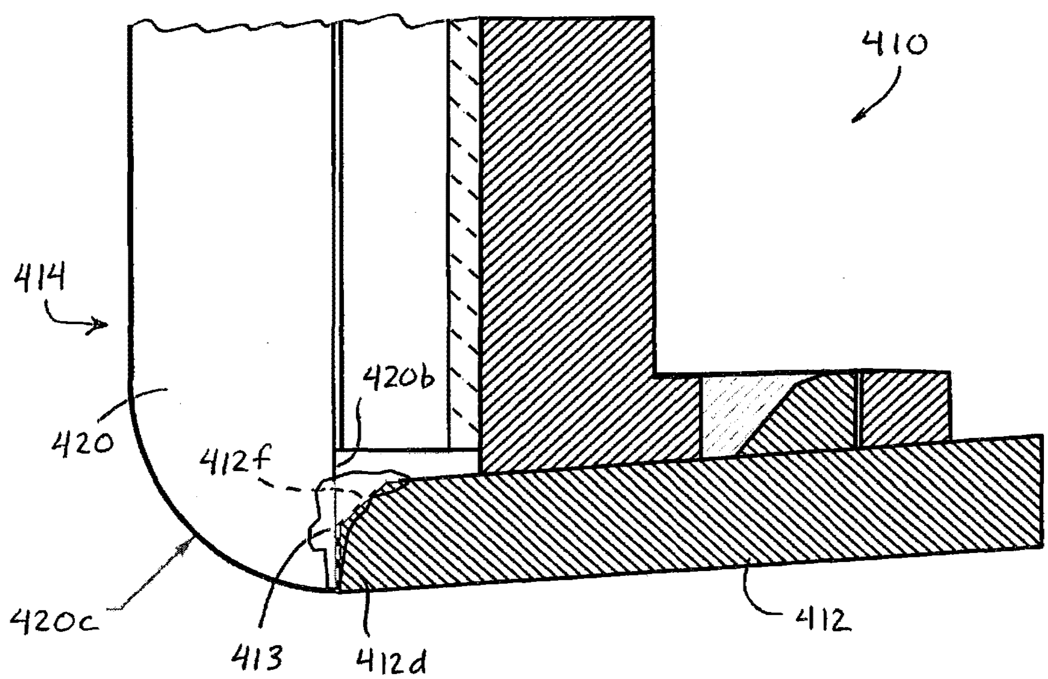

410
414
420b
420
412f
420c
413
412d
412

FIG. 8D

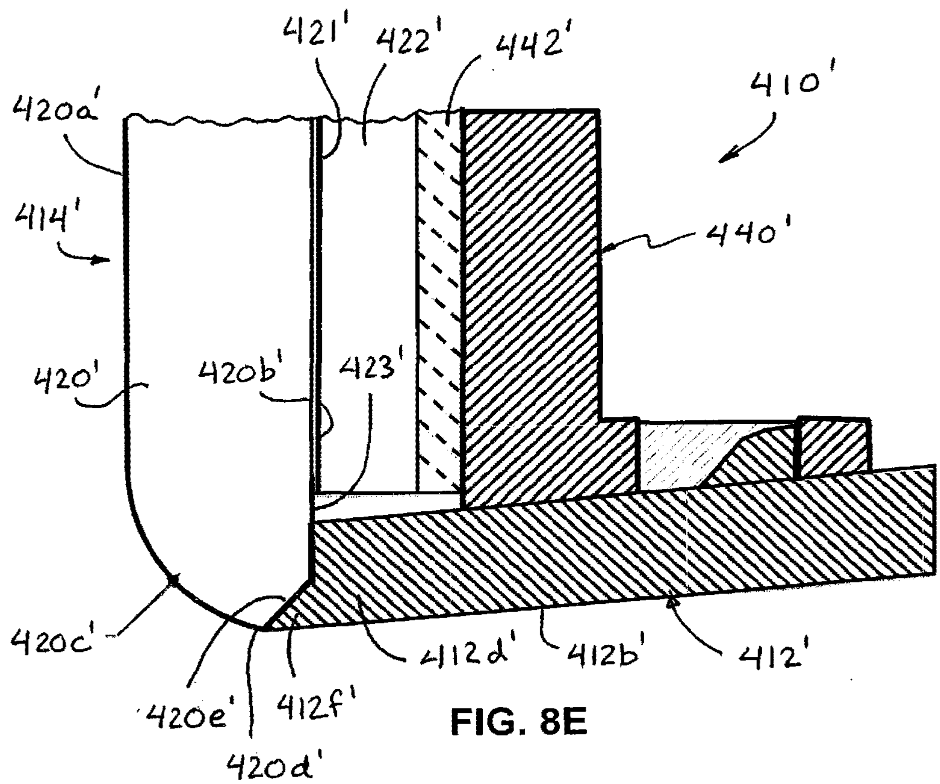

421'
422'
442'
410'
420a'
414'
440'
420'
420b'
423'
420c'
412d'
412b'
412'
420e'
412f'
420d'

FIG. 8E

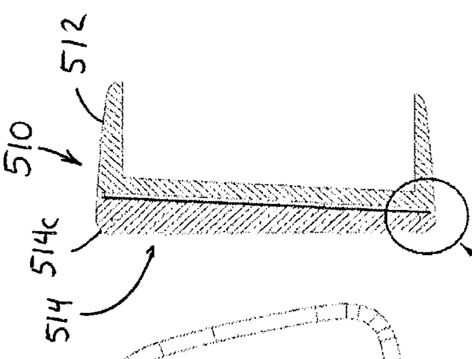


FIG. 9A

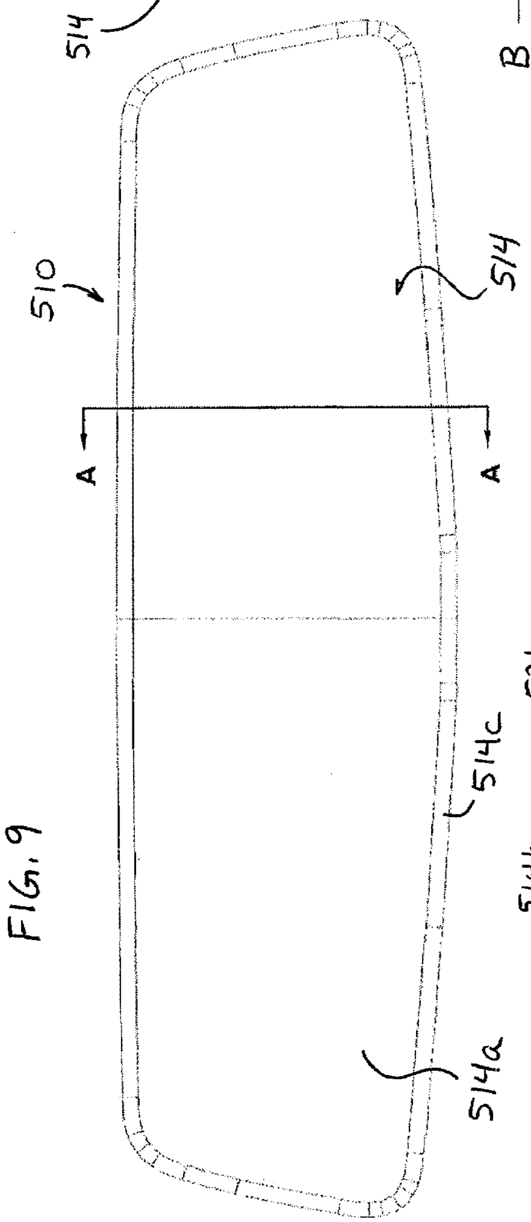


FIG. 9

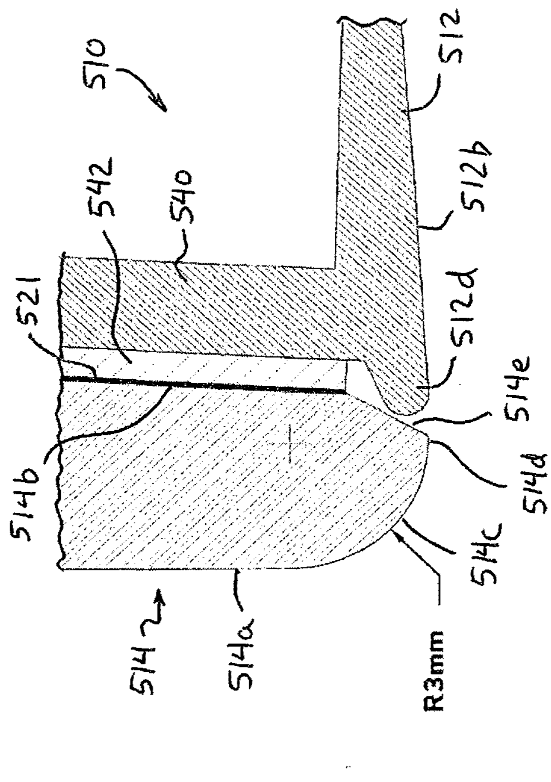


FIG. 9B

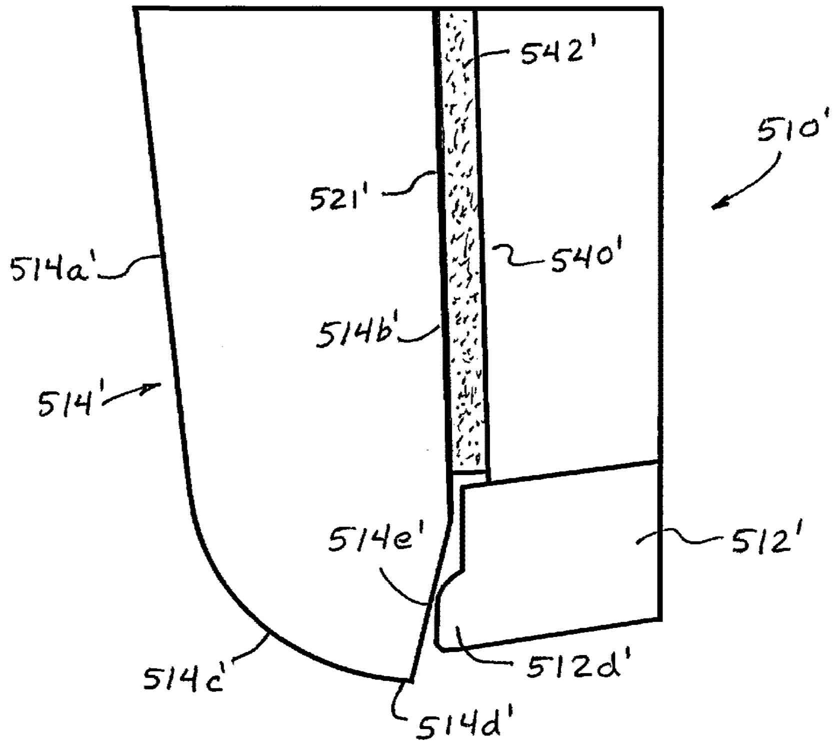


FIG. 10A

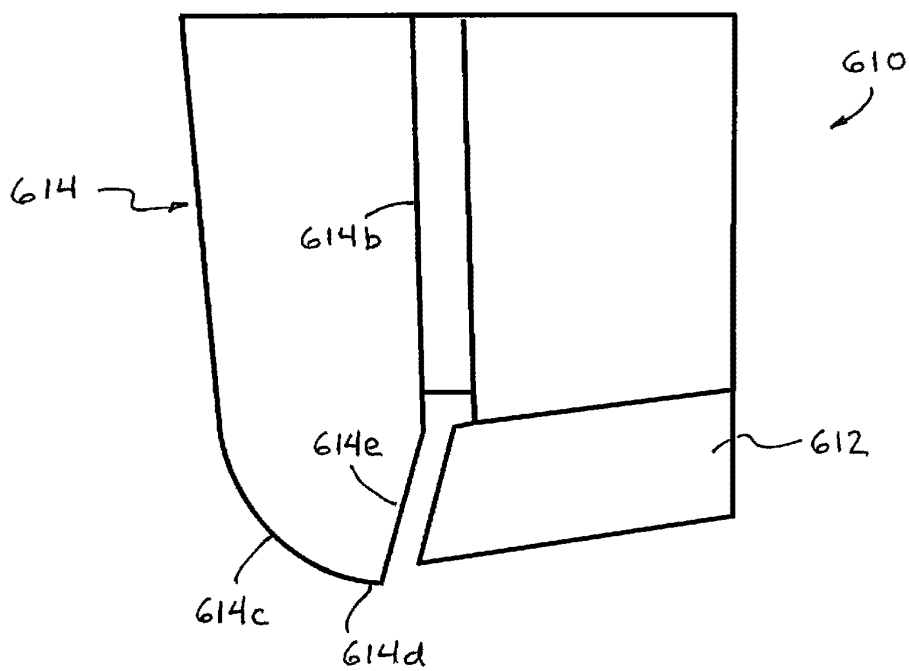


FIG. 10B

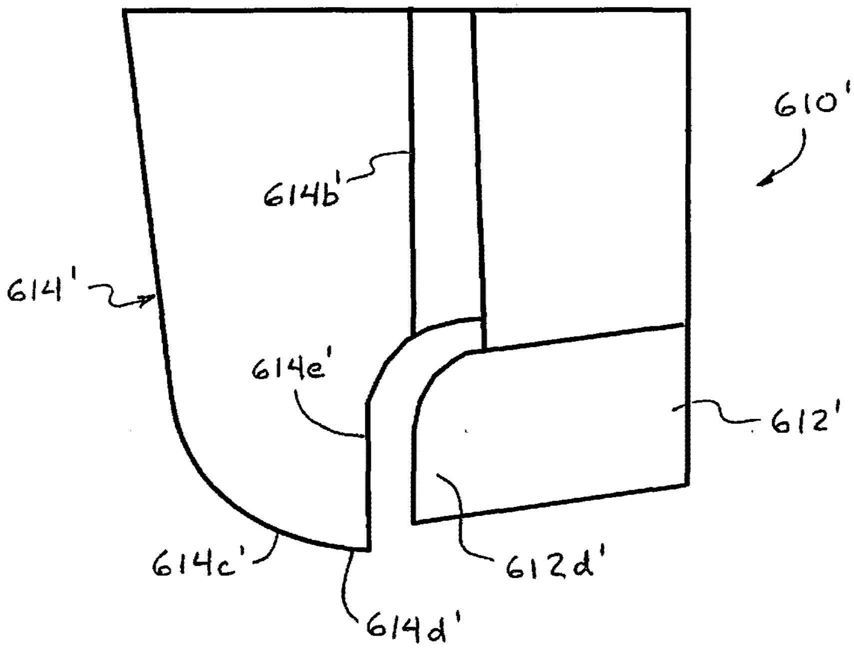


FIG. 10C

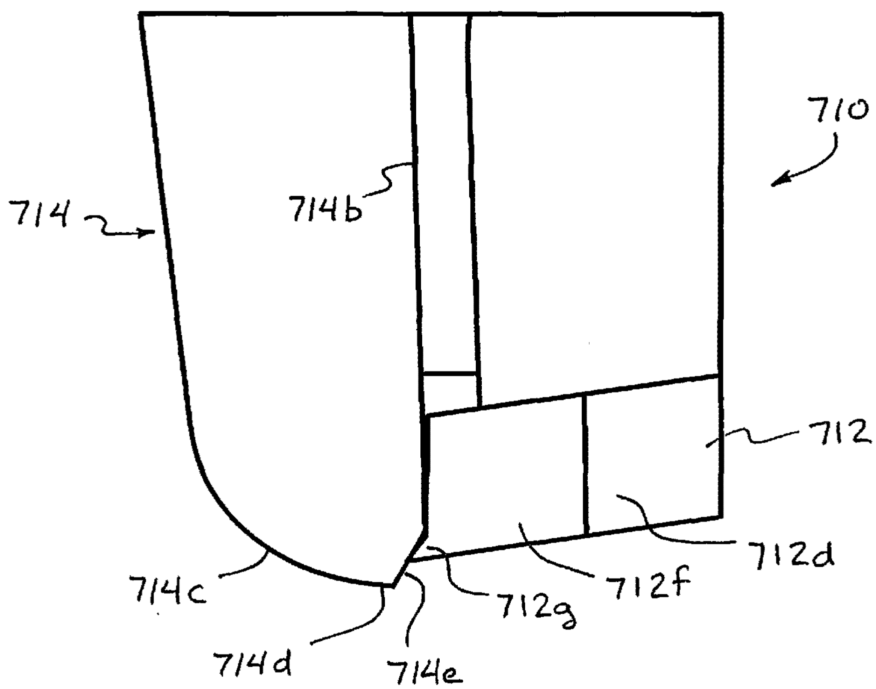


FIG. 10D

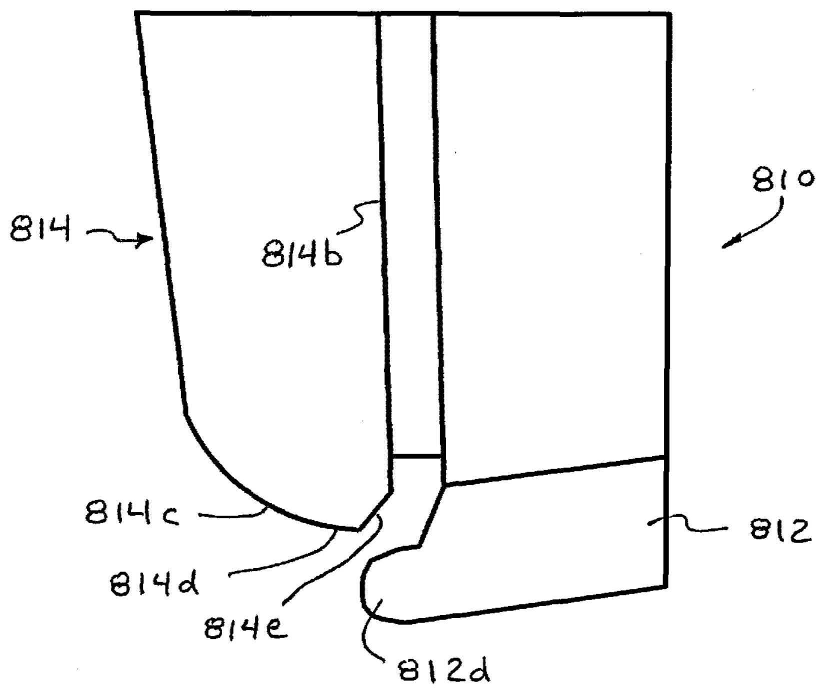


FIG. 10E

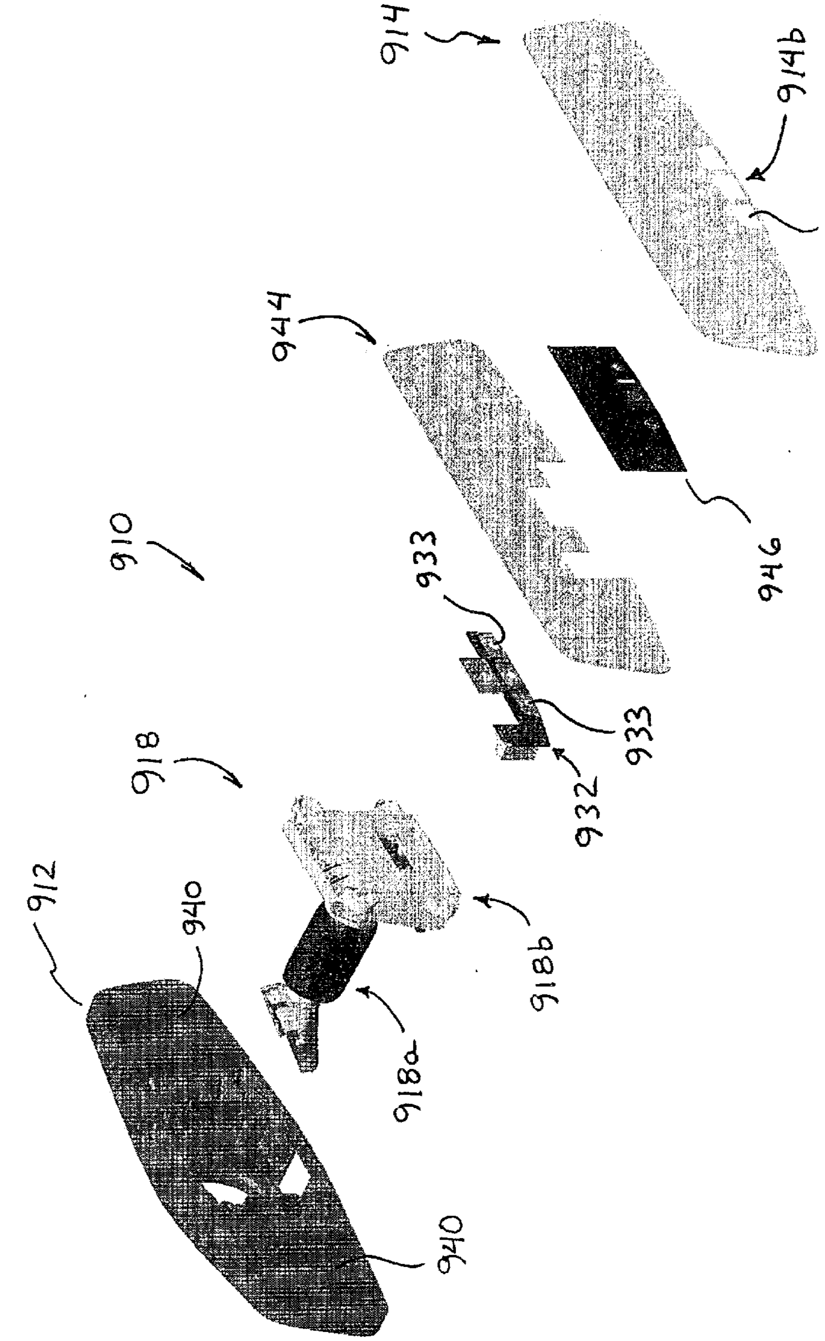


FIG. 11

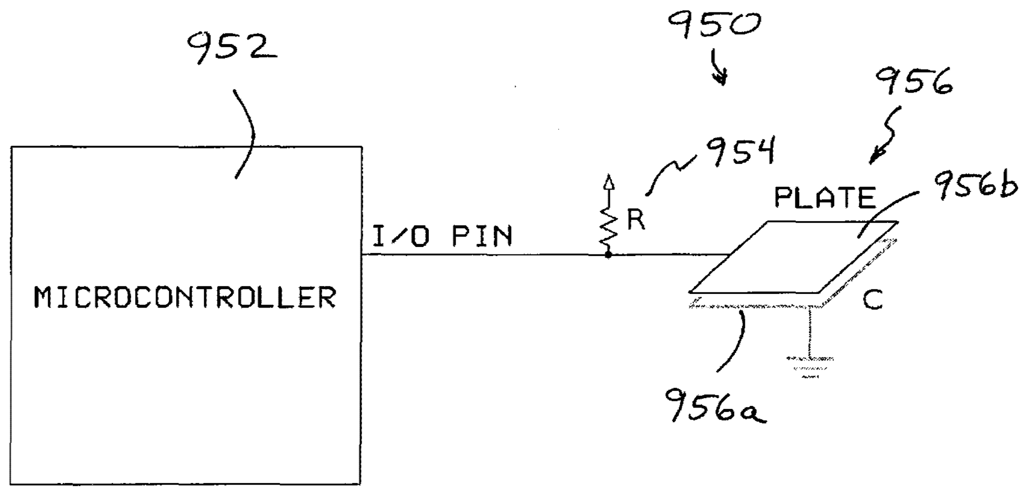


FIG. 12

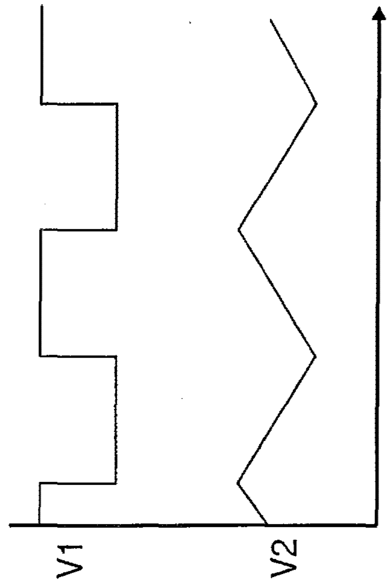

V1
V2
t

FIG. 14

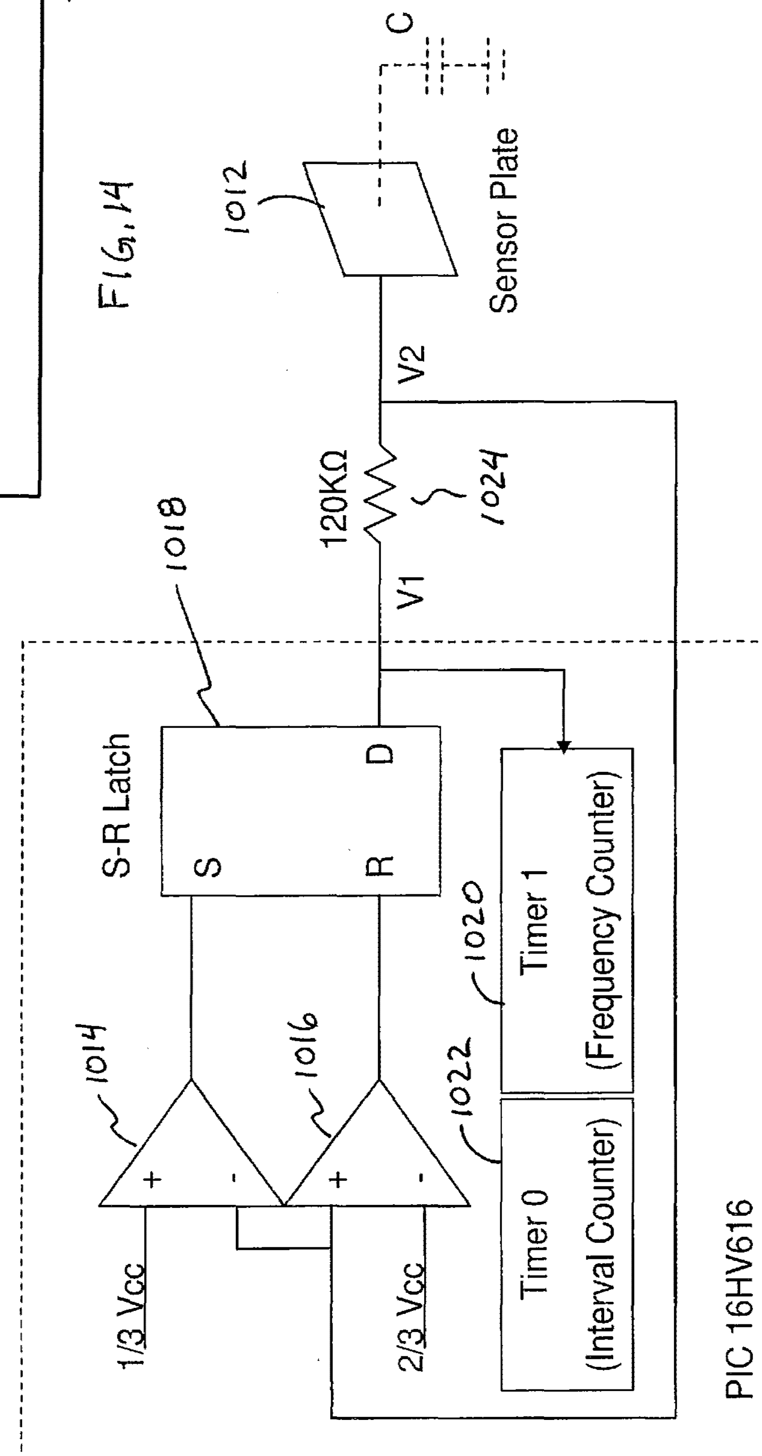

1010
1014
1016
1/3 Vcc
2/3 Vcc
S-R Latch
S
R
D
1018
1022
1020
Timer 0
(Interval Counter)
Timer 1
(Frequency Counter)
PIC 16HV616
V1
120KΩ
1024
V2
1012
Sensor Plate
C

FIG. 13

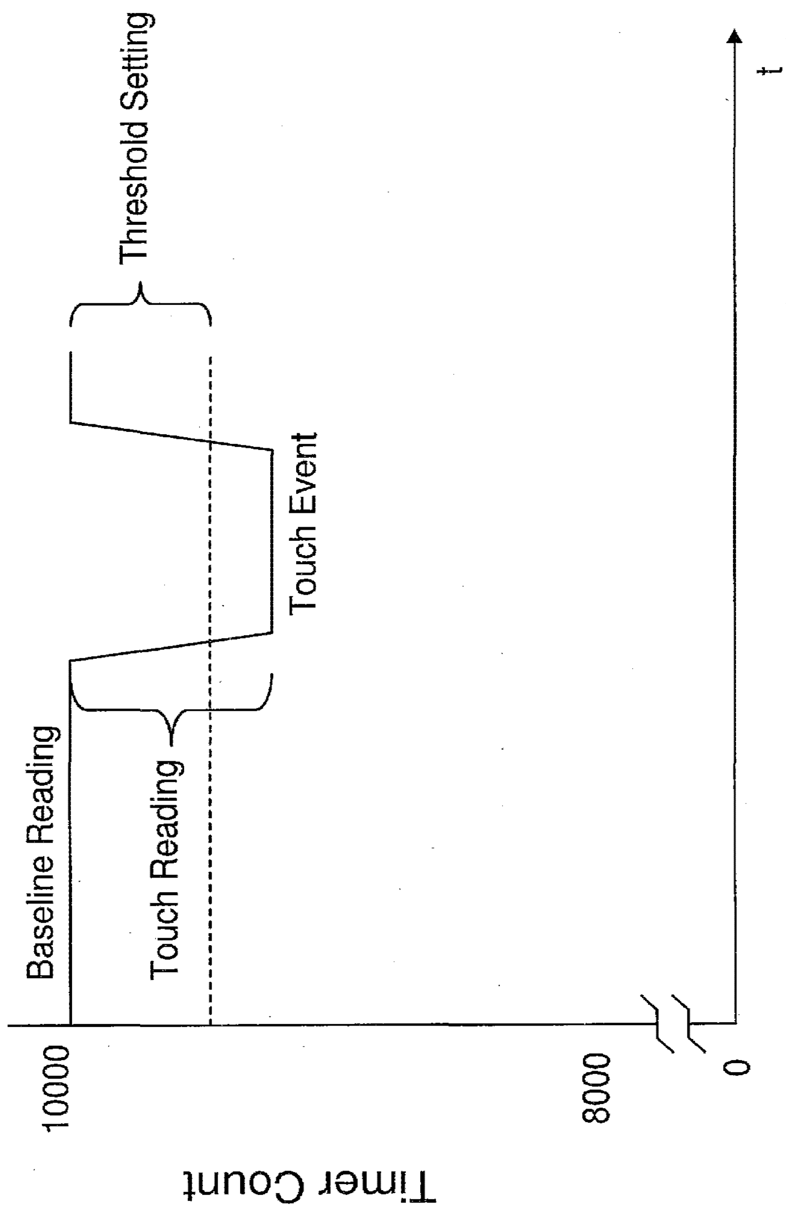

Threshold Setting
Touch Event
Baseline Reading
Touch Reading
10000
8000
0
t
Timer Count

FIG. 15

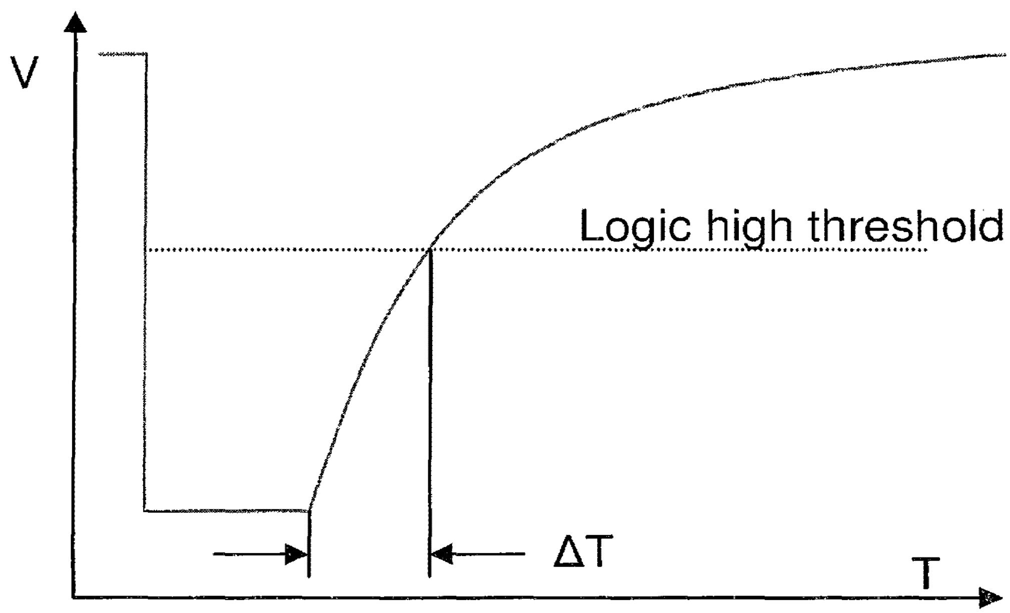


FIG. 16

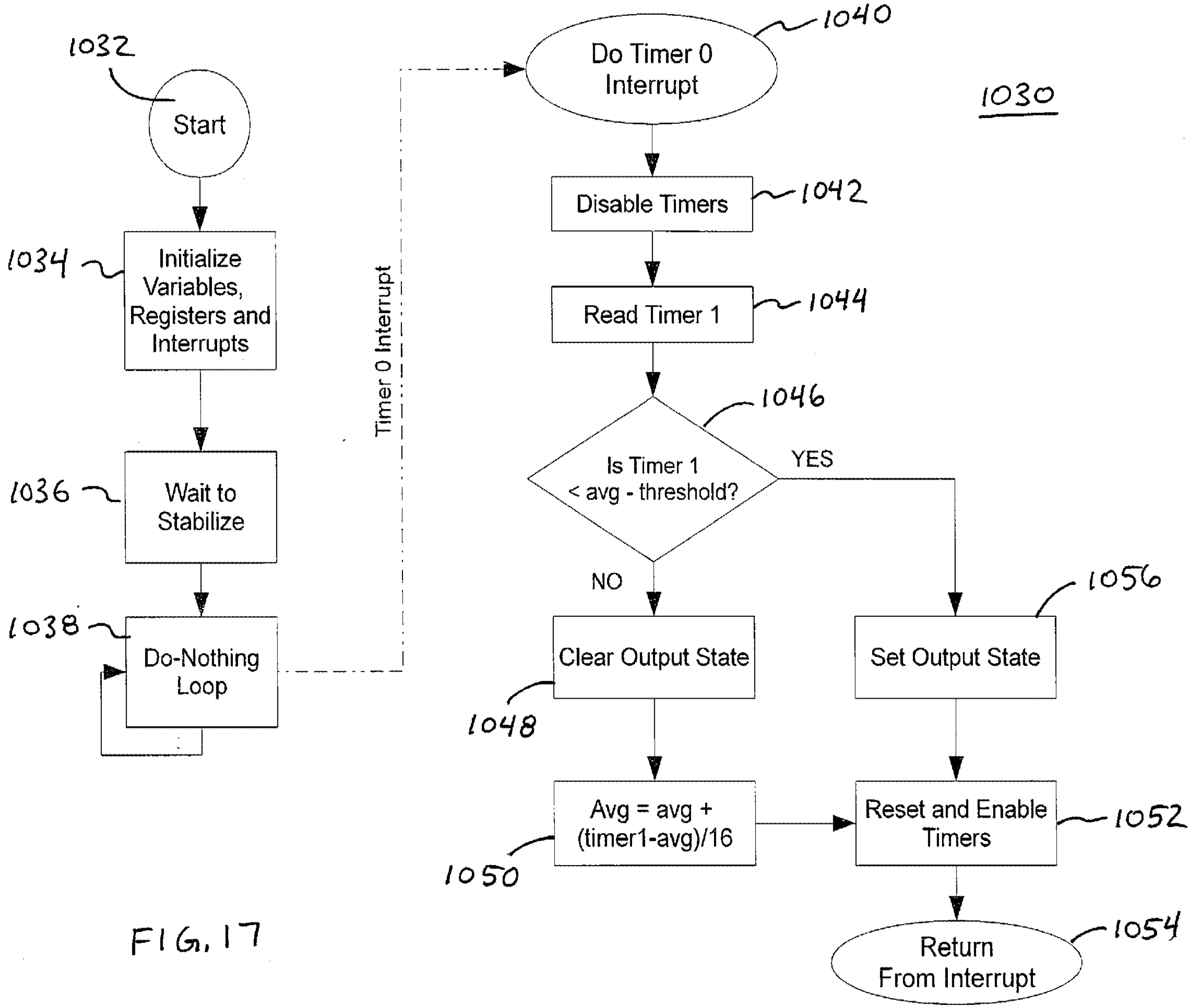

1030
1032
Start
1034
Initialize Variables, Registers and Interrupts
1036
Wait to Stabilize
1038
Do-Nothing Loop
Timer 0 Interrupt
1040
Do Timer 0 Interrupt
1042
Disable Timers
1044
Read Timer 1
1046
Is Timer 1 < avg - threshold?
YES
NO
1048
Clear Output State
1056
Set Output State
1050
Avg = avg + (timer1-avg)/16
1052
Reset and Enable Timers
1054
Return From Interrupt

FIG. 17

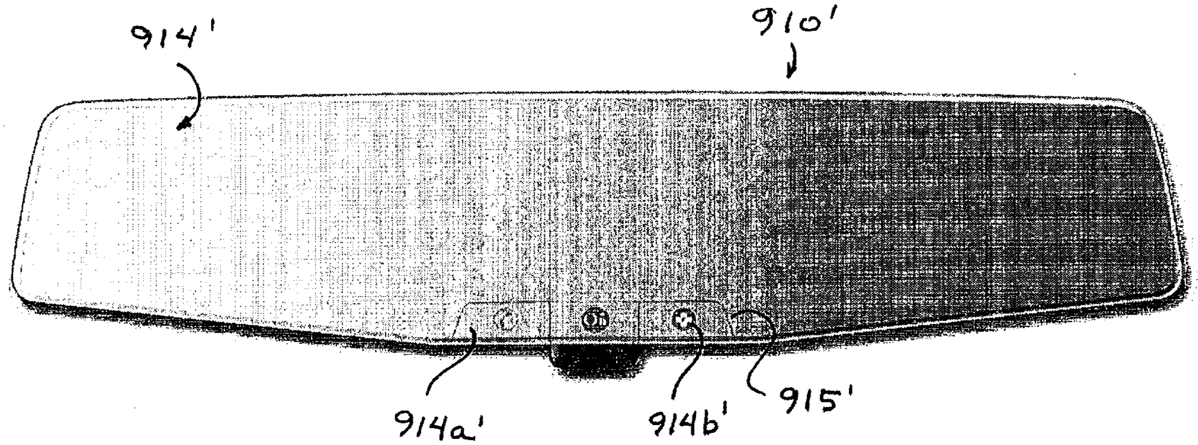


FIG. 18

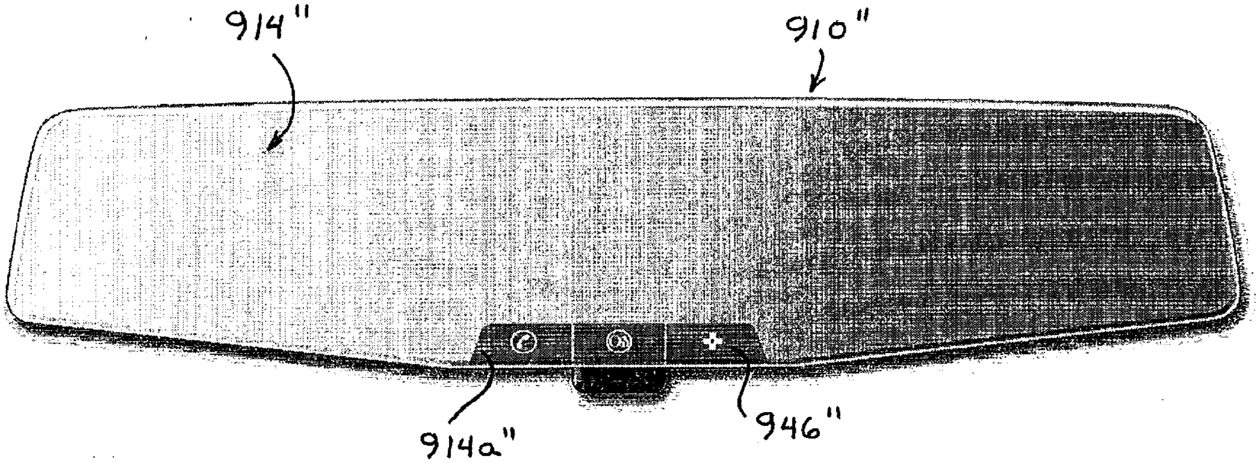


FIG. 19

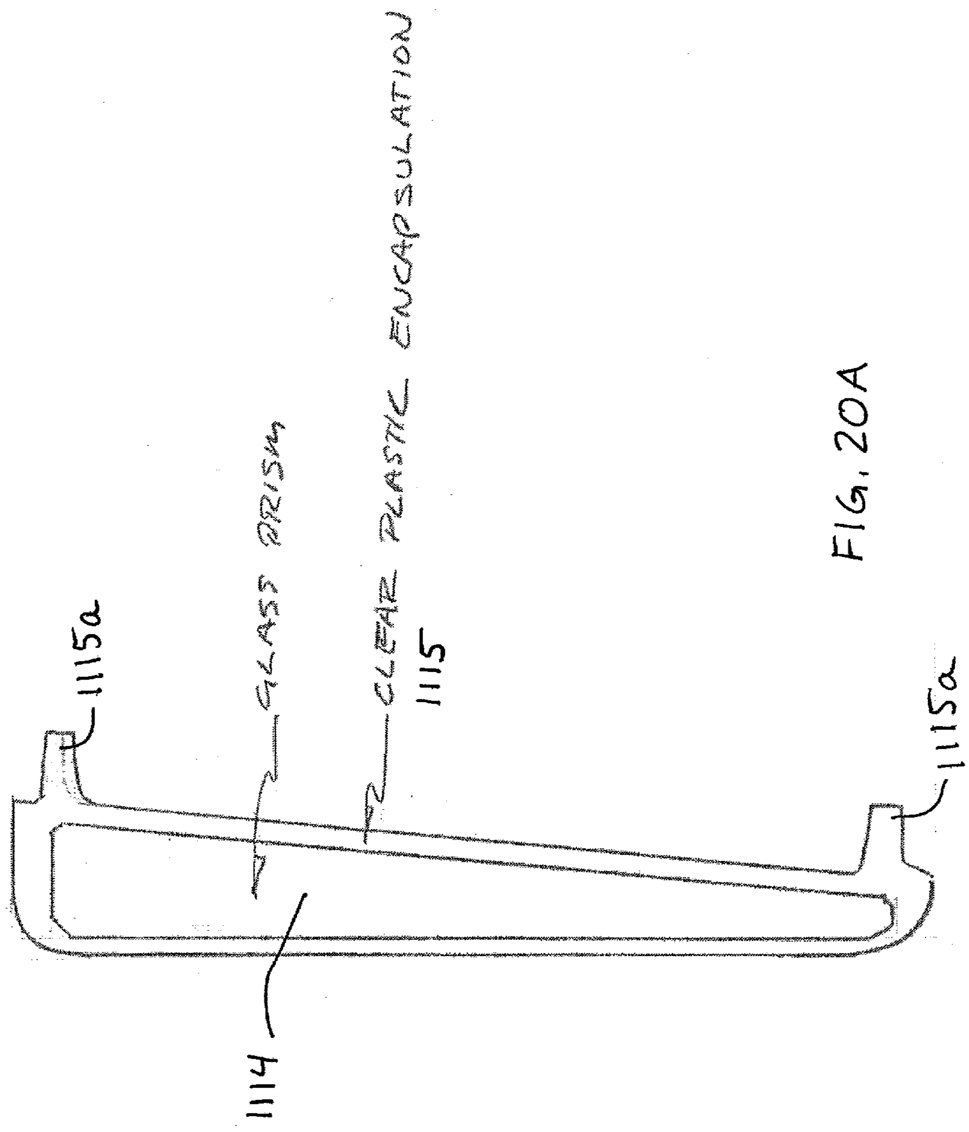

1115a
GLASS PRISM
CLEAR PLASTIC ENCAPSULATION
1115
1115a
1114

FIG. 20A

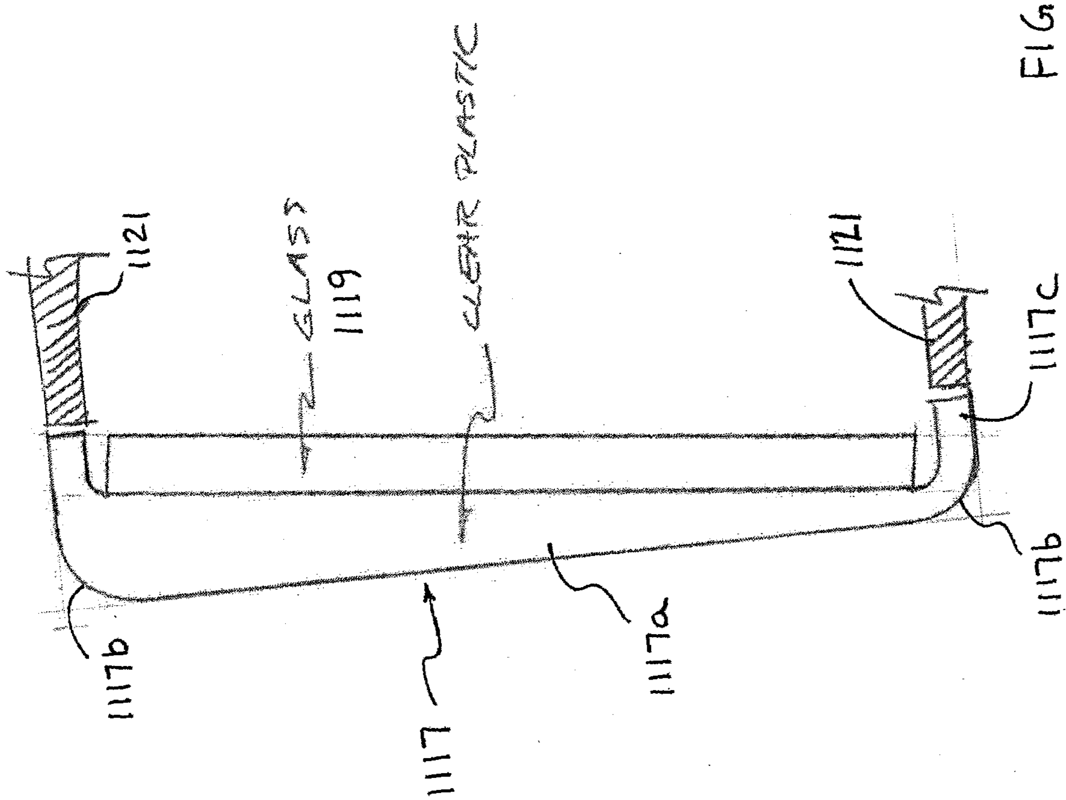

1121
GLASS
1119
CLEAR PLASTIC
1121
1117c
1117b
1117a
1117
1117b

FIG. 20B

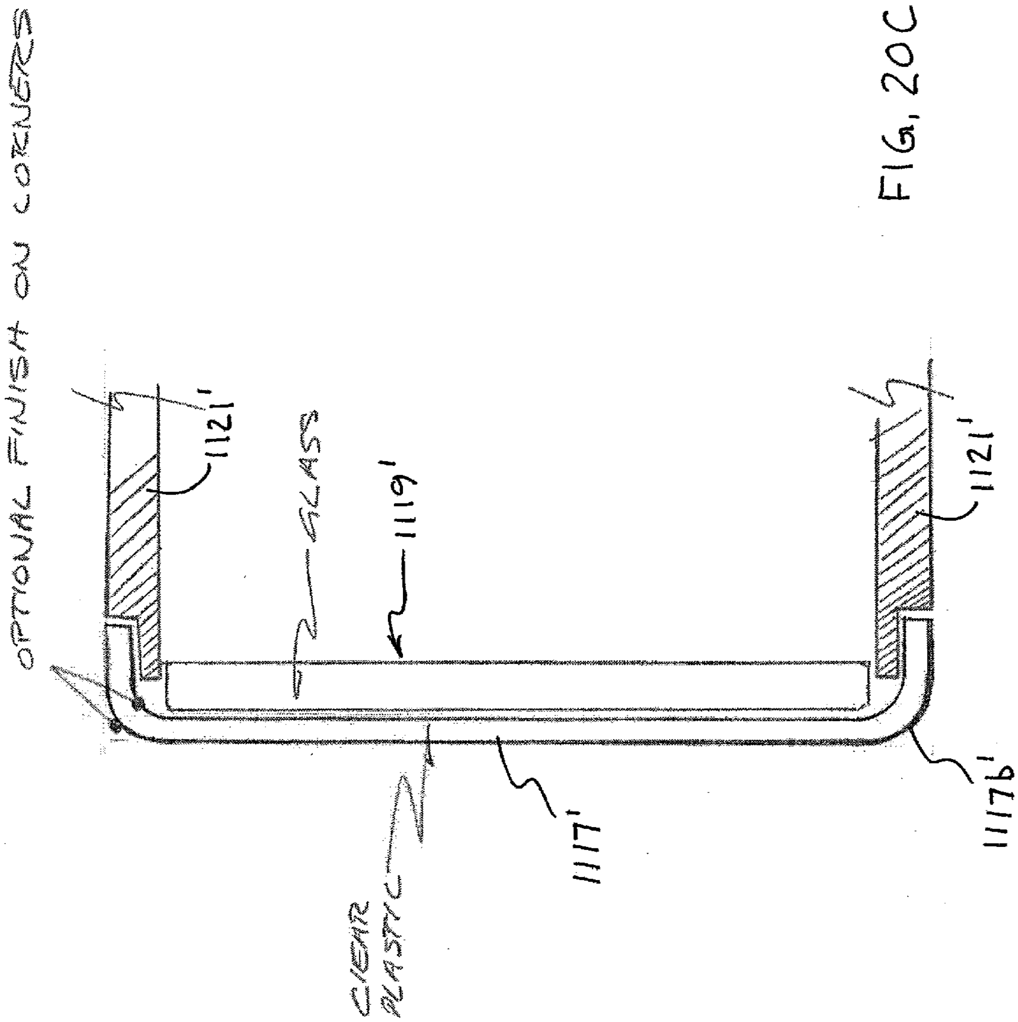
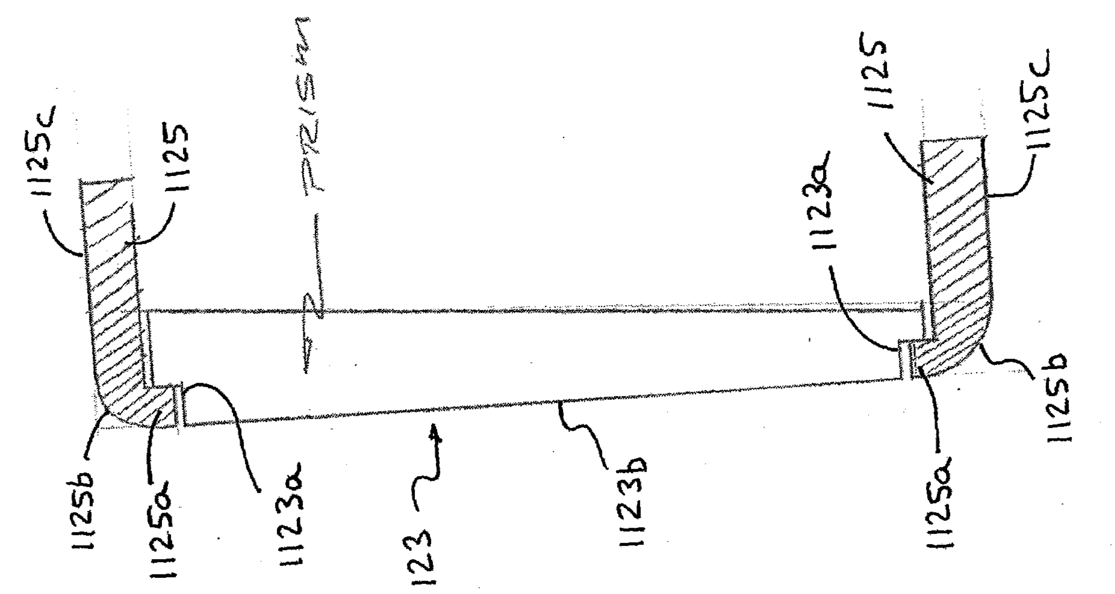

OPTIONAL FINISH ON CORNERS
1121'
GLASS
1119'
1121'
1117'
1117b'
CLEAR PLASTIC

FIG. 20C

FIG. 20D


1125c
1125
PRISM
1123a
1125
1125c
1125b
1125a
1123a
1123
1123b
1125a
1125b

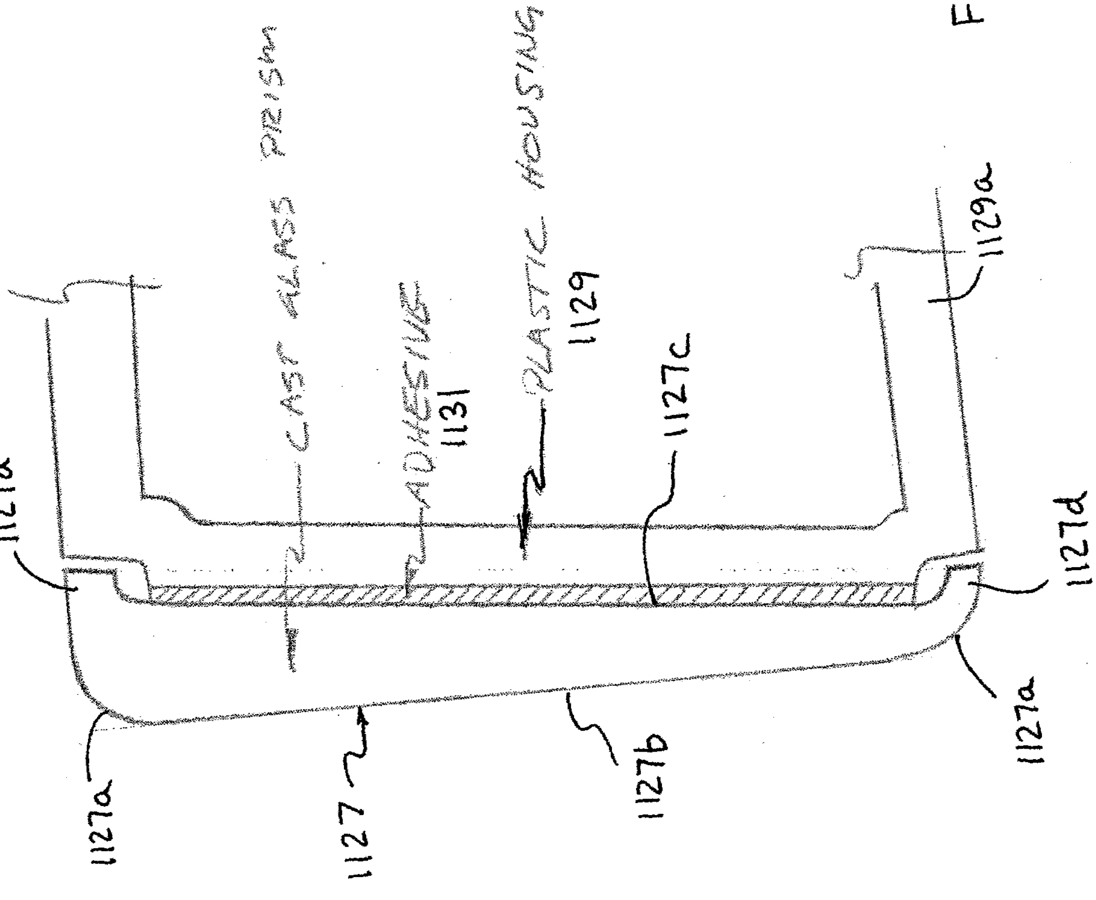

CAST GLASS PRISM
ADHESIVE
1131
PLASTIC HOUSING
1129
1127c
1129a
1127d
1127d
1127a
1127
1127b
1127a

FIG. 20E

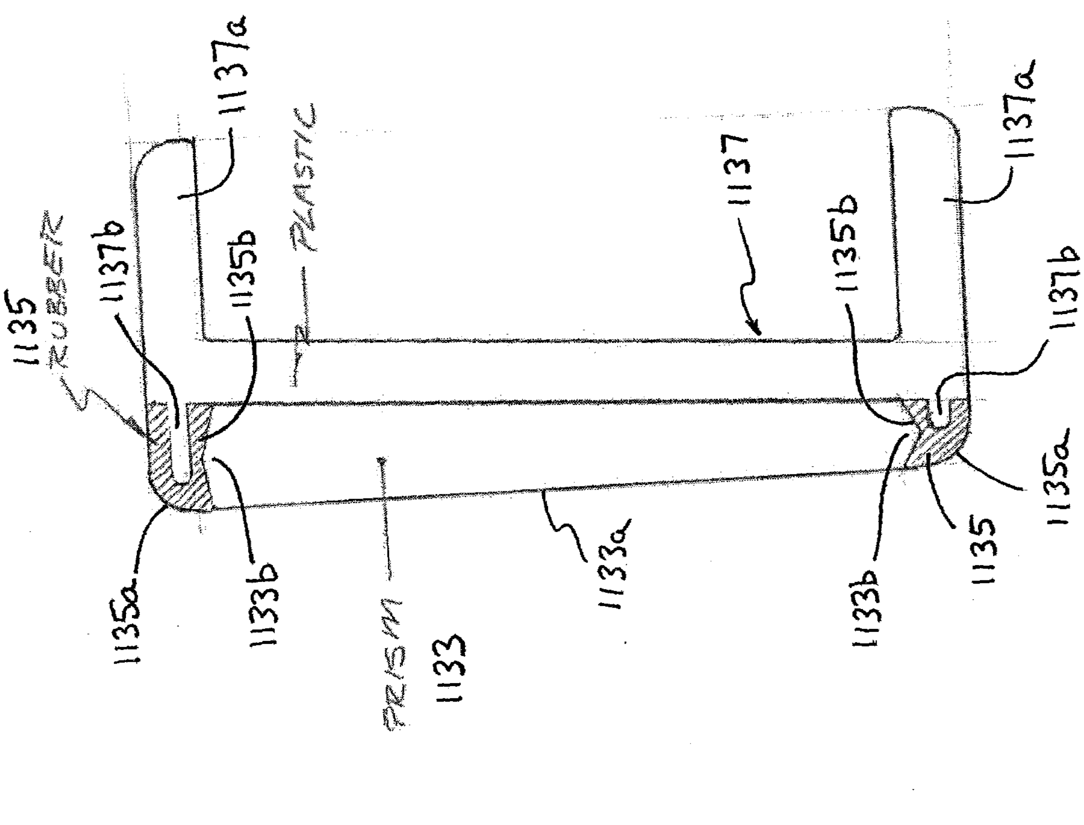

1135
RUBBER
1137b
1135b
PLASTIC
1137a
1137
1135b
1137a
1137b
1135a
1135
1133b
1133a
PRISM
1133
1135a
1133b

FIG. 20F

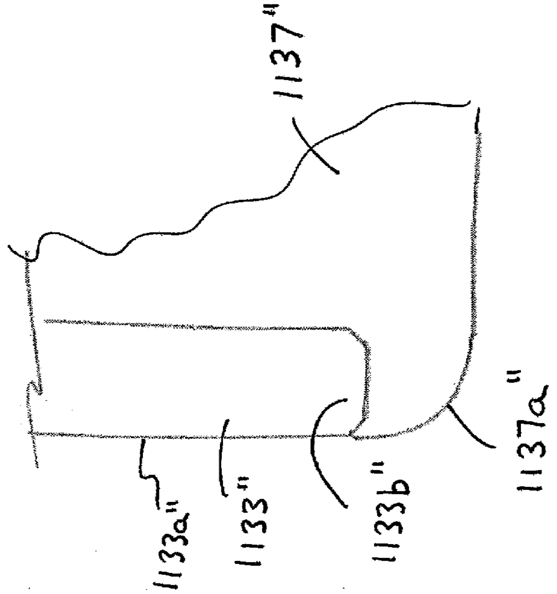


FIG. 20H

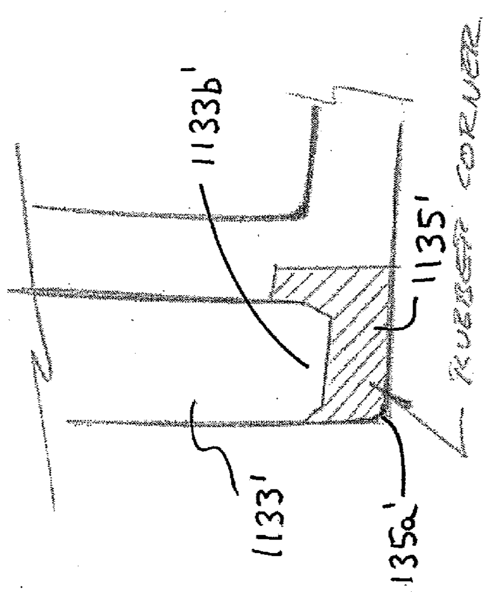


FIG. 20G

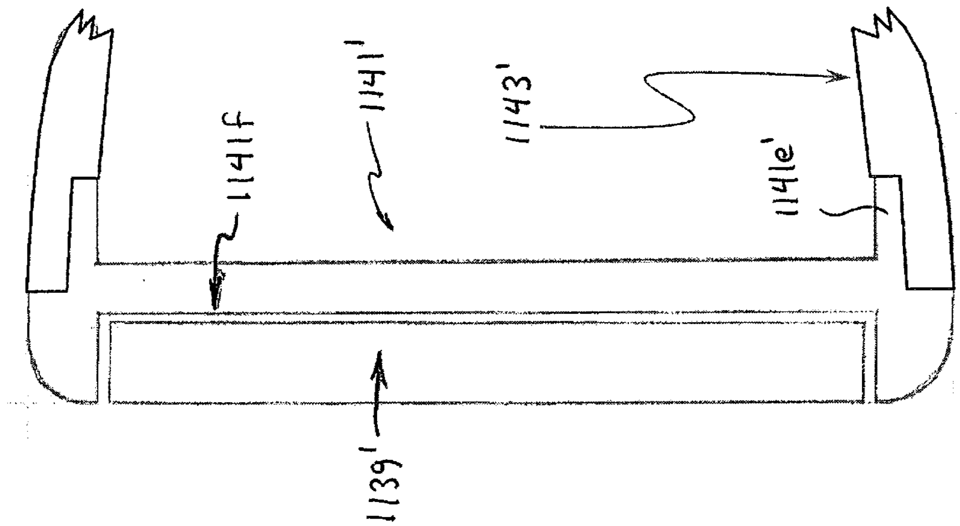


FIG. 20J

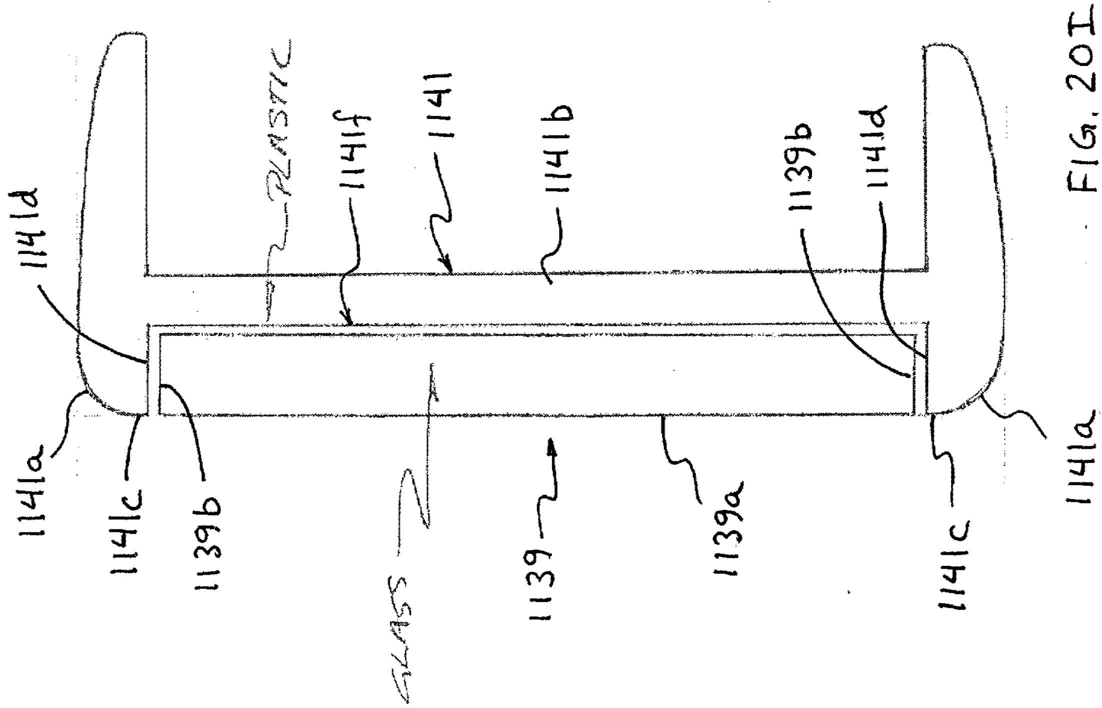


FIG. 20I

FIG. 20K

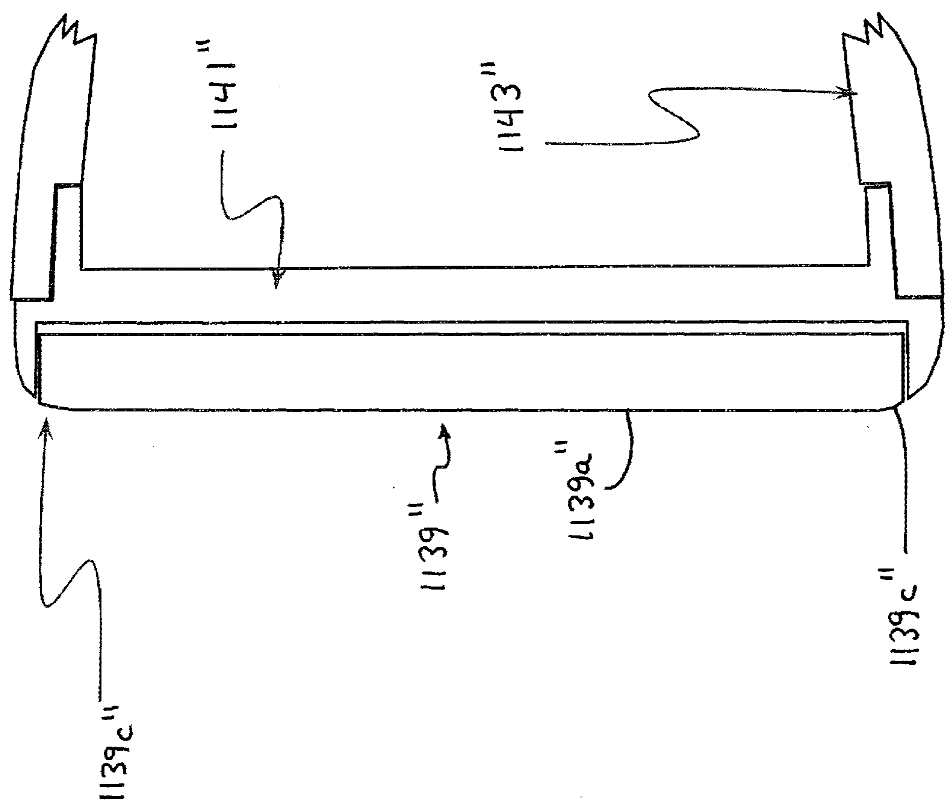
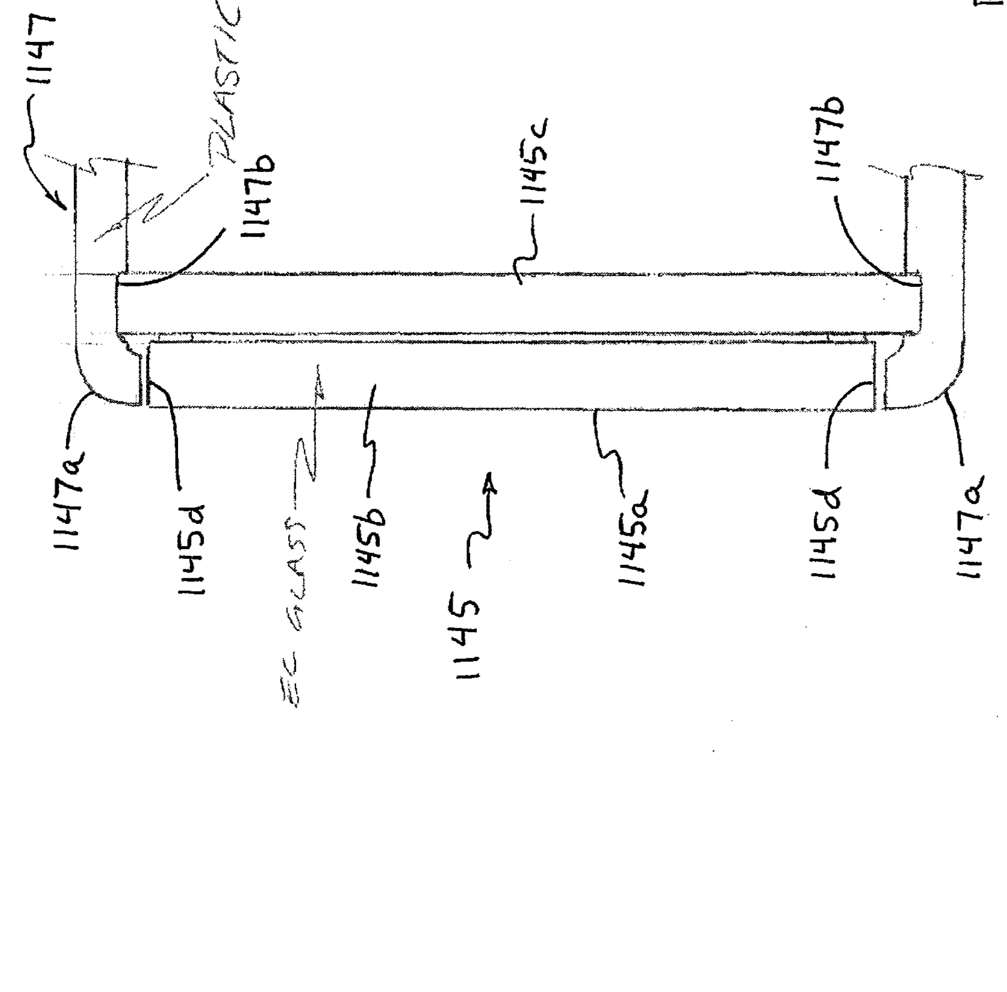


FIG. 20L


1147
PLASTIC
1147b
1145c
1147b
1147a
1145d
EC GLASS
1145b
1145
1145a
1145d
1147a

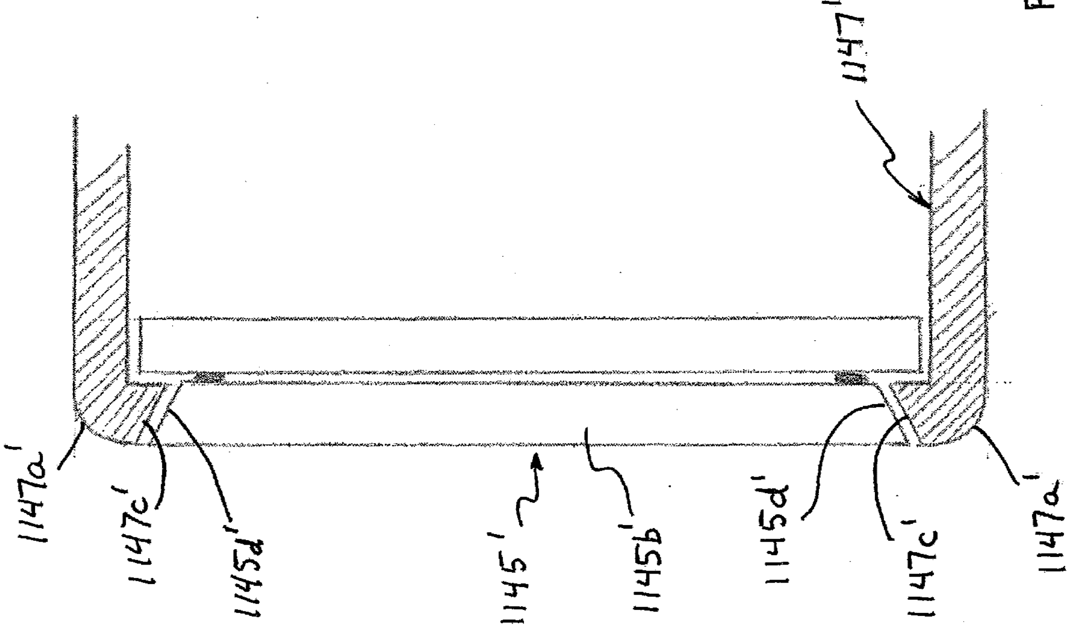


FIG. 20M

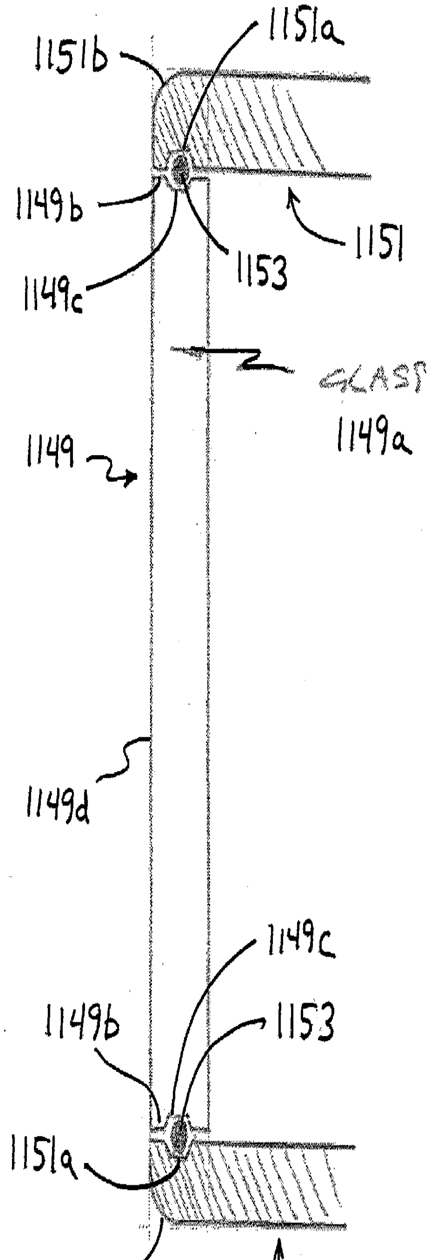

1151b
1151a
1149b
1153
1151
1149c
GLASS
1149a
1149
1149d
1149c
1149b
1153
1151a
1151b
1151

FIG. 20N

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2010/051741

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - B60R 1/08 (2010.01)
USPC - 359/604
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC(8) - B60R 1/02, 1/04, 1/08; G02B 5/08, 7/18, 7/182, 7/198 (2010.01)
USPC - 359/245, 265, 267, 604, 838, 843, 871, 872

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PatBase, MicroPatent, Google Patents, Google Scholar

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X ------- Y	US 2009/0237820 A1 (MCCABE et al) 24 September 2009 (24.09.2009) entire document	16, 17, 20, 21 ---- 1, 5-15, 22
Y	US 2002/0057494 A1 (LANG) 16 May 2002 (16.05.2002) entire document	1, 5-15
Y	US 4,530,571 A (CONNOR) 23 July 1985 (23.07.1985) entire document	1, 5-15, 22
A	US 2008/0180780 A1 (LAWLOR et al) 31 July 2008 (31.07.2008) entire document	1-22
A	US 7,570,413 B2 (TONAR et al) 04 August 2009 (04.08.2009) entire document	1-22
A	US 2002/0098461 A1 (CARDARELLI) 25 July 2002 (25.07.2002) entire document	1-22

☐ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
17 November 2010	26 NOV 2010
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (July 2009)

Espacenet

Bibliographic data: DE102008026039 (A1) — 2009-12-10

Rear view mirror for installing at window triangle of motor vehicle, has locking insert comprising mirror carrier-mounting structure, base-mounting structure and locking unit, where locking unit manually rotates carrier relative to base

Inventor(s): ROSENTHAL DIRK [DE] + (ROSENTHAL, DIRK)

Applicant(s): WILKE & CO METALLWARENFABRIK [DE] + (METALLWARENFABRIK WILKE GMBH & CO. KG, ; FICOSA INTERNATIONAL GMBH)

Classification: - international: ***B60R1/074; B60R1/076; B62D65/04; B62D65/16***
- cooperative: **B60R1/074; B60R1/076**

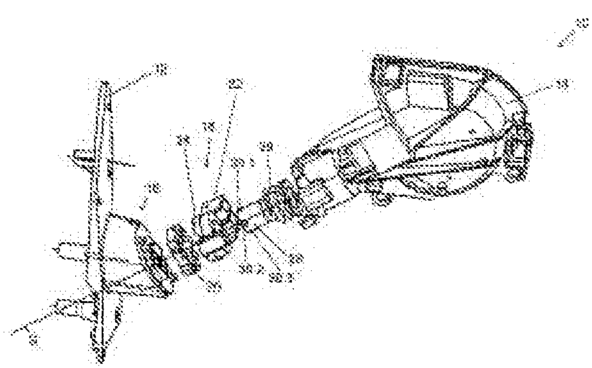
Application number: DE20081026039 20080530

Priority number(s): DE20081026039 20080530

Also published as: DE102008026039 (B4)

Abstract of DE102008026039 (A1)

The mirror (10) has a mirror carrier (14) holding a mirror element and fixed to a base (12), where the mirror carrier is pivotable around a rotation axis relative to the base. The mirror carrier is connected with the base by a locking insert (16). The locking insert includes a mirror carrier-mounting structure with which the locking insert is fastened to the mirror carrier, a base-mounting structure with which the locking insert is fastened to the base, and a locking unit. The locking unit manually rotates the mirror carrier relative to the base. An independent claim is also included for a method for installing a rear view mirror at a motor vehicle.



(19) Bundesrepublik Deutschland
Deutsches Patent- und Markenamt

(10) **DE 10 2008 026 039 A1** 2009.12.10

(12) **Offenlegungsschrift**

(21) Aktenzeichen: **10 2008 026 039.8**
(22) Anmeldetag: **30.05.2008**
(43) Offenlegungstag: **10.12.2009**

(51) Int Cl.[8]: ***B60R 1/076*** (2006.01)
B60R 1/074 (2006.01)
B62D 65/04 (2006.01)
B62D 65/16 (2006.01)

(71) Anmelder:
METALLWARENFABRIK WILKE GmbH & Co. KG, 38302 Wolfenbüttel, DE

(74) Vertreter:
GRAMM, LINS & PARTNER GbR, 38122 Braunschweig

(72) Erfinder:
Rosenthal, Dirk, 38300 Wolfenbüttel, DE

(56) Für die Beurteilung der Patentfähigkeit in Betracht gezogene Druckschriften:

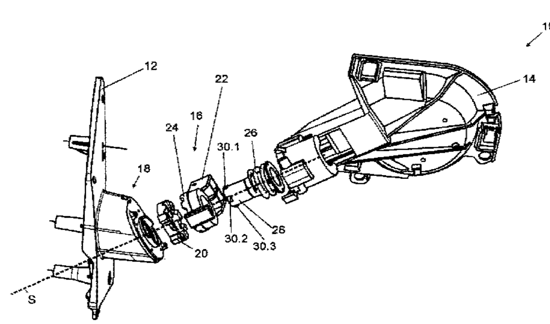
DE	**10 2004 029229**	**A1**
DE	**32 48 759**	**C2**
DE	**85 33 057**	**U1**
DE	**695 14 091**	**T2**
DE	**600 09 737**	**T2**
DE	**100 51 238**	**A1**

Die folgenden Angaben sind den vom Anmelder eingereichten Unterlagen entnommen

Prüfungsantrag gemäß § 44 PatG ist gestellt.

(54) Bezeichnung: **Rückspiegel und Verfahren zum Montieren eines Rückspiegels an einem Kraftwagen**

(57) Zusammenfassung: Rückspiegel mit einem Fuß (12), der ausgebildet ist zum Befestigen des Rückspiegels (10) an einem Kraftwagen, und einem Spiegelträger (14), der ausgebildet ist zum Halten eines Spiegelelements, am Fuß (12) befestigt und relativ zum Fuß (12) um eine Schwenkachse schwenkbar ist. Erfindungsgemäß ist vorgesehen, dass der Spiegelträger (14) über einen Rasteinsatz mit dem Fuß (12) verbunden ist, wobei der Rasteinsatz (16) eine Spiegelträger-Montagestruktur besitzt, mit der der Rasteinsatz (16) am Spiegelträger (14) befestigt ist, eine Fuß-Montagestruktur besitzt, mit der der Rasteinsatz (16) am Fuß (12) befestigt ist, und eine Rasteinheit umfasst, die ausgebildet ist zum manuellen Verschwenken des Spiegelträgers (14) relativ zum Fuß (12).



Beschreibung

[0001] Die Erfindung betrifft einen Rückspiegel mit einem Fuß, der ausgebildet ist zum Befestigen des Rückspiegels an einem Kraftwagen und einem Spiegelträger, der ausgebildet ist zum Halten eines Spiegelelements, der am Fuß befestigt ist und der relativ zum Fuß um eine Schwenkachse schwenkbar ist. Gemäß einem zweiten Aspekt betrifft die Erfindung ein Verfahren zum Montieren eines Rückspiegels an einem Kraftwagen, mit den Schritten eines Erfassens einer Statusinformation, die kodiert, ob ein manuell verstellbarer Rückspiegel oder ein motorischer verstellbarer Rückspiegel am Kraftwagen zu montieren ist, und eines Montierens des Rückspiegels.

[0002] Rückspiegel sind bekannt und dienen dazu, dem Fahrer eines Kraftwagens den Blick nach hinten zu gestatten. Rückspiegel sind beispielsweise an einer Tür des Kraftwagens montiert, insbesondere in einem Fensterdreieck benachbart zu einem Fenster des Kraftwagens.

[0003] Rückspiegel können manuell verstellbar oder motorisch verstellbar ausgeführt sein. Ein manuell verstellbarer Rückspiegel wird dadurch relativ zu einem Fuß verschwenkt, dass mit der Hand ein Drehmoment auf den Spiegelträger aufgebracht wird, bis ein Losbrech-Drehmoment überschritten ist und der Spiegelträger schwenkt. Bei motorisch verstellbaren Rückspiegeln ist dazu ein Elektromotor vorgesehen.

[0004] Der Spiegelträger und der Fuß sind Spritzgussteile. Bei der Herstellung von Spritzgussteilen spielen die Kosten für das Spritzgusswerkzeug eine dominante Rolle. Nachteilig bei bekannten Rückspiegeln ist, dass sehr komplexe Spitzgusswerkzeuge notwendig sind. Das führt dazu, dass die Spritzgusswerkzeuge schnell verschleißen.

[0005] Der Erfindung liegt die Aufgabe zugrunde, einen Rückspiegel anzugeben, der mit Spritzgusswerkzeugen gefertigt werden kann, die eine höhere Lebensdauer haben.

[0006] Die Erfindung löst das Problem durch einen gattungsgemäßen Rückspiegel, bei dem der Spiegelträger über einen Rasteinsatz mit dem Fuß verbunden ist, wobei der Rasteinsatz eine Spiegelträger-Montagestruktur, mit der der Rasteinsatz am Spiegelträger befestigt ist, eine Fuß-Montage-Struktur, mit der der Rasteinsatz am Fuß befestigt ist, und eine Rasteinheit umfasst, die ausgebildet ist zum manuellen Verschwenken des Spiegelträgers relativ zum Fuß.

[0007] Gemäß einem zweiten Aspekt löst die Erfindung das Problem durch ein gattungsgemäßes Verfahren, bei dem ein gattungsgemäßer Rückspiegel montiert wird, wenn ein manuell verstellbarer Rückspiegel zu montieren ist, und bei dem ein Rückspiegel montiert wird, der einen Elektromotor aufweist, der einen Elektromotor-Kopf, der der Spiegelträger-Montagestruktur des Rasteinsatzes entspricht, und einen Elektromotor-Fuß, der der Fuß-Montagestruktur des Rasteinsatzes entspricht, besitzt, wenn der motorisch verstellbare Außenspiegel zu montieren ist.

[0008] Vorteilhaft an der Erfindung ist, dass für das Fertigen des Spiegelträgers und des Fußes einfach strukturierte Spritzwerkzeuge verwendet werden können. Diese Spritzgusswerkzeuge zeigen einen geringeren Verschleiß.

[0009] Vorteilhafterweise ist der erfindungsgemäße Rückspiegel zudem mechanisch stabiler. Das liegt daran, dass das mechanisch am höchsten belastete Bauteil, nämlich die Rasteinheit, in der die Bewegung zwischen dem Spiegelträger und dem Fuß stattfindet, als gesondertes Bauelement ausgeführt ist. Dadurch kann die Materialstärke im Spiegelträger und im Fuß deutlich geringer gewählt werden, ohne die mechanische Stabilität zu gefährden. Der Rasteinsatz kann mit geringerem Auwand mit einer hohen Materialstärke gefertigt werden.

[0010] Die Herstellung von Rückspiegeln erfolgt in einem Spritzguss und damit in einem Massenverfahren. Es werden daher große Anstrengungen unternommen, um die Kosten für die Herstellung des Rückspiegels möglichst gering zu halten. Es wäre daher eigentlich zu erwarten, dass das Vorsehen eines zusätzlichen Teils in Form des Rasteinsatzes wegen des erhöhten Aufwandes unwirtschaftlich ist. Es hat sich überraschenderweise jedoch gezeigt, dass die erhöhte Lebensdauer der Spritzgießwerkzeuge für den Spiegelträger und den Fuß den zusätzlichen Aufwand für die Fertigung des Rasteinsatzes überkompensiert.

[0011] Es ist ein weiterer Vorteil der Erfindung, dass die Montage des Rückspiegels besonders einfach möglich ist, wenn ein manuell verstellbarer Rückspiegel eine Modellvariante im Vergleich zu einem motorisch betätigten Rückspiegel ist. In diesem Fall können der Fuß und der Spiegelträger sowohl für die manuell verstellbare als auch für die motorisch verstellbare Modellvariante verwendet werden. Es wird dann die Herstellung von separaten Spritzgussformen für die motorisch betätigte Variante erspart.

[0012] Im Rahmen der vorliegenden Beschreibung wird unter dem Merkmal, dass der Rasteinsatz mit der Spiegelträgermontagestruktur am Spiegelträger befestigt ist, insbesondere verstanden, dass der Rasteinsatz drehfest und starr am Spiegelträger befestigt ist. Analog ist der Rasteinsatz günstigerweise drehfest und starr am Fuß befestigt. Das heißt in anderen Worten, dass bei einem manuellen Verschwenken die vollständige Schwenkbewegung im Rasteinsatz erfolgt.

[0013] In einer bevorzugten Ausführungsform sind die Fuß-Montagestruktur und der Fuß so ausgebildet, dass der Rasteinsatz und der Fuß miteinander verrastbar sind. So kann der Rasteinsatz besonders leicht am Fuß montiert werden. Besonders günstig ist es, wenn die Fuß-Montagestruktur und der Fuß einen Bajonettverschluss bilden. Aus dem gleichen Grund der besonders einfachen Montierbarkeit ist bevorzugt vorgesehen, dass die Spiegelträger-Montagestruktur und der Spiegelträger so ausgebildet sind, dass der Rasteinsatz und der Spiegelträger miteinander verrastbar sind. Auch diese bilden bevorzugt einen Bajonettverschluss.

[0014] Ein besonders einfach zu fertigender Rasteinsatz umfasst ein unteres Rastelement, ein mit dem unteren Rastelement zusammenwirkendes oberes Rastelement, eine Spannhülse und eine Feder, die eine Druckkraft zwischen dem oberen Rastelement und der Spannhülse aufbringt und so das untere Rastelement gegen das obere Rastelement verspannt. Hier wie in der gesamten Beschreibung ist der unbestimmte Artikel nicht als Zahlwort zu verstehen.

[0015] Ein erfindungsgemäßes Verfahren ist besonders einfach durchführbar, wenn der Elektromotor eine Elektromotor-Bauhöhe hat, die einer Rasteinsatz-Bauhöhe des Rasteinsatzes entspricht. Vorteilhaft hieran ist, dass ein Kraftwagen mit einem manuell verstellbaren Rückspiegel einfach dadurch aufgerüstet werden kann, dass der Rasteinsatz durch den Elektromotor ersetzt wird. In anderen Worten ist der Elektromotor so ausgebildet, dass er am Fuß und am Spiegelträger montierbar, insbesondere verrastbar ist.

[0016] Besonders bevorzugt wird ein Elektromotor montiert, der über einen Bus ansteuerbar ist. Dabei kann der Bus-Anschluss in jedem Kraftwagen vorhanden sein, so dass das Aufrüsten von einem manuell verstellbaren Rückspiegel auf einen motorisch verstellbaren Rückspiegel besonders einfach ist, da bereits vorhandene elektrische Anschlüsse verwendet werden können.

[0017] Im Folgenden wird die Erfindung anhand eines exemplarischen Ausführungsbeispiels näher erläutert. Dabei zeigt

[0018] Fig. 1 eine Explosionsansicht eines erfindungsgemäßen Rückspiegels in einer ersten Ansicht,

[0019] Fig. 2 den Rückspiegel nach Fig. 1 in einer zweiten Ansicht,

[0020] Fig. 3 eine Detailansicht der Spiegelträger-Montagestruktur und

[0021] Fig. 4 eine perspektivische Ansicht auf die Spiegelträger-Montagestruktur.

[0022] Fig. 5 zeigt eine isometrische Ansicht des Rückspiegels mit einem Elektromotor und

[0023] Fig. 6 ist eine Explosionsansicht des Rückspiegels gemäß Fig. 5.

[0024] Fig. 1 zeigt einen Rückspiegel **10**, der einen Fuß **12**, einen Spiegelträger **14** und einen Rasteinsatz **16** umfasst. Der Spiegelträger **14** ist ausgebildet, um ein Spiegelelement zu haltern. Der Fuß **12** ist ausgebildet, um in einem Fensterdreieck eines Kraftwagens montiert zu werden.

[0025] Der Fuß **12** ist ein einstückiges Spritzgussteil, an dem eine Rasteinsatz-Aufnahme **18** ausgebildet ist. Die Rasteinsatz-Aufnahme **18** wirkt mit einer Fuß-Montagestruktur an einem unteren Rastelement **20** des Rasteinsatzes **16** zusammen und fixiert dieses bezüglich Rotation und Translation relativ zum Fuß **12**.

[0026] An seiner dem Fuß **12** abgewandten Seite wirkt das untere Rastelement **20** mit einem Rasteinsatz **22** zusammen, der ein oberes Rastelement **24** besitzt, das mit dem unteren Rastelement **20** so zusammen wirkt, dass ein Losbrech-Drehmoment M notwendig ist, um beide gegeneinander um eine Schwenkachse S zu verschwenken.

[0027] Dazu weisen die Rastelemente **20**, **22** Rastnocken auf, die ineinander greifen und aneinander abgleiten können.

[0028] Die Rastelemente **20**, **22** werden durch eine Feder in Form einer Tellerfeder **26** gegeneinander verspannt, die zwischen dem Rasteinsatz **22** und einer Spannhülse **28** wirkt. Die Spannhülse **28** besitzt Vorsprünge **30.1**, **30.2**, ..., die in Fig. 1 nicht sichtbare Ausnehmungen in dem Fuß **12** eingreifen. So ist der Rasteinsatz **16** mit dem Fuß **12** verrastbar. Gleichzeitig ist der Rasteinsatz **16**, der im montierten Zustand eine Bauhöhe $B_{\text{Rasteinsatz}}$ hat, mit dem Spiegelträger **14** verrastbar. Dazu wirkt eine Spiegelträger-Montagestruktur mit dem Spiegelträger **14** formschlüssig zusammen. Die Spannhülse **28** ist Teil einer Spiegelträger-Montagestruktur, die mit zugehörigen Ausnehmungen im Fuß **12** einen Bajonettverschluss bilden.

[0029] Im montierten Zustand hat der Rasteinsatz **16** eine Bauhöhe $B_{\text{Rasteinsatz}}$.

[0030] Fig. 2 zeigt eine zweite perspektivische Ansicht des erfindungsgemäßen Rückspiegels **10**, bei dem die Ausnehmungen **32.2** und **32.3** sichtbar sind.

in die die Vorsprünge **30.2** und **30.3**, die in Fig. 2 nicht sichtbar sind, eingreifen.

[0031] Fig. 3 zeigt eine Detailansicht von Fig. 1, bei der die Spannhülse **28** teilweise weggeschnitten ist.

[0032] Fig. 4 zeigt ein Detail als Explosionszeichnung, in dem die Fuß-Montagestruktur in Form des unteren Rastelements **20** zu sehen ist.

[0033] Fig. 5 zeigt eine perspektivische Ansicht des Rückspiegels **10**, bei dem statt des Rasteinsatzes **16** ein Elektromotor **34** den Fuß **12** mit dem Spiegelträger **14** verbindet. Die geometrischen Abmessungen des Elektromotors **34** sind so gewählt, dass die Lage von Fuß **12** zu Spiegelträger **14** identisch ist mit der Lage, die beide Komponenten zueinander haben, wenn der Rasteinsatz **16** verwendet wird. Der Elektromotor **34** verfügt über einen in Fig. 5 nicht sichtbaren elektrischen Anschluss an einen Datenbus zum Ansteuern und zur Stromversorgung.

[0034] Fig. 6 zeigt eine Explosionsansicht des Rückspiegels **10** gemäß Fig. 5. Der Elektromotor **34** besitzt einen Elektromotor-Fuß **36**, der mit der Rasteinsatz-Aufnahme **18** zusammenwirkt. Der Elektromotor-Fuß **36** besitzt auf seiner dem Fuß **12** zugewandten Seite eine Kontur, die der Kontur des unteren Rastelements **20** (vgl. Fig. 1) des Rasteinsatzes **16** entspricht. In anderen Worten entspricht eine Fuß-Montagestruktur des Elektromotor-Fußes **36**, der der Fuß-Montagestruktur des Rast-Einsatzes **16** entspricht. Der Elektromotor **34** hat zudem einen Elektromotor-Kopf **38**, der der Spiegelträger-Montagestruktur des Rasteinsatzes **16** entspricht.

[0035] Mit Bezug auf Fig. 1 wird nun die Montage des Rückspiegels **10** an einem nicht eingezeichneten Kraftwagen erläutert. Zunächst wird der Fuß **12** mit dem Kraftwagen verbunden. In diesem Zustand wird der Kraftwagen zu einer Montagestation für die Endmontage des Rückspiegels **10** gebracht. Dort wird eine Statusinformation erfasst, die kodiert, ob ein manuell verstellbarer Rückspiegel, wie er in den Fig. 1 bis Fig. 4 gezeigt ist, eingebaut werden soll. Das kann beispielsweise automatisch geschehen, indem eine entsprechende Datenbank ausgelesen wird. Alternativ kann ein an dem Kraftwagen befestigter Funkchip ausgelesen werden.

[0036] Soll ein manuell verstellbarer Rückspiegel montiert werden, so wird der Rasteinsatz **16** bereitgestellt und mit dem Fuß **12** verrastet. Anschließend wird der Spiegelträger **14** mit dem Rasteinsatz **16** verbunden. Alternativ liegt der Rasteinsatz **16** bereits mit dem Spiegelträger **14** verbunden vor und die so gebildete Einheit wird in einem Schritt mit dem Fuß **12** verbunden.

[0037] Ergibt die Statusinformation, dass ein motorisch verstellbarer Außenspiegel wie in den Fig. 5 und Fig. 6 montiert werden soll, so wird statt des Rasteinsatzes **16** ein Elektromotor anmontiert, der einen Elektromotor-Fuß **36** beisitzt, der in seiner Außenkontur derjenigen Kontur entspricht, die das untere Rastelement **20** dem Fuß **12** zuwendet.

[0038] Der Elektromotor-Fuß **36** ist so ausgebildet, dass er auf die gleiche Weise wie der Rasteinsatz **16** mit den Ausnehmungen **32** (Fig. 2) verrastet werden kann. Der Elektromotor **34** wird nun mit dem Fuß **12** verrastet. Anschließend wird der Spiegelträger **14** mit dem Elektromotor-Kopf **38** des Elektromotors **34** verbunden. Alternativ ist der Elektromotor **34** bereits mit dem Spiegelträger **14** verbunden, so dass die Einheit aus beiden mit dem Fuß **12** verbunden wird. Der Elektromotor **34** besitzt eine Elektromotor-Bauhöhe B_{Motor}, die der Bauhöhe $B_{Rasteinheit}$ der Rasteinheit entspricht, so dass die Position des Spiegelträgers **14** nicht davon abhängt, ob der Rasteinsatz oder der Elektromotor **34** eingebaut wurde.

[0039] Alternativ zu einer Rastverbindung könnten der Fuß **12**, der Rasteinsatz **16** und der Spiegelträger **14** jeweils auch verschraubt, verklebt oder auf sonstige Weise miteinander verbunden werden.

Bezugszeichenliste

10	Rückspiegel
12	Fuß
14	Spiegelträger
16	Rasteinsatz
18	Rasteinsatz-Aufnahme
20	unteres Rastelement
22	Rasteinheit
24	oberes Rastelement
26	Tellerfeder
28	Spannhülse
30	Vorsprung
32	Ausnehmung
34	Elektromotor
36	Elektromotor-Fuß
38	Elektromotor-Kopf
M	Losbrech-Drehmoment
B	Bauhöhe

Patentansprüche

1. Rückspiegel mit
(a) einem Fuß (**12**), der ausgebildet ist zum Befestigen des Rückspiegels (**10**) an einem Kraftwagen, und
(b) einem Spiegelträger (**14**), der
(i) ausgebildet ist zum Halten eines Spiegelelements,
(ii) am Fuß (**12**) befestigt und
(iii) relativ zum Fuß (**12**) um eine Schwenkachse schwenkbar ist,
dadurch gekennzeichnet, dass
(c) der Spiegelträger (**14**) über einen Rasteinsatz mit

dem Fuß (**12**) verbunden ist, wobei der Rasteinsatz (**16**)
(i) eine Spiegelträger-Montagestruktur besitzt, mit der der Rasteinsatz (**16**) am Spiegelträger (**14**) befestigt ist,
(ii) eine Fuß-Montagestruktur besitzt, mit der der Rasteinsatz (**16**) am Fuß (**12**) befestigt ist, und
(iii) eine Rasteinheit umfasst, die ausgebildet ist zum manuellen Verschwenken des Spiegelträgers (**14**) relativ zum Fuß (**12**).

2. Rückspiegel nach Anspruch 1, dadurch gekennzeichnet, dass die Fuß-Montagestruktur und der Fuß (**12**) so ausgebildet sind, dass der Rasteinsatz (**16**) und der Fuß (**12**) miteinander verrastbar sind.

3. Rückspiegel nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, dass die Spiegelträger-Montagestruktur und der Spiegelträger (**14**) so ausgebildet sind, dass der Rasteinsatz (**16**) und der Spiegelträger (**14**) miteinander verrastbar sind.

4. Rückspiegel nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, dass der Rasteinsatz (**16**)
– ein unteres Rastelement (**20**),
– ein mit dem unteren Rastelement (**20**) zusammenwirkendes oberes Rastelement (**22**),
– eine Spannhülse (**28**) und
– eine Feder (**26**) umfasst, die eine Druckkraft zwischen dem oberen Rastelement und der Spannhülse aufbringt und so das untere Rastelement (**20**) gegen das obere Rastelement (**22**) verspannt, umfasst.

5. Rückspiegelmontagesatz mit
(a) einem Rückspiegel (**10**) nach einem der vorstehenden Ansprüche und
(b) einem Elektromotor (**34**), der
– einen Elektromotor-Kopf (**38**), der der Spiegelträger-Montagestruktur des Rasteinsatzes (**16**) entspricht, und
– einen Elektromotor-Fuß (**36**), der der Fuß-Montagestruktur des Rasteinsatzes (**16**) entspricht,
besitzt, so dass der Elektromotor (**34**) alternativ zu einem Rasteinsatz (**16**) des Rückspiegels montierbar ist.

6. Verfahren zum Montieren eines Rückspiegels an einem Kraftwagens, mit den Schritten:
(a) Erfassen einer Statusinformation, die kodiert, ob ein manuell verstellbarer Rückspiegel oder ein motorisch verstellbarer Rückspiegel am Kraftwagen zu montieren ist, und
(b) Montieren des Rückspiegels, dadurch gekennzeichnet, dass
(c) ein Rückspiegel nach einem der Ansprüche 1 bis 4 montiert wird, wenn die Statusinformation kodiert, dass ein manuell verstellbarer Rückspiegel zu montieren ist, und
(d) ein Rückspiegel montiert wird, der statt des Rasteinsatzes einen Elektromotor (**34**) aufweist, der
– einen Elektromotor-Kopf, der der Spiegelträger-Montagestruktur des Rasteinsatzes (**16**) entspricht, und
– einen Elektromotor-Fuß (**36**), der der Fuß-Montagestruktur des Rasteinsatzes (**16**) entspricht, besitzt, wenn die Statusinformation kodiert, dass der motorisch verstellbare Außenspiegel zu montieren ist.

7. Verfahren nach Anspruch 6, dadurch gekennzeichnet, dass der Elektromotor eine Elektromotor-Bauhöhe hat, die einer Rasteinsatz-Bauhöhe ($B_{Rasteinsatz}$) des Rasteinsatzes (**16**) entspricht.

8. Verfahren nach Anspruch 6 oder 7, dadurch gekennzeichnet, dass der Elektromotor über einen Bus ansteuerbar ist.

Es folgen 6 Blatt Zeichnungen

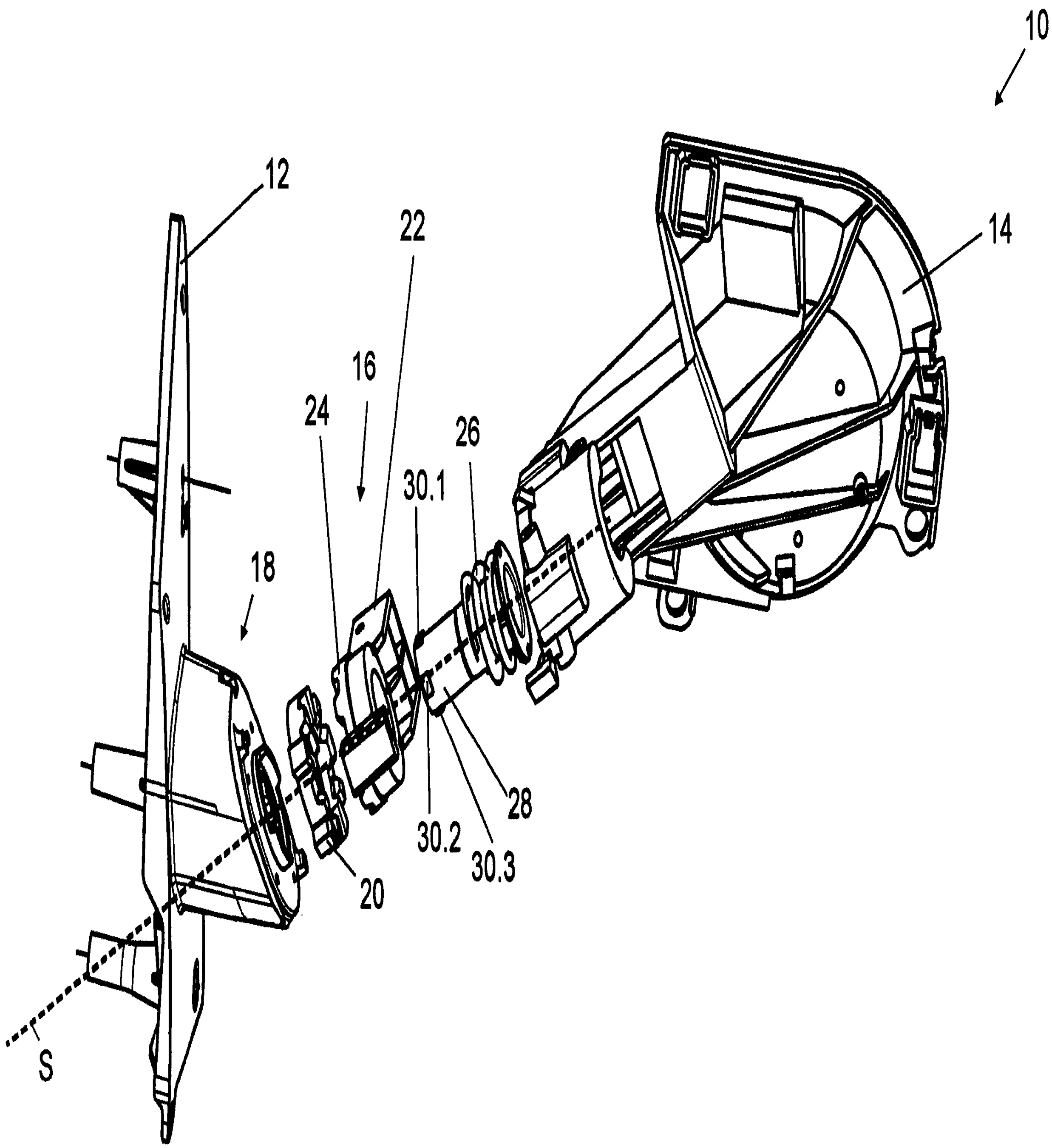


Fig. 1

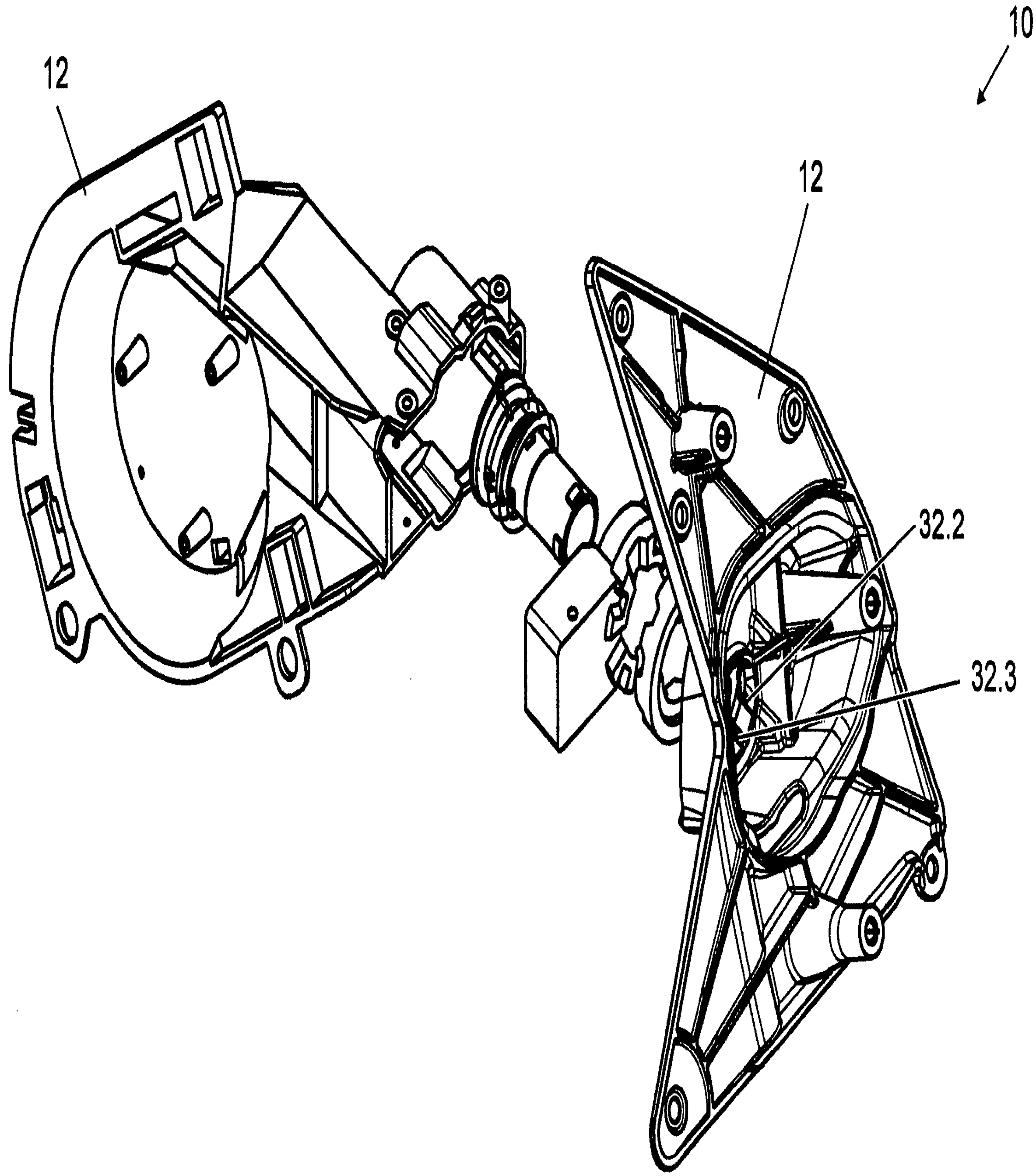


Fig. 2

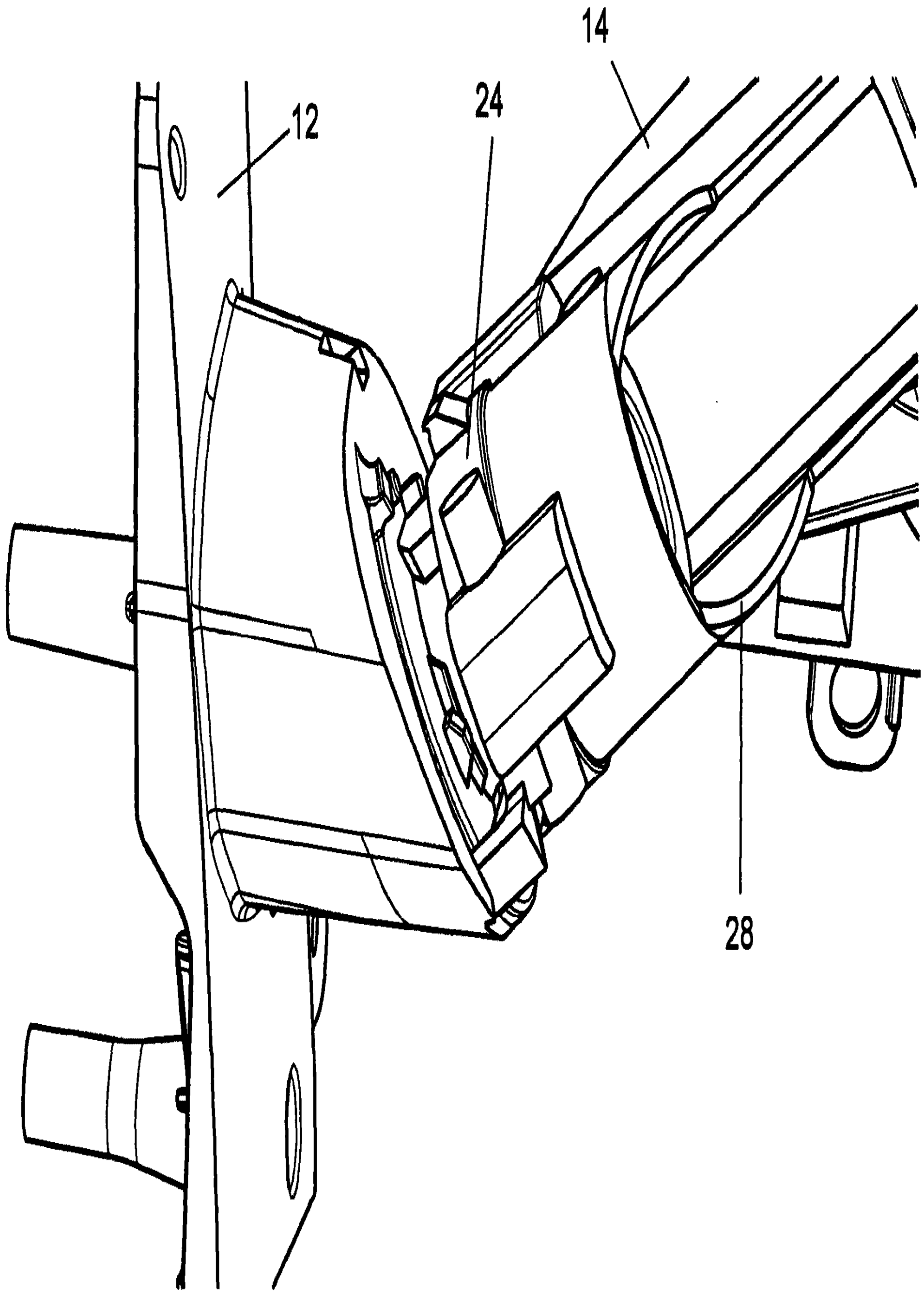
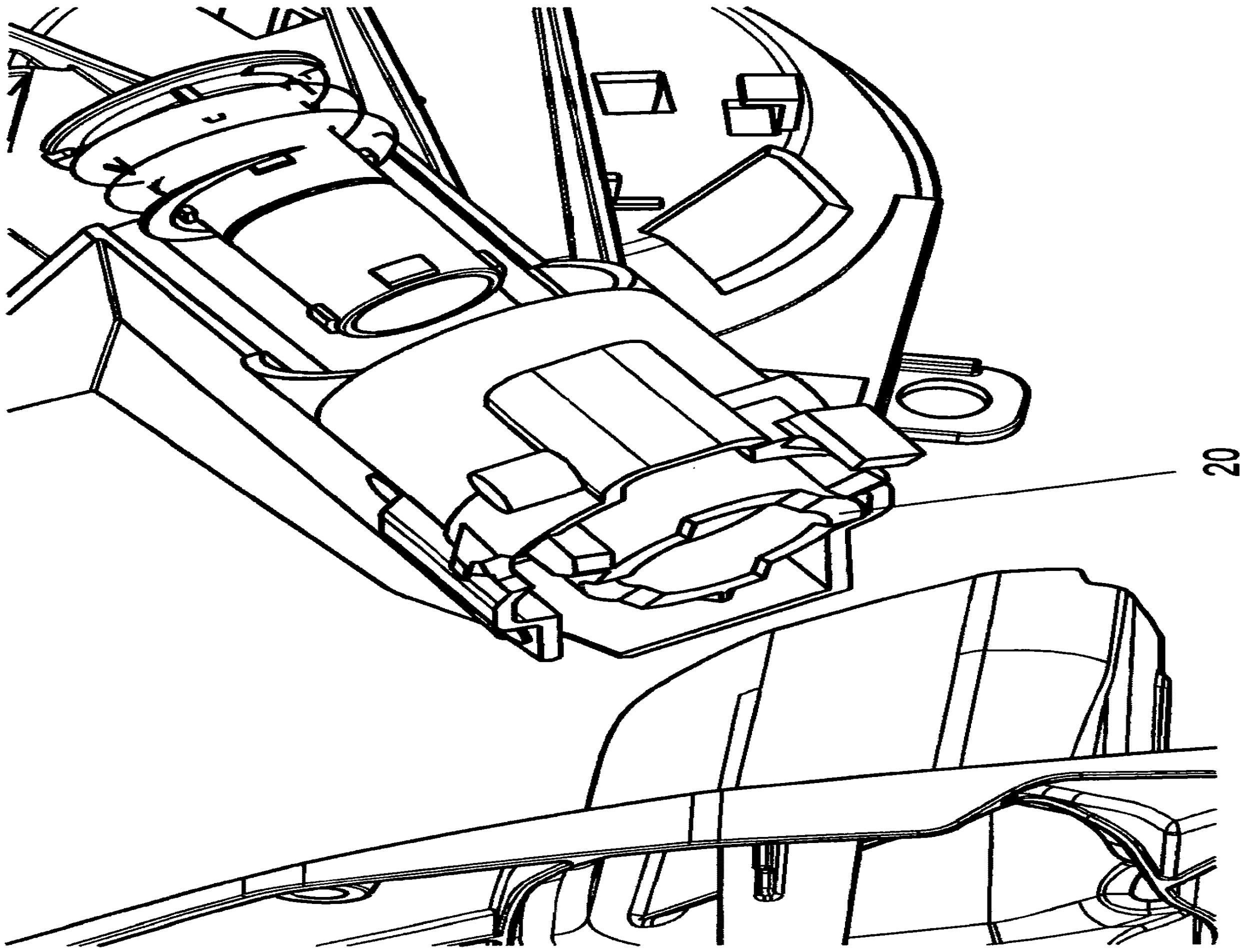


Fig. 3

Fig. 4



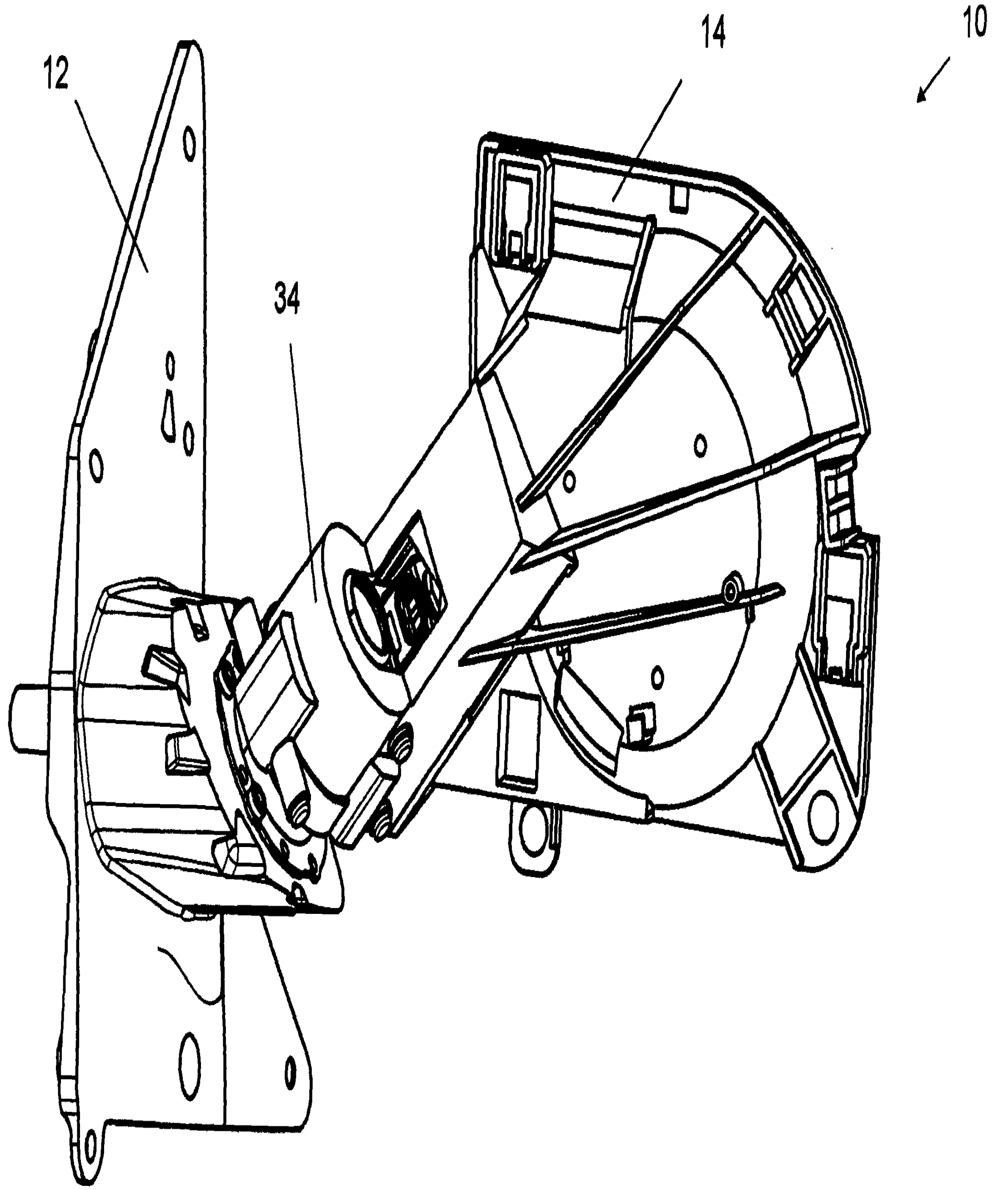


Fig. 5

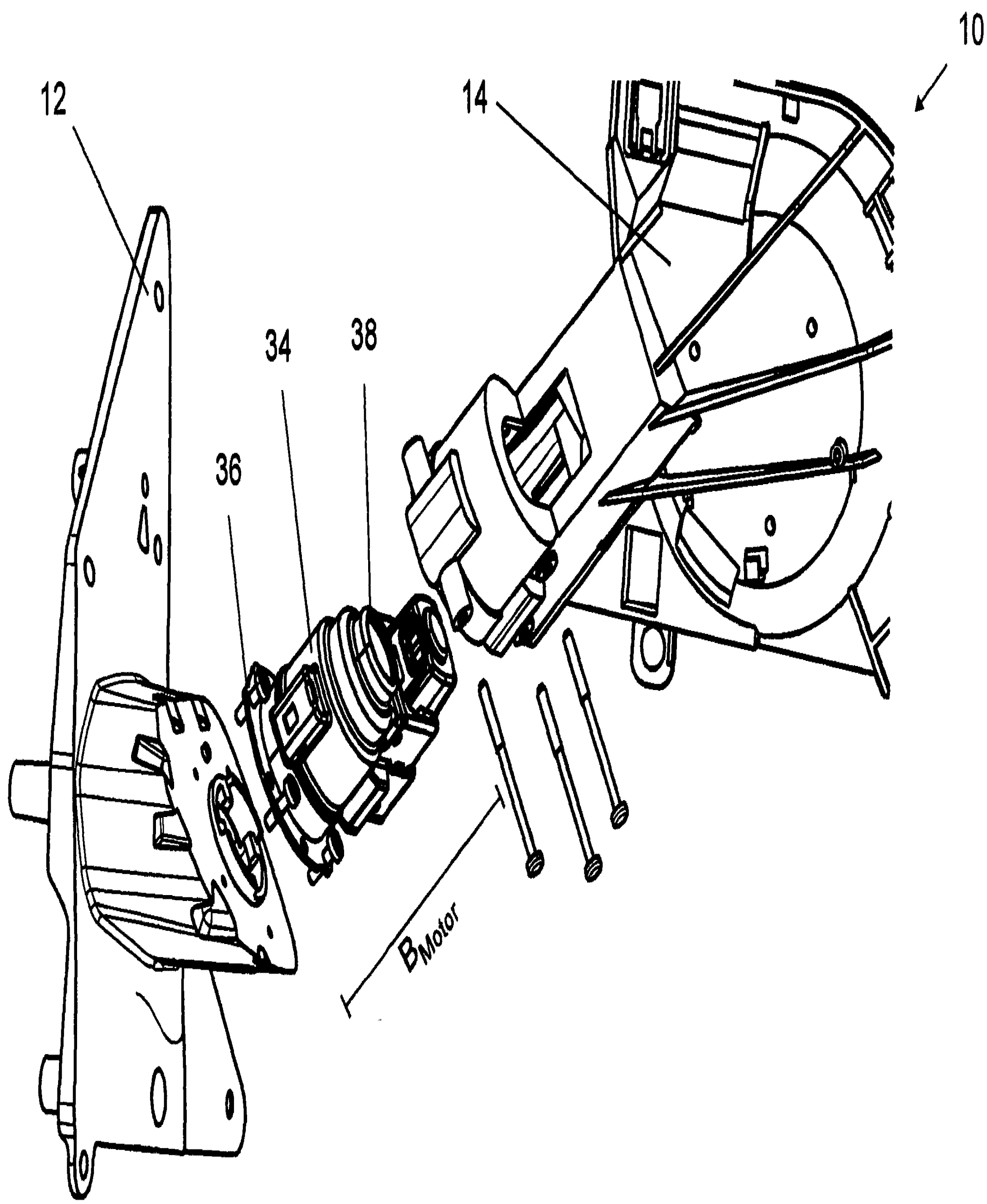


Fig. 6

Espacenet

Bibliographic data: DE1755577 (B1) — 1972-05-04

REAR VIEW MIRRORS FOR ROAD VEHICLES

Inventor(s): BAKER ALFRED DICKENS

Applicant(s): LUCAS INDUSTRIES LTD

Classification: - **international:** ***B60R1/076;*** (IPC1-7): A47G1/24
- **cooperative:** **B60R1/076**; Y10S248/90

Application number: DE19681755577 19680524

Priority number(s): GB19670024610 19670526

Also published as: FR1566955 (A) GB1212988 (A) US3485470 (A)

Abstract not available for DE1755577 (B1)
Abstract of corresponding document: GB1212988 (A)

1,212,988. Exterior rear view vehicle mirrors. JOSEPH LUCAS (INDUSTRIES) Ltd. 18 April, 1968 [26 May, 1967], No. 24610/67. Heading B7J. A vehicle exterior rear view mirror comprises a base 12, having resilient arms 13 extending upwardly therefrom, and a member 18 connecting said arms to a head 23, the upper ends of said arms being urged towards each other and defining an aperture 15 adapted to receive a corresponding shaped spigot of said member 18, the arrangement being such that rotation of said head will cause the spigot to rotate in aperture 15 forcing the arms apart, but on release of the head the resilience of the arms will cause the head to return to its original position, or 180 degrees with respect thereto if the rotation is greater than 90 degrees. The end of member 18 remote from the spigot is formed with a ball 22 received in a socket 28 of a member 25. Said member 25 is generally cylindrical and formed with a groove 26 gripped by the edge of an aperture 24 in the back wall 23 of the head. The part of member 25 forming the recess 28 comprises four axial fingers having rotatable thereabout a sleeve 31. Posts 32 of said sleeve co-operate with ramp surfaces forming the base of a groove 27, rotation of the sleeve causing the fingers to grip the ball. The mirror parts may be formed from moulded synthetic resin and the reflective surface of the head formed by chromium plating a specular surface.

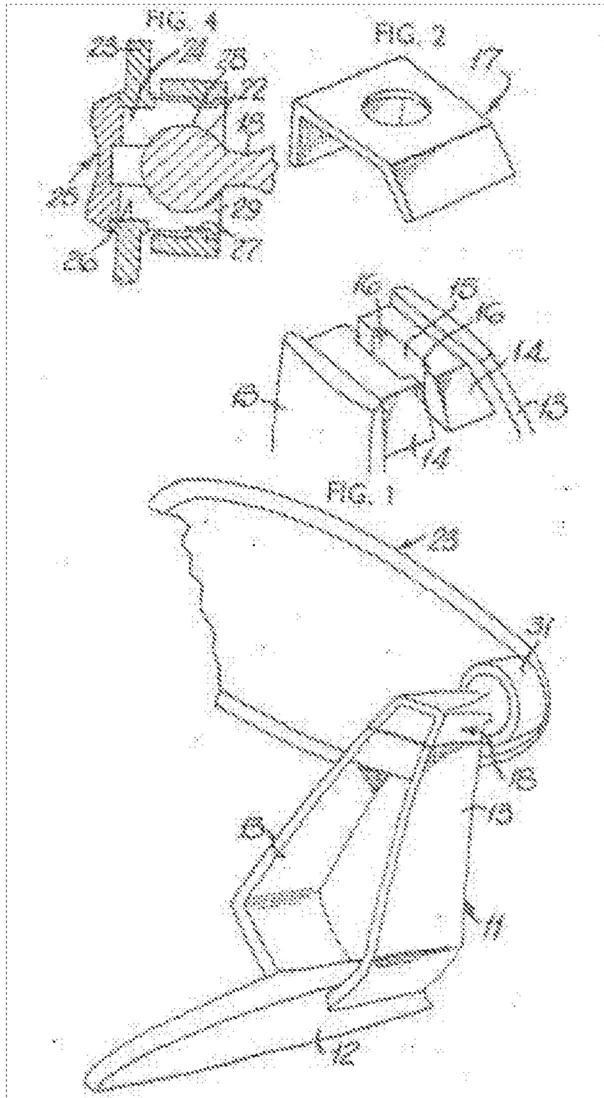


FIG. 4
FIG. 2
FIG. 1

(51) Int. Cl.: B 60 r, 1/02

BUNDESREPUBLIK DEUTSCHLAND

DEUTSCHES PATENTAMT

(52) Deutsche Kl.: 63 c, 91

(10)
(11)
Auslegeschrift 1 755 577

(21) Aktenzeichen: P 17 55 577.0-21
(22) Anmeldetag: 24. Mai 1968
(43) Offenlegungstag: —
(44) Auslegetag: 4. Mai 1972

Ausstellungspriorität: —

(30) Unionspriorität
(32) Datum: 26. Mai 1967
(33) Land: Großbritannien
(31) Aktenzeichen: 24610

---

(54) Bezeichnung: Außenrückspiegel für Kraftfahrzeuge

(61) Zusatz zu: —

(62) Ausscheidung aus: —

(71) Anmelder: Joseph Lucas (Industries) Ltd., Birmingham (Großbritannien)

Vertreter gem. § 16 PatG: Cohausz, W., Dipl.-Ing.; Florack, W., Dipl.-Ing.; Patentanwälte, 4000 Düsseldorf

(72) Als Erfinder benannt: Baker, Alfred Dickens, Solihull, Warwickshire (Großbritannien)

---

(56) Für die Beurteilung der Patentfähigkeit in Betracht gezogene Druckschriften:
DT-Gbm 1 775 118
GB-PS 221 921

DT 1 755 577

ORIGINAL INSPECTED

⊕ 4.72 209 519/240

Patentansprüche:

1. Außenrückspiegel für Kraftfahrzeuge mit einem zum Befestigen des Rückspiegels an der Karosserie vorgesehenen Ständer mit zwei etwa parallelen Armen, die einen die Spiegelplatte tragenden Teil festklemmen, und mit einer kugeligen Verbindung zwischen der Spiegelplatte und dem Ständer, dadurch gekennzeichnet, daß die Arme (13) federnd ausgeführt sind und an ihren zur Spiegelplatte (23) gerichteten Enden innen Klemmbacken (14) besitzen, von denen mindestens eine U-förmig ist und die durch die Federkraft der Arme (13) gegeneinander drückbar sind und eine Auskehlung (15) bilden, in die ein gegen ein Herausrutschen gesicherter, mit mindestens einer Anflachung versehener Zapfen (19) einliegt, durch dessen Drehung um die Längsachse die Klemmbacken (14) auseinanderspreizbar sind.

2. Außenrückspiegel nach Anspruch 1, dadurch gekennzeichnet, daß der Zapfen (19) einen Teil (22) der kugeligen Verbindung zwischen der Spiegelplatte (23) und dem Ständer (11) trägt.

3. Außenrückspiegel nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß die Klemmbacken (14) gegen ein seitliches Verschieben gegeneinander durch einen die Klemmbacken seitlich umfassenden Bügel (17) gesichert sind.

Die Erfindung betrifft einen Außenrückspiegel für Kraftfahrzeuge mit einem zum Befestigen des Rückspiegels an der Karosserie vorgesehenen Ständer mit zwei etwa parallelen Armen, die einen die Spiegelplatte tragenden Teil festklemmen, und mit einer kugeligen Verbindung zwischen der Spiegelplatte und dem Ständer.

Aus der britischen Patentschrift 221 921 ist ein Außenrückspiegel mit einem Ständer mit zwei parallelen Armen bekannt, deren als pfannenförmige Lager ausgebildete Enden eine an einer Spiegelplatte befestigte Kugel festklemmen, wobei die Klemmwirkung durch eine durch die Armenden gesteckte Schraube erzeugt wird.

Ferner ist es aus dem deutschen Gebrauchsmuster 1 775 118 bekannt, die an der Spiegelplatte befestigte Kugel in einer geschlitzten Aufweitung des Ständers zu lagern, wobei die Aufweitung die Kugel übergreift und durch eine Überwurfmutter gegen die Kugel geklemmt wird.

Wird bei diesen bekannten Rückspiegeln z. B. durch spielende Kinder, durch Radfahrer oder durch die Bürsten einer automatischen Waschanlage ein Stoß auf die Spiegelplatte ausgeübt, so führt dies entweder zu einer Verstellung des Spiegels oder der Ständer bricht sogar ab. Eine Verstellung des Spiegels ist besonders dann unangenehm, wenn der Rückspiegel vorne an der Karosserie befestigt ist, da dann zwei Personen für die Einstellung des Spiegels notwendig sind.

Aufgabe der Erfindung ist es einen Außenrückspiegel zu schaffen, der bei einer Stoßeinwirkung weder seine Einstellung verliert noch abbricht.

Diese Aufgabe wird erfindungsgemäß dadurch gelöst, daß die Arme federnd ausgeführt sind und an ihren zur Spiegelplatte gerichteten Enden innen Klemmbacken besitzen, von denen mindestens eine U-förmig ist und die durch die Federkraft der Arme gegeneinander drückbar sind und eine Auskehlung bilden, in die ein gegen ein Herausrutschen gesicherter, mit mindestens einer Anflachung versehener Zapfen einliegt, durch dessen Drehung um die Längsachse die Klemmbacken auseinanderspreizbar sind.

Bei einer derartigen Anordnung bewirkt ein Stoß gegen die Spiegelplatte eine Verdrehung der Spiegelplatte und des an der Spiegelplatte befestigten Zapfens, wobei nach dem Stoß die Federkraft der Ständerarme den Zapfen wieder in seine ursprüngliche Lage zurückdreht, so daß die Spiegeleinstellung erhalten bleibt.

Vorzugsweise kann der Zapfen einen Teil der kugeligen Verbindung zwischen der Spiegelplatte und dem Ständer tragen.

In einer Ausgestaltung können die Klemmbacken gegen ein seitliches Verschieben gegeneinander durch einen die Klemmbacken seitlich umfassenden Bügel gesichert sein.

Ein Ausführungsbeispiel der Erfindung wird an Hand der Zeichnung im folgenden näher beschrieben. Es zeigt

Fig. 1 eine perspektivische Darstellung eines Rückspiegels,

Fig. 2 eine Darstellung des oberen Teils des in Fig. 1 gezeigten Ständers in auseinandergezogener Anordnung,

Fig. 3 ein zwischen Spiegelplatte und Ständer sitzendes Verbindungsteil aus Fig. 1,

Fig. 4 einen Längsschnitt durch die Verbindung zwischen dem Verbindungsteil und der Spiegelplatte,

Fig. 5 ein Teil aus Fig. 4 in auseinandergezogener Darstellung und

Fig. 6 eine schematische Darstellung des Trägers in drei winkligen Stellungen der Spiegelplatte gegenüber dem Träger.

Der in der Zeichnung dargestellte Spiegel besteht aus einem aus Kunststoff hergestellten Ständer **11**, der einen an der Karosserie befestigbaren Fuß **12** aufweist.

Von dem Fuß **12** nach oben, und mit diesem ein Teil bildend, reichen ein Paar federnde Arme **13**, die an ihren freien Enden abgeflachte U-förmige Klemmbacken **14** (Fig. 2) aufweisen. Die Klemmbacken **14** werden durch die Federkraft der Arme **13** gegeneinander gepreßt und bilden zwischen sich eine Auskehlung **15**, deren Ecken **16** gerundet sind. Mit dem Ständer **11** ist ein im wesentlichen trapezförmig ausgebildeter Bügel **17** verbunden, dessen beide abgebogenen Seitenflächen die zueinanderstehenden Seitenflächen der Klemmbacken **14** umfassen. Die Grundfläche des Bügels **17** weist ein Loch auf, das der Auskehlung **15** entspricht. Durch den Bügel **17** wird erreicht, daß sich die Klemmbacken **14** nur senkrecht zueinander bewegen können und nicht seitlich aneinander vorbei.

In der Auskehlung **15** und durch die Klemmbacken **14** gehalten, befindet sich ein mit einem Verbindungsteil **18** (Fig. 3) in einem Stück hergestellter Zapfen **19**. Der Zapfen **19** hat einen Querschnitt, der dem der Auskehlung **15** entspricht und besitzt an seinem unteren Ende einen kreisförmigen Flansch **21**, der an der Unterseite der Klemmbacken **14** angreift und dadurch verhindert, daß der Zapfen **19** nach oben aus der Auskehlung **15** herausgezogen werden kann. Das von dem Zapfen **19** abgekehrte Ende des Verbindungsteils **18** hat die Form einer Kugel **22**.

Der Spiegel enthält ferner eine aus Kunststoff hergestellte Spiegelplatte **23**. Die Spiegelplatte **23** ist so beschaffen, daß ihre eine Fläche ein spiegelndes Aussehen besitzt. Nach dem Beschichten mit Chrom wirkt diese Seite der Spiegelplatte **23** in erhöhtem Maße reflektierend und bildet einen Spiegel. Die andere Fläche der Spiegelplatte **23** ist matt gehalten, wodurch sie nach dem Beschichten ein dekoratives Aussehen erhält. Die Spiegelplatte **23** besitzt im Bereich einer ihrer Ecken eine Aussparung **24**, in welcher sich ein aus Kunststoff hergestellter zylindrischer Halter **25** befindet. Der Halter **25** ist mit einem Paar axial ausgesparter Ringnuten **26, 27** und einer Kugelpfanne **28** (Fig. 4) versehen. Außerdem weist das Halteteil **25** vier axial verlaufende und gleichwinklig angeordnete Öffnungen **29** auf, durch welche die Wand der Kugelpfanne **28** federnde Eigenschaften erhält.

Der Halter **25** wird in die Aussparung **24** der Spiegelplatte **23** eingesetzt, und die Spiegelplatte **23** schnappt in die entsprechende Ringnut **26** des Halters **25** ein. Der Teil des Halters **25**, welcher die Ringnut **27** und die Kugelpfanne **28** aufweist, ragt aus der der Spiegelfläche abgewandten Fläche der Spiegelplatte **23** heraus. Der Bereich des Halters **25**, der die Ringnut **27** und die Kugelpfanne **28** aufweist, ist durch Schlitze **29** in vier fingerartige Streifen unterteilt, wobei jeder Streifen in seiner Außenfläche einen Teil der Ringnut **27** besitzt. Die Tiefe der Ringnut **27** steigt in jedem Abschnitt von einem Minimum auf der einen Seite zu einem Maximum auf der anderen Seite an, so daß im Ganzen gesehen der Boden der Ringnut **27** vier gleich gewölbte Ansteigungen aufweist. Mit dem Halter **25** ist eine aus Kunststoff hergestellte Klemmanschette **31** verbunden, deren Außenmantel Längsrippen aufweist, die ein manuelles Drehen der Manschette **31** erleichtern. Der Innenmantel der Manschette **31** besitzt vier ringförmig ausgerichtete, nach innen weisende und gleichwinklig angeordnete Nocken **32**.

Um den Ständer **11** mit der Spiegelplatte **23** zu verbinden, wird die Kugel **22** des Verbindungsteils **18** in die Kugelpfanne **28** des Halters **25** gedrückt. Durch die Kugelgelenkverbindung der beiden Teile kann die Spiegelplatte **23** relativ zum Ständer **11** bewegt und in jeder gewünschten Stellung festgehalten werden. Die Klemmanschette **31** wird dann über den Halter **25** gezogen und durch eine Drehbewegung festgezogen, wobei die Nocken **32** in der Ringnut **27** gegen die Ansteigungen bewegt werden. Sobald die Nocken **32** gegen die Ansteigungen gedrückt werden, bewegen sich die fingerartigen Streifen des Halters **25** radial nach innen und die Wand der Kugelpfanne **28** umschließt die Kugel **22**, wodurch die Spiegelplatte **23** relativ zum Ständer **11** festgeklemmt wird. Ferner sind die Ringnuten **26, 27** und die Kugelpfanne **28** so relativ zueinander angeordnet, daß, sobald das Festklemmen erfolgt, die Bereiche der Streifen des Halters **25**, die an die Ringnut **26** angrenzen, die Tendenz haben, sich nach außen zu biegen. Dadurch verringert sich die Breite der Ringnut **26**, so daß die Spiegelplatte **23** in der Ringnut **26** festgeklemmt wird. Wenn während des Gebrauches die Spiegelplatte relativ zu dem Ständer **11** soweit in einer Richtung bewegt wird, daß sich der Zapfen **19** dreht, werden die Arme **13** durch die Wirkung des Querschnitts des Zapfens **19** und des Querschnitts der Auskehlung **15** gegen ihre natürliche Federwirkung auseinandergedrückt. Wird die Spiegelplatte **23** losgelassen, bewegen sich die Arme **13** wieder gegeneinander, wobei der Zapfen **19** durch die Form seines Querschnitts und der des Querschnitts der Auskehlung **15** gedreht wird, und die Spiegelplatte **3** wieder ihre alte Stellung einnimmt. Sollte die Spiegelplatte **23** während des Gebrauchs einen Stoß erhalten, so wird die Spiegelplatte **23** eher nachgeben als brechen und anschließend wieder in ihre alte Stellung zurückkehren.

Von Vorteil ist auch, daß, wenn die Spiegelplatte **23** dermaßen geschwenkt wird, daß der Zapfen **19** sich mehr als 90° dreht, die Spiegelplatte **23** in eine Position gebracht wird, die einer um 180° gedrehten Stellung der Ausgangsstellung entspricht.

Hierzu 1 Blatt Zeichnungen

Nummer: 1 755 577
Int. Cl.: B 60 r, 1/02
Deutsche Kl.: 63 c, 91
Auslegetag: 4. Mai 1972

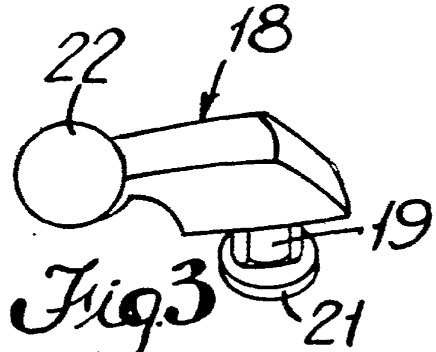


Fig.3

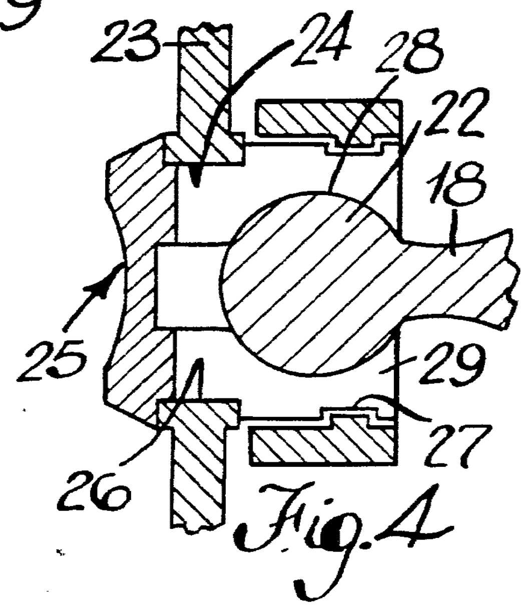


Fig.4

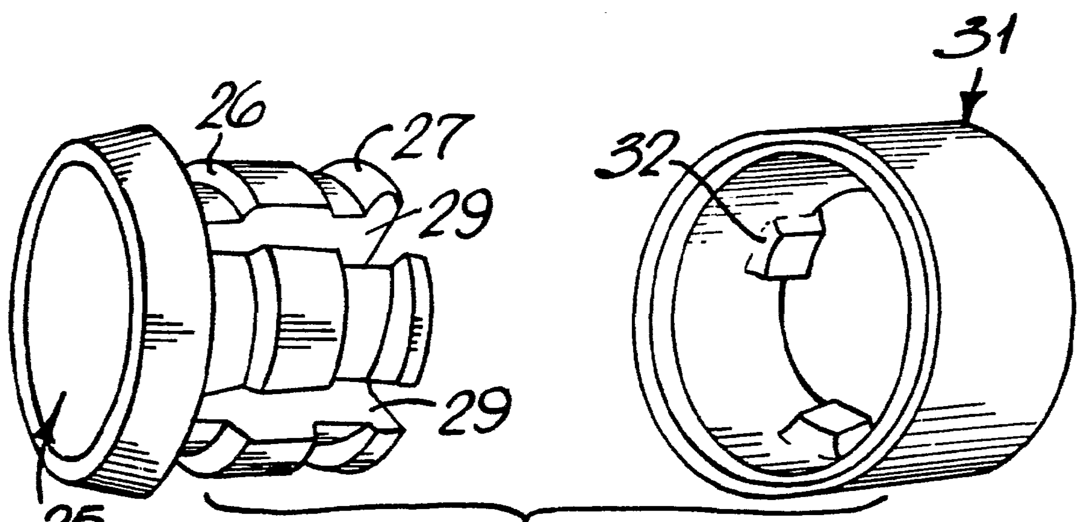


Fig.5

209 519/240

Nummer: 1 755 577
Int. Cl.: B 60 r, 1/02
Deutsche Kl.: 63 c, 91
Auslegetag: 4. Mai 1972

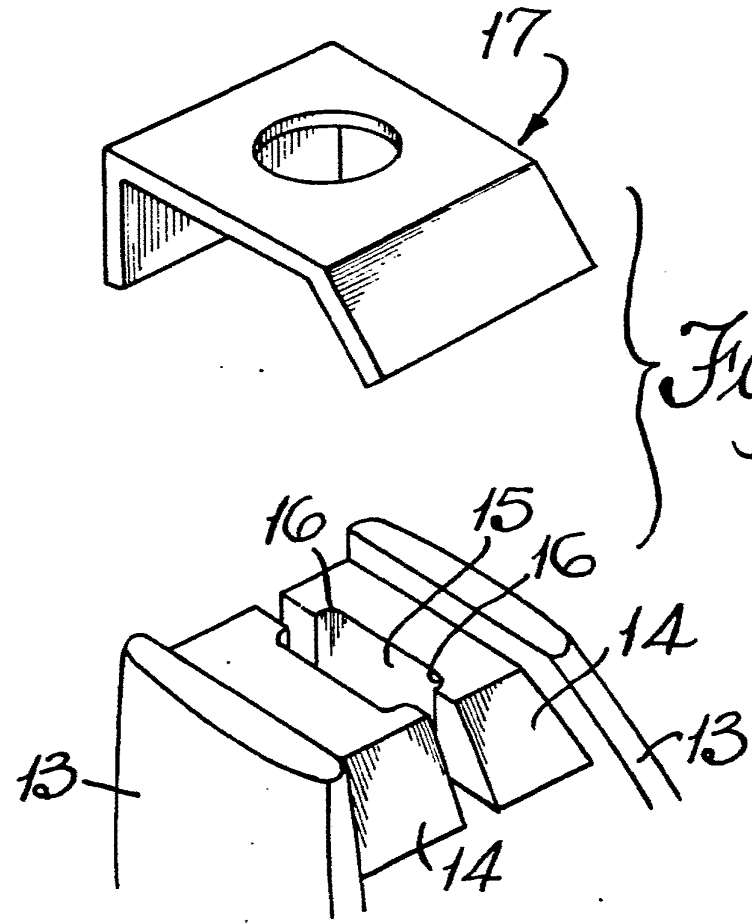


Fig. 2

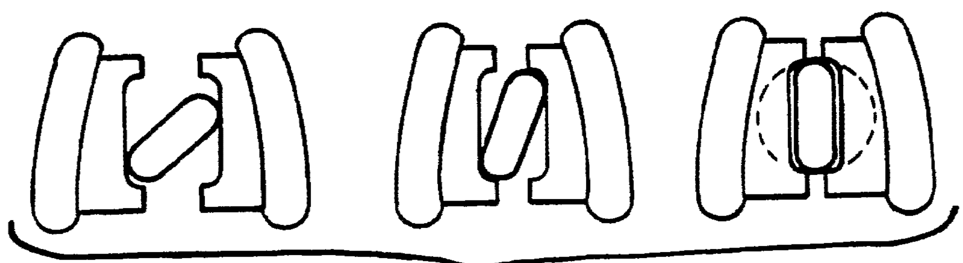


Fig. 6

Nummer:	1 755 577
Int. Cl.:	B 60 r, 1/02
Deutsche Kl.:	63 c, 91
Auslegetag:	4. Mai 1972

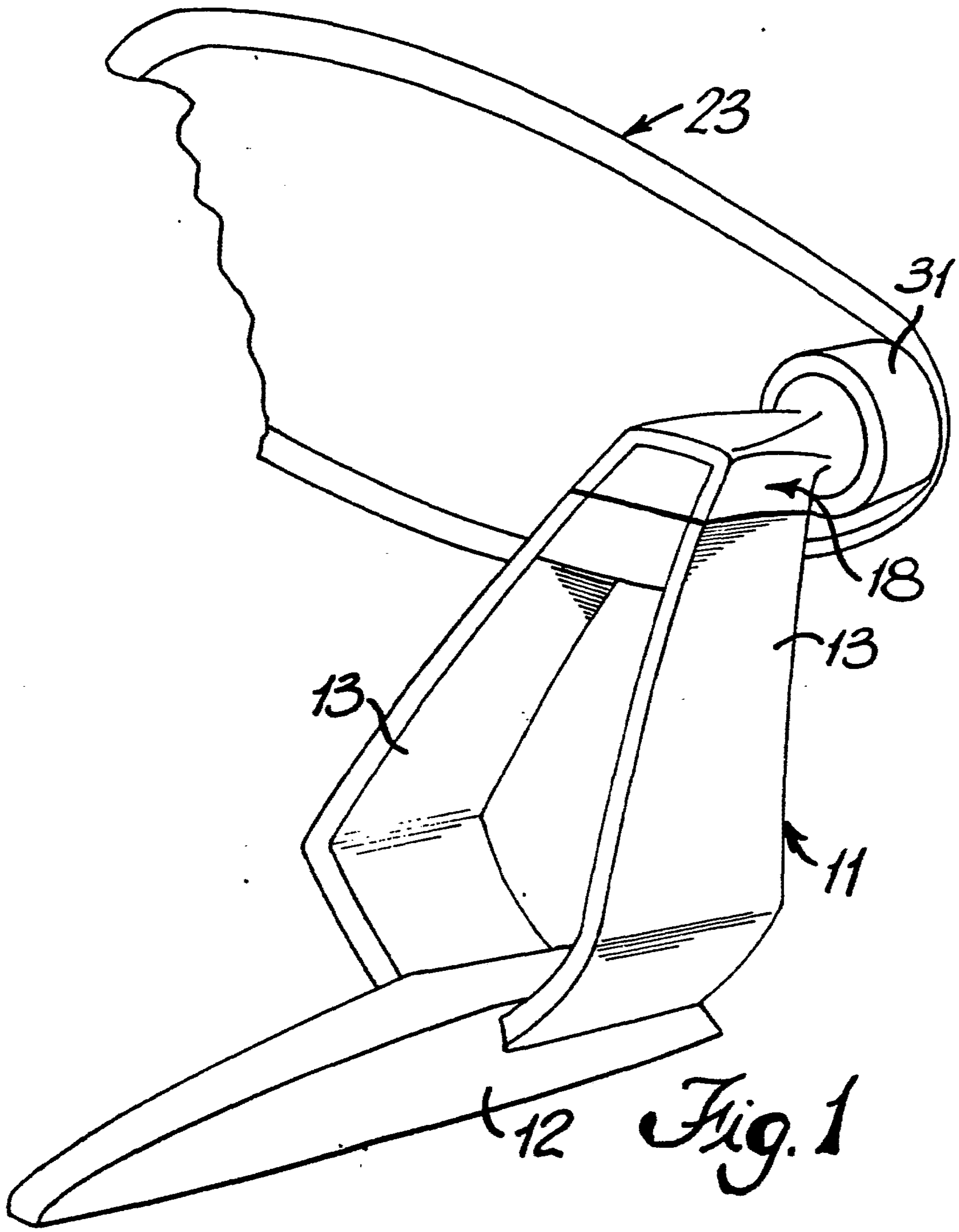


Fig. 1

Bek gem 2 1. JULI 1960

77a, 67/06. 1 815 368. Anastasia Meier, Wolfratshausen (Obb.). | Geschicklichkeitsspiel. 4. 5. 60. M 34 819. (T. 2; Z. 1)

Nr. 1 815 368 eingetr. 21.7.60

P.A. 373 032 * 18. 6. 60

1

Wolfratshausen, den 14. Juni 1960

An das
Deutsche Patentamt
München 2
Zweibrückenstr. 12

Aktenzeichen: M 34819/77a Gm

Hiermit melde ich
Anastasia Meier, (ledige) Landwirtstochter, in Wolfratshausen, Berggasse 24,
den in den Anlagen beschriebenen Gegenstand an und beantrage seine Eintragung in die Rolle für Gebrauchsmuster.
Die Bezeichnung lautet:

" Geschicklichkeitsspiel ".

Die Anmeldegebühr mit 30.- DM ist bereits auf das Postscheckkonto München 79191 der Amtskasse des Deutschen Patentamts eingezahlt worden.

Anlagen:

1) 2 weitere Stücke dieses Antrags,
2) 3 gleichlautende Schutzansprüche.

Alle für uns bestimmten Sendungen sind an mich zu richten.
Von diesem Antrag und allen Anlagen habe ich Abschriften zurückbehalten.

Meier Anastasia
(Meier Anastasia)

P.A. 353 361*-8. 6.60

Meier Anastasia, geb. Meier
Landwirtstochter, ledig
Wolfratshausen/Obb.
Berggasse 24

Wolfratshausen, den 2. Juni 1960

Antrag auf Gebrauchsmustereintragung

Das Gebrauchsmuster wird nur für obige Person nachgesucht. Es handelt sich um ein von mir als " Asta Ringspiel " bezeichnetes Kinderspiel. Es besteht aus einer kreisrunden Bodenplatte von 30 cm Durchmesser und 30 cm Höhe. In der Mitte der Bodenplatte ist ein 30 cm hoher Stab angebracht. Dazu gehört ein Ring aus Plastik. Dieser Ring wird über den Stab geworfen. Das Spiel ist ein Geschicklichkeitsspiel.

Ich beantrage hiermit für obenbezeichnetes und beschriebenes " Asta Ringspiel " die Eintragung eines Gebrauchsmusters beim Deutschen Patentamt München.

(Meier Anastasia)

Meier Anastasia

An das
Deutsche Patentamt
M ü n c h e n

Antrag auf Gebrauchsmustereintragung in dreifacher Fertigung.

P.A. 373 032 * 18. 6. 60 3

Meier Anastasia
Wolfratshausen
Berggasse 24

Wolfratshausen, den 14.6.1960

Aktenzeichen: M 34819/77a Gm.

S c h u t z a n s p r u c h

1) Schutzanspruch für das Geschicklichkeitsspiel:

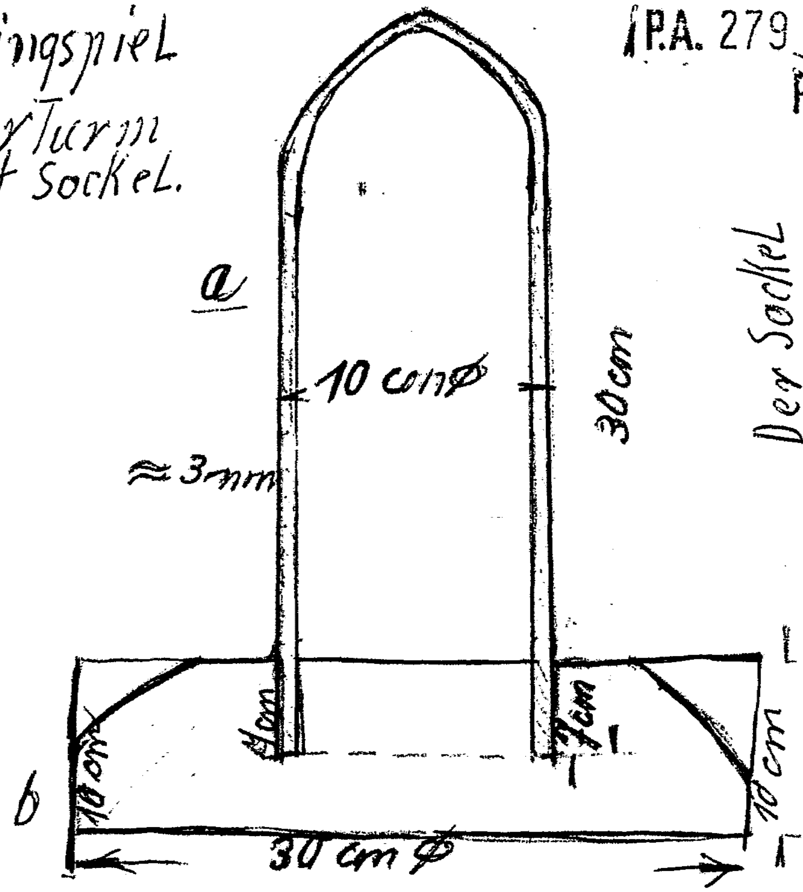
dadurch gekennzeichnet, dass sich in der Mitte einer kreisrunden Unterlage mit 30 cm Durchmesser und 17 cm Höhe ein runder etwa 30 cm hoher Stab erhebt, der an der kreisrunden Unterlage befestigt ist.

2) Geschicklichkeitsspiel nach Anspruch 1, dadurch gekennzeichnet, dass zu der kreisrunden Unterlage mit Stab noch ein Ring aus Plastik mit einem Durchmesser von etwa 30 cm gehört.

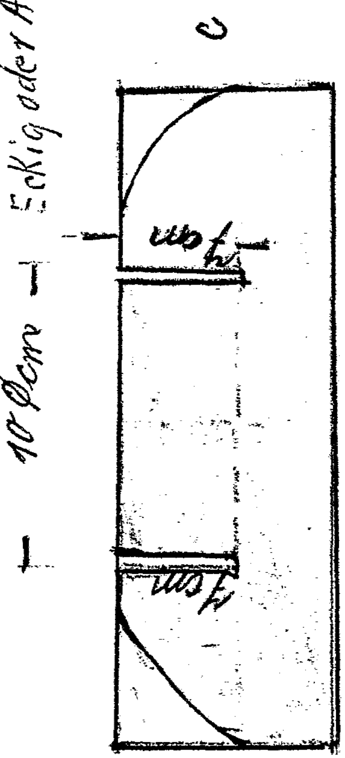
Meier Anastasia
(Meier Anastasia)

Asta Ringspiel
Der Turm
mit Sockel.

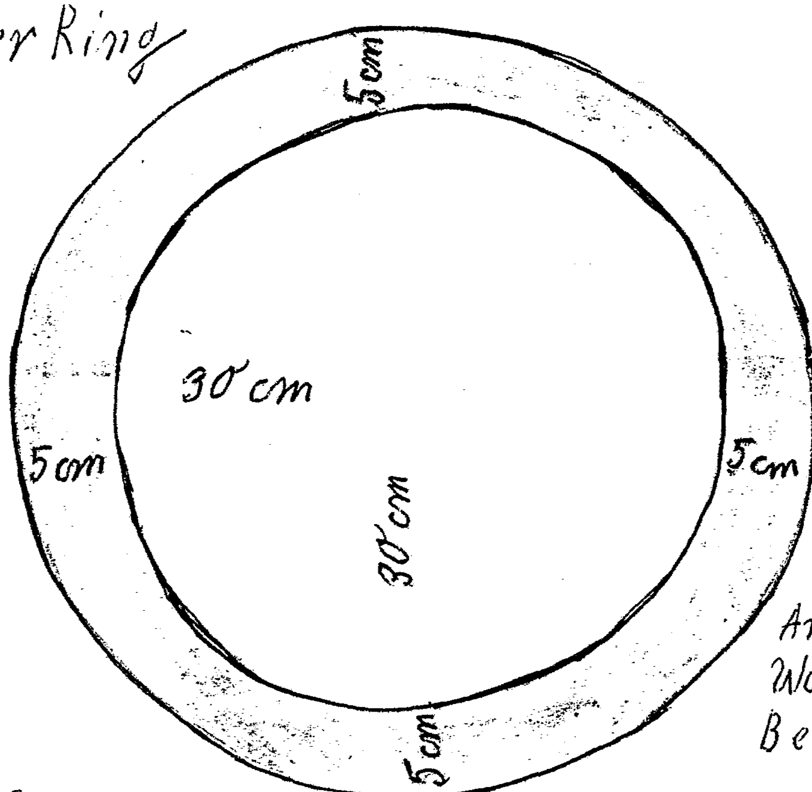
P.A. 279 656*-4. 5.60
P.A. 353 361*-8. 6.60



Der Sockel



Der Ring



Frl.
Anastasia Meier.
Wolfratshausen
Berggasse 24.

U 3x 819/77a

Notice

DESCRIPTION DE1815368

The invention relates to an adjustable from the outside exterior rearview mirrors for vehicles, especially motor vehicles, with an attached to a ball joint in the vehicle lever, a vehicle wall penetrating linkage and attached to the outer wall of the vehicle, the mirror carrier holding ball joint in which the two ball joints with each a shaft pointing into the vehicle wall are provided.

It is known to construct such mirrors so that the convincing from both sides in the interior of the driving convincing shafts in the center position of the mirror aligned and articulated overlap. A rotationally fixed connection of the shafts is achieved in that a trained in a Kugelgelenkkopt hexagon fits into a hexagon socket of the ball head cross-sleeve. Such mirrors can be mounted only where the ball joint of the actuating lever can be attached to the ball joint of the mirror directly opposite to the vehicle wall. This is not possible in many cases but for design reasons. In addition, it makes sense to attach the rearview mirror as far as possible, for example on a vehicle door, so that the head of the driver when looking in the mirror does not have to be turned too much. However, the lever should not normally be placed so far forward to be easily accessible.

In another known embodiment of a mirror adjustment, the ball joint of the adjusting lever is mounted on a surface which is perpendicular to the mounting surface of the mirror. To power two running at different angles, the ball joints connecting rods are used. In such an actuator does not occur exact Bewegungsungsanalogie between lever and mirror. An accurate guidance of the mirror is difficult to achieve.

Object of the present invention is to provide an externally adjustable exterior mirrors, in which the ball joint of the actuating lever and the ball joint of the mirror on the vehicle wall need not be directly opposite, and in the technically simple and reliable accurate guidance of the mirror. This object is achieved in an exterior rearview mirror of the type mentioned in the present invention, that the two staggered staggered shafts are rotatably connected by a parallelogram linkage.

Due to the rotationally fixed connection of the two shafts kann-. the mirror rotation about the shaft axis is usually about horizontally possible, while pivoting of the control lever about the inner ball joint of the associated shaft and the mounted on the mirror shaft is pivoted and thus a rotational movement of the mirror is caused about its vertical axis. In the same way, the mirror can also be pivoted about the horizontal axis lying parallel to the vehicle axis, but this type of movement has little significance. A significant advantage is that in the vehicle wall, only the two shafts and their connecting member are housed and that the ball joints can be very simple. On the ball of the ball-and-socket joint mounted in the vehicle interior, the adjusting lever is mounted on the outside and the associated shaft on the inside, while the mirror carrier and the other shaft are likewise rigidly fastened to the ball of the other joint.

The two shafts can be guided from each side of the outer wall to about the middle of the wall, and they are rigidly attached at their end in the middle of a vertically extending sheet. The upper ends and the lower ends of the two sheets may be connected to each other by articulated rods. By a rotation of the shaft attached to the lever, the associated sheet is also rotated, in such a way that its main axis now extends at an angle to the vertical. This angle is transmitted through the rigid rods on the other sheet, the associated shaft and thus also on the mirror. In this type of power transmission, it is not necessary to form one of the two shafts variable in length, since at a pivoting movement of the actuating lever, which is also transmitted, the forces pointing in the longitudinal direction of the shanks can be absorbed by the parallelogram bar.

The adjusting lever may consist of an angled lever rigidly connected to the corresponding shaft. Furthermore, he can wear a handle wheel at its end. For an easy-to-use, little obstructive actuator is created, and a very significant advantage is that each movement of the control lever is converted into a precisely corresponding movement of the mirror, so that virtually no mistakes can occur during operation. The tilting of the mirror takes place by turning the handle designed in the manner of a hand crank, while the lateral pivoting is made by pressing the adjusting lever to the vehicle wall or by subtracting from this.

In a preferred embodiment of the invention, the shaft ends are connected to one another by a parallelogram of bars, the rods of which extend approximately perpendicular to the shaft axes.

The invention will be explained below with reference to the figures of an embodiment. FIG. 1

shows a plan view of the mirror with the adjustment device required for adjustment, FIG. 2 shows a side view of the adjustment device and FIG. 3 is a section along the line III-III of Fig. 1st

In the illustrated exterior mirror, the mirror support 1 is offset relative to the adjusting lever 12 mounted on the outer wall of a vehicle. The outer panel of this wall is denoted by 2 and the inner panel by 3. It is assumed that the inner panel 3 is flat, while the outer panel 2 is curved upward. Both the adjusting lever 12 and the mirror support 1 are attached to ball joints 4,5, so that they are in principle pivotable about all three axes. The coupling of the two elements takes place by shafts 6, 7, which are rigidly mounted on the adjusting lever 12 and the support arm 14 for the mirror support 1. The shafts 6, 7 point from both sides into the interior of the vehicle wall, and their lying approximately in the middle of the vehicle wall ends have elongated shaped, in the normal state approximately perpendicular plates 10, 11, at the ends of the parallel rods 8, 9th with the sheets 10 and 11 a parallelogram linkage 8, 9, 10, 11 forming, are articulated screwed. The two shafts 6, 7 are connected to each other only by the parallelogram linkage 8, 9, 10, 11, and thereby rotational movements of the shaft 6 are transmitted to the shaft 7.

The adjusting lever 12 is designed as a hand crank with the rotatable grip wheel 13. A tilting and tilting of the mirror 1 is done by turning the hand crank 12th As a result, the shaft 6 is rotated about its longitudinal axis and the corresponding adjusting movement is transmitted to the shaft 7 via the rods 8, 9. In this way it is achieved that the mirror 1 executes the predetermined by the crank 12 tilt angle.

Since the hand crank 12 is fixed to the shaft 6 by the ball joint 4 on the wall 3, a pivoting of the running in the illustration parallel to the wall 3 crank arm is possible, in such a way that the crank arm is pressed either against the wall 3 or subtracted from it. The shaft 6 is in accordance with the pivotal movement of the crank arm in F i g. 1 pivoted about the ball joint 4 either to the right or left and transmits this pivotal movement on the rods 8, 9 on the shaft. 7 If the crank arm is thus pressed in the drawn position against the wall, the shafts 6, 7 are pivoted relative to the ball joints 4, 5 to the right.

The mirror 1 is accordingly further rotated towards the vehicle. The removal of the crank arm from the wall 3 causes a mirror rotation outwards about the vertical axis. Theoretically, it is possible to have the shafts 6, 7 also perform vertical pivoting movements and thereby perform a corresponding Spiegelverschwenknng, the two pivotal movements already described, however, are usually sufficient for mirror adjustment, and it can be provided in the ball joint 4, a lock that prevents a vertical pivoting movement of the shafts is made. This barrier may be that the opening provided in the socket of the ball joint 4 opening for the passage of the axis of the actuating lever

12 is not formed in the form of a round hole, but in the form of a horizontally extending slot. This ensures that only horizontal pivoting movements and rotations of the control lever 12 are transmitted to the mirror 1.

In the present embodiment, the mirror 1 relative to the adjusting lever 12 is not only arranged in the horizontal direction, but also slightly offset in the vertical direction, as that of F i g. 2 shows.

Claims: 1. Interior adjustable exterior rearview mirrors for vehicles, especially motor vehicles, with a mounted on a ball joint in the vehicle interior lever, a vehicle wall penetrating linkage and attached to the outer wall of the vehicle, the mirror carrier holding ball joint, wherein the two ball joints, each with a in the vehicle wall characterized in that the two offset staggered shafts (6, 7) by a parallelogram linkage (8, 9,10,11) rotatably connected to each other.

2.
Exterior rearview mirror according to Claim 1, characterized in that the adjusting lever (12) in a known manner consists of an angled lever rigidly connected to a shaft (6).

3.
Exterior rearview mirror according to claim 2, characterized in that the lever (12) carries in a known manner at its end a grip wheel (13).

Notice

DESCRIPTION DE1815368

The invention relates to an adjustable from the outside exterior rearview mirrors for vehicles, especially motor vehicles, with an attached to a ball joint in the vehicle lever, a vehicle wall penetrating linkage and attached to the outer wall of the vehicle, the mirror carrier holding ball joint in which the two ball joints with each a shaft pointing into the vehicle wall are provided.

Die Erfindung betrifft einen von innen einstellbaren Außenrückspiegel für Fahrzeuge, insbesondere Kraftfahrzeuge, mit einem an einem Kugelgelenk im Fahrzeuginnern angebrachten Stellhebel, einem die Fahrzeugwand durchdringenden Gestänge und einem an der Außenwand des Fahrzeuges befestigten, den Spiegelträger haltenden Kugelgelenk, bei welchem die beiden Kugelgelenke mit je einem in die Fahrzeugwand hineinweisenden Schaft versehen sind.

It is known to construct such mirrors so that the convincing from both sides in the interior of the driving convincing shafts in the center position of the mirror aligned and articulated overlap. A rotationally fixed connection of the shafts is achieved in that a trained in a Kugelgelenkkopt hexagon fits into a hexagon socket of the ball head cross-sleeve. Such mirrors can be mounted only where the ball joint of the actuating lever can be attached to the ball joint of the mirror directly opposite to the vehicle wall. This is not possible in many cases but for design reasons. In addition, it makes sense to attach the rearview mirror as far as possible, for example on a vehicle door, so that the head of the driver when looking in the mirror does not have to be turned too much. However, the lever should not normally be placed so far forward to be easily accessible.

Es ist bekannt, derartige Spiegel so aufzubauen, daß die von beiden Seiten in das Innere der Fahr zeugwand hineinragenden Schäfte in der Mittelstellung des Spiegels fluchten und gelenk artig übereinandergreifen. Eine drehfeste Verbindung der Schäfte wird dabei dadurch erzielt, daß ein in einen Kugelgelenkkopt eingearbeiteter Sechskant in einen Innensechskant einer den Kugelkopf übergreifenden Muffe hineinpaßt. Derartige Spiegel lassen sich nur dort montieren, wo das Kugelgelenk des Stellhebels dem Kugelgelenk des Spiegels unmittelbar gegenüberliegend an der Fahrzeugwand angebracht werden kann. Dies ist in vielen Fällen aber aus konstruktiven Gründen nicht möglich. Außerdem ist es sinnvoll, den Rückspiegel beispielsweise an einer Fahrzeugtür möglichst weit vorn anzubringen, damit der Kopf des Fahrers beim Einblicken in den Spiegel nicht zu sehr gedreht werden muß. Der Stellhebel darf jedoch normalerweise nicht so weit vorn angeordnet sein, um bequem zugänglich zu sein.

In another known embodiment of a mirror adjustment, the ball joint of the adjusting lever is mounted on a surface which is perpendicular to the mounting surface of the mirror. To power two running at different angles, the ball joints connecting rods are used. In such an actuator does not occur exact Bewegungsungsanalogie between lever and mirror. An accurate guidance of the mirror is difficult to achieve.

Bei einer anderen bekannten Ausführungsform einer Spiegelverstellung ist das Kugelgelenk des Stellhebels an einer Fläche angebracht, die senkrecht zur Befestigungsfläche des Spiegels steht. Zur Kraftübertragung werden zwei unter verschiedenen Winkeln verlaufende, die Kugelgelenke verbindende Stangen benutzt. Bei einer derartigen Stellvorrichtung tritt keine exakte Bewegungsanalogie zwischen Stellhebel und Spiegel auf. Eine genaue Führung des Spiegels ist schwer zu erzielen.

Object of the present invention is to provide an externally adjustable exterior mirrors, in which the ball joint of the actuating lever and the ball joint of the mirror on the vehicle wall need not be directly opposite, and in the technically simple and reliable accurate guidance of the mirror. This object is achieved in an exterior rearview mirror of the type mentioned in the present invention, that the two staggered staggered shafts are rotatably connected by a parallelogram linkage.

Aufgabe der vorliegenden Erfindung ist es, einen von innen einstellbaren Außenspiegel zu schaffen, bei dem sich das Kugelgelenk des Stellhebels und das Kugelgelenk des Spiegels an der Fahrzeugwand nicht unmittelbar gegenüberliegen müssen, und bei dem technisch einfach und zuverlässig eine genaue Führung des Spiegels erfolgt. Diese Aufgabe wird bei einem Außenrückspiegel der eingangs genannten Art erfindungsgemäß dadurch gelöst, daß die beiden gegeneinander versetzt angebrachten Schäfte durch ein Parallelogrammgestänge drehfest miteinander verbunden sind.

Due to the rotationally fixed connection of the two shafts kann-. the mirror rotation about the shaft axis is usually about horizontally possible, while pivoting of the control lever about the inner ball joint of the associated shaft and the mounted on the mirror shaft is pivoted and thus a rotational movement of the mirror is caused about its vertical axis. In the same way, the mirror can also be pivoted about the horizontal axis lying parallel to the vehicle axis, but this type of movement has little significance. A significant advantage is that in the vehicle wall, only the two shafts and their connecting member are housed and that the ball joints can be very simple. On the ball of the ball-and-socket joint mounted in the vehicle interior, the adjusting lever is mounted on the outside and the associated shaft on the inside, while the mirror carrier and the other shaft are likewise rigidly fastened to the ball of the other joint.

Durch die drehfeste Verbindung der beiden Schäfte kann-. die- Spiegeldrehung um- die zumeist etwa horizontal liegende Schaftachse ermöglicht werden, während durch Verschwenken des Stellhebels um das innere Kugelgelenk der zugehörige Schaft und auch der am Spiegel angebrachte Schaft verschwenkt wird und damit eine Drehbewegung des Spiegels um seine vertikale Achse verursacht wird. Auf dieselbe Weise kann der Spiegel auch um die parallel zur Fahrzeugachse liegende horizontale Achse verschwenkt werden, jedoch kommt dieser Bewegungsart nur eine geringe Bedeutung zu. Ein wesentlicher Vorteil besteht darin, daß in der Fahrzeugwand nur die beiden Schäfte und ihr Verbindungsglied untergebracht sind und daß die Kugelgelenke sehr einfach aufgebaut sein können. An der Kugel des im Fahrzeuginnern angebrachten Kugelgelenkes ist außen der Stellhebel und innen der zugehörige Schaft starr angebracht, während an der Kugel des anderen Gelenkes der Spiegelträger und der andere Schaft ebenfalls starr befestigt sind.

The two shafts can be guided from each side of the outer wall to about the middle of the wall, and they are rigidly attached at their end in the middle of a vertically extending sheet. The upper ends and the lower ends of the two sheets may be connected to each other by articulated rods. By a rotation of the shaft attached to the lever, the associated sheet is also rotated, in such a way that its main axis now extends at an angle to the vertical. This angle is transmitted through the rigid rods on the other sheet, the associated shaft and thus also on the mirror. In this type of power transmission, it is not necessary to form one of the two shafts variable in length, since at a pivoting movement of the actuating lever, which is also transmitted, the forces pointing in the longitudinal direction of the shanks can be absorbed by the parallelogram bar.

Die beiden Schäfte können von jeder Seite der Außenwand bis etwa zur Wandmitte geführt sein, und sie sind an ihrem Ende in der Mitte eines vertikal verlaufenden Bleches starr angebracht. Die oberen Enden und die unteren Enden der beiden Bleche können jeweils durch gelenkig angebrachte Stangen miteinander verbunden sein. Durch eine Drehung des am Stellhebel angebrachten Schaftes wird das zugehörige Blech ebenfalls gedreht, und zwar so, daß seine Hauptachse nun unter einem Winkel zur Vertikalen verläuft. Dieser Winkel wird durch die starren Stangen auf das andere Blech, den zugehörigen Schaft und damit auch auf den Spiegel übertragen. Bei dieser Art der Kraftübertragung ist es nicht notwendig, einen der beiden Schäfte längenveränderlich auszubilden, da bei einer Verschwenkbewegung des Stellhebels, die ebenfalls übertragen wird, die in Längsrichtung der Schäfte weisenden Kräfte vom Stangenparallelogramm aufgenommen werden können.

The adjusting lever may consist of an angled lever rigidly connected to the corresponding shaft. Furthermore, he can wear a handle wheel at its end. For an easy-to-use, little obstructive actuator is created, and a very significant advantage is that each movement of the control lever is converted into a precisely corresponding movement of the mirror, so that virtually no mistakes can occur during operation. The tilting of the mirror takes place by turning the handle designed in the manner of a hand crank, while the lateral pivoting is made by pressing the adjusting lever to the vehicle wall or by subtracting from this.

Der Stellhebel kann aus einem starr mit dem entsprechenden Schaft verbundenen abgewinkelten Hebel bestehen. Ferner kann er an seinem Ende ein Griffrad tragen. Damit ist eine einfach zu handhabende, wenig behindernde Stellvorrichtung geschaffen, und ein ganz wesentlicher Vorteil besteht darin, daß jede Bewegung des Stellhebels in eine genau entsprechende Bewegung des Spiegels umgesetzt wird, so daß bei der Bedienung praktisch kaum Fehlgriffe vorkommen können. Das Kippen des Spiegels erfolgt durch Drehen des nach Art einer Handkurbel ausgebildeten Stellhebels, während das seitliche Verschwenken durch Andrücken des Stellhebels an die Fahrzeugwand oder durch Abziehen von dieser vorgenommen wird.

In a preferred embodiment of the invention, the shaft ends are connected to one another by a parallelogram of bars, the rods of which extend approximately perpendicular to the shaft axes.

Bei einer bevorzugten Ausführungsform der Erfindung sind die Schaftenden durch ein Stangenparallelogramm, dessen Stangen etwa senkrecht zu den Schaftachsen verlaufen, miteinander verbunden.

The invention will be explained below with reference to the figures of an embodiment. FIG. 1 shows a plan view of the mirror with the adjustment device required for adjustment, FIG. 2 shows a side view of the adjustment device and FIG. 3 is a section along the line III-III of Fig. 1st

----

Die Erfindung wird im folgenden unter Bezugnahme auf die Figuren an einem Ausführungsbeispiel erläutert. Es zeigt Fig.1 eine Draufsicht des Spiegels mit der zur Einstellung erforderlichen Verstellvonichtung, Fig.2 eine Seitenansicht der Verstellvorrichtung und F i g. 3 einen Schnitt entlang der Linie III-III der Fig. 1.

In the illustrated exterior mirror, the mirror support 1 is offset relative to the adjusting lever 12 mounted on the outer wall of a vehicle. The outer panel of this wall is denoted by 2 and the inner panel by 3. It is assumed that the inner panel 3 is flat, while the outer panel 2 is curved upward. Both the adjusting lever 12 and the mirror support 1 are attached to ball joints 4,5, so that they are in principle pivotable about all three axes. The coupling of the two elements takes place by shafts 6, 7, which are rigidly mounted on the adjusting lever 12 and the support arm 14 for the mirror support 1. The shafts 6, 7 point from both sides into the interior of the vehicle wall, and their lying approximately in the middle of the vehicle wall ends have elongated shaped, in the normal state approximately perpendicular plates 10, 11, at the ends of the parallel rods 8, 9th with the sheets 10 and 11 a parallelogram linkage 8, 9, 10, 11 forming, are articulated screwed. The two shafts 6, 7 are connected to each other only by the parallelogram linkage 8, 9, 10, 11, and thereby rotational movements of the shaft 6 are transmitted to the shaft 7.

Bei dem dargestellten Außenspiegel ist der Spiegelträger 1 gegenüber dem Stellhebel 12 versetzt an der Außenwand eines Fahrzeuges angebracht. Das Außenblech dieser Wand ist mit 2 und das Innenblech mit 3 bezeichnet. Es sei angenommen, daß das Innenblech 3 eben verläuft, während das Außenblech 2 nach oben hin gekrümmt ist. Sowohl der Stellhebel 12 als auch der Spiegelträger 1 sind an Kugelgelenken4,5 befestigt, so daß sie prinzipiell um alle drei Achsen schwenkbar sind. Die Verkopplung beider Elemente erfolgt durch Schäfte 6, 7, die starr am Stellhebel 12 bzw. am Tragarm 14 für den Spiegelträger 1 angebracht sind. Die Schäfte 6, 7 weisen von beiden Seiten her in das Innere der Fahrzeugwand hinein, und ihre etwa in der Mitte der Fahrzeugwand liegenden Enden tragen länglich geformte, im Normalzustand etwa senkrecht stehende Bleche 10, 11, an deren Enden die parallelen Stangen 8, 9 mit den Blechen 10 und 11 ein Parallelogrammgestänge 8, 9, 10, 11 bildend, gelenkig angeschraubt sind. Die beiden Schäfte 6, 7 sind nur durch das Parallelogrammgestänge 8, 9, 10, 11 miteinander verbunden, und es werden dadurch Drehbewegungen des Schaftes 6 auf den Schaft 7 übertragen.

The adjusting lever 12 is designed as a hand crank with the rotatable grip wheel 13. A tilting and tilting of the mirror 1 is done by turning the hand crank 12th As a result, the shaft 6 is rotated about its longitudinal axis and the corresponding adjusting movement is transmitted to the shaft 7 via the rods 8, 9. In this way it is achieved that the mirror 1 executes the predetermined by the crank 12 tilt angle.

Der Stellhebel 12 ist als Handkurbel mit dem drehbaren Griffrad 13 ausgebildet. Ein Auf- und Abkippen des Spiegels 1 erfolgt durch Drehen der Handkurbel 12. Dadurch wird der Schaft 6 um seine Längsachse gedreht und die entsprechende Stellbewegung über die Stangen 8, 9 auf den Schaft 7 übertragen. Auf diese Weise wird erreicht, daß der Spiegel 1 den durch die Kurbel 12 vorgegebenen Kippwinkel ausführt.

Since the hand crank 12 is fixed to the shaft 6 by the ball joint 4 on the wall 3, a pivoting of the running in the illustration parallel to the wall 3 crank arm is possible, in such a way that the crank arm is pressed either against the wall 3 or subtracted from it. The shaft 6 is in accordance with the pivotal movement of the crank arm in F i g. 1 pivoted about the ball joint 4 either to the right or left and transmits this pivotal movement on the rods 8, 9 on the shaft. 7 If the crank arm is thus pressed in the drawn position against the wall, the shafts 6, 7 are pivoted relative to the ball joints 4, 5 to the right.

Da die Handkurbel 12 mit dem Schaft 6 durch das Kugelgelenk 4 an der Wand 3 befestigt ist, ist auch ein Verschwenken des in der Darstellung parallel zur Wand 3 verlaufenden Kurbelarmes möglich, und zwar in der Art, daß der Kurbelarm entweder gegen die Wand 3 gedrückt oder von ihr abgezogen wird. Der Schaft 6 wird entsprechend der Schwenkbewegung des Kurbelarmes in F i g. 1 um das Kugelgelenk 4 herum entweder nach rechts oder links verschwenkt und überträgt diese Schwenkbewegung über die Stangen 8, 9 auf den Schaft 7. Wird der Kurbelarm also in der gezeichneten Stellung gegen die Wand gedrückt, so werden die Schäfte 6, 7 gegenüber den Kugelgelenken 4, 5 nach rechts verschwenkt.

The mirror 1 is accordingly further rotated towards the vehicle. The removal of the crank arm from the wall 3 causes a mirror rotation outwards about the vertical axis. Theoretically, it is possible to have the shafts 6, 7 also perform vertical pivoting movements and thereby perform a corresponding Spiegelverschwenknng, the two pivotal movements already described, however, are usually sufficient for mirror adjustment, and it can be provided in the ball joint 4, a lock that prevents a vertical pivoting movement of the shafts is made. This barrier may be that the opening provided in the socket of the ball joint 4 opening for the passage of the axis of the actuating lever 12 is not formed in the form of a round hole, but in the form of a horizontally extending slot. This ensures that only horizontal pivoting movements and rotations of the control lever 12 are transmitted to the mirror 1.

Der Spiegel 1 wird dementsprechend weiter zum Fahrzeug hin gedreht. Das Abziehen des I(urbelarmes von der Wand 3 verursacht eine Spiegeldrehung nach außen um die vertikale Achse. Theoretisch ist es möglich, die Schäfte 6, 7 auch vertikale Schwenkbewegungen ausführen zu lassen und dadurch eine entsprechende Spiegelverschwenknng durchzuführen, die beiden bereits beschriebenen Schwenkbewegungen reichen jedoch normalerweise zur Spiegeleinstellung aus, und es kann im Kugelgelenk 4 eine Sperre vorgesehen sein, die verhindert, daß eine vertikale Schwenkbewegung der Schäfte vorgenommen wird. Diese Sperre kann darin bestehen, daß die in der Gelenkpfanne des Kugelgelenkes 4 vorgesehene Öffnung zum Durchtritt der Achse des Stellhebels 12 nicht in Form eines runden Loches, sondern in Form eines horizontal verlaufenden Langloches ausgebildet ist. Dadurch wird erreicht, daß nur horizontale Schwenkbewegungen sowie Drehungen des Stellhebels 12 auf den Spiegel 1 übertragen werden.

In the present embodiment, the mirror 1 relative to the adjusting lever 12 is not only arranged in the horizontal direction, but also slightly offset in the vertical direction, as that of F i g. 2 shows.

Im vorliegenden Ausführungsbeispiel ist der Spiegel 1 gegenüber dem Stellhebel 12 nicht nur in horizontaler Richtung, sondern auch geringfügig in vertikaler Richtung versetzt angeordnet, wie das aus F i g. 2 hervorgeht.

Claims: 1. Interior adjustable exterior rearview mirrors for vehicles, especially motor vehicles, with a mounted on a ball joint in the vehicle interior lever, a vehicle wall penetrating linkage and attached to the outer wall of the vehicle, the mirror carrier holding ball joint, wherein the two ball joints, each with a in the vehicle wall characterized in that the two offset staggered shafts (6, 7) by a parallelogram linkage (8, 9,10,11) rotatably connected to each other.

Patentansprüche: 1. Von innen einstellbarer Außenrückspiegel für Fahrzeuge, insbesondere Kraftfahrzeuge, mit einem an einem Kugelgelenk im Fahrzeuginnern angebrachten Stellhebel, einem die Fahrzeugwand durchdringenden Gestänge und einem an der Außenwand des Fahrzeuges befestigten, den Spiegelträger haltenden Kugelgelenk, bei welchem die beiden Kugelgelenke mit je einem in die Fahrzeugwand hineinweisenden Schaft versehen sind, dadurch gekennzeichnet, daß die beiden gegeneinander versetzt angebrachten Schäfte (6, 7) durch ein Parallelogrammgestänge (8, 9,10,11) drehfest miteinander verbunden sind.

2.

Exterior rearview mirror according to Claim 1, characterized in that the adjusting lever (12) in a known manner consists of an angled lever rigidly connected to a shaft (6).

Außenrückspiegel nach Anspruch 1, dadurch gekennzeichnet, daß der Stellhebel (12) in bekannter Weise aus einem starr mit einem Schaft (6) verbundenen abgewinkelten Hebel besteht.

3.

Exterior rearview mirror according to claim 2, characterized in that the lever (12) carries in a known manner at its end a grip wheel (13).

Außenrückspiegel nach Anspruch 2, dadurch gekennzeichnet, daß der Hebel (12) in bekannter Weise an seinem Ende ein Griffrad (13) trägt.

Espacenet

Bibliographic data: DE19538770 (A1) — 1997-04-24

Car outside rear view mirror

Inventor(s): NAGEL BERND [DE]; WALDMANN BERND [DE] + (NAGEL, BERND, 71229 LEONBERG, DE, ; WALDMANN, BERND, 73733 ESSLINGEN, DE, ; NAGEL, BERND, ; WALDMANN, BERND)

Applicant(s): REITTER & SCHEFENACKER GMBH [DE] + (REITTER & SCHEFENACKER GMBH & CO. KG, 73730 ESSLINGEN, DE, ; SMR PATENTS S.A.R.L)

Classification:
- **international:** ***B60Q1/26; B60R1/12; B60R25/00; G07C9/00;*** (IPC1-7): B60Q1/38; B60R1/06; B60R1/12; B60R25/04; E05B65/12
- **cooperative:** **B60Q1/2665**; **B60R1/12**; **B60R1/1207**; **B60R25/00**; **G07C9/00182**; G07C2009/00769

Application number: DE1995138770 19951018

Priority number (s): DE1995138770 19951018

Also published as: DE19538770 (B4) US5774283 (A)

Abstract of DE19538770 (A1)

An outside rear view mirror for cars has a flashing lamp (10) in the head of the mirror and at least one receiver (11) for control signals. Both are in a chamber within the mirror head. The lamp sits behind a coloured but transparent window. The window is on the end of the head furthest from the foot, on the outer side. The window is curved in the height direction. The lamp is an LED or neon lamp or is formed from optic fibre conductor. The receiver is behind the window and the window is transparent for control signals. If there are two receivers, they have overlapping reception areas. The receiver (s) are part of the anti-theft or door lock system.

(19) BUNDESREPUBLIK DEUTSCHLAND

DEUTSCHES PATENTAMT

(12) **Offenlegungsschrift**

(10) **DE 195 38 770 A 1**

(51) Int. Cl.[6]:
B 60 R 1/06
B 60 R 1/12
B 60 R 25/04
B 60 Q 1/38
E 05 B 65/12

(21) Aktenzeichen: 195 38 770.8
(22) Anmeldetag: 18. 10. 95
(43) Offenlegungstag: 24. 4. 97

DE 195 38 770 A 1

(71) Anmelder:
Reitter & Schefenacker GmbH & Co. KG, 73730 Esslingen, DE

(74) Vertreter:
Jackisch-Kohl und Kollegen, 70469 Stuttgart

(72) Erfinder:
Nagel, Bernd, 71229 Leonberg, DE; Waldmann, Bernd, 73733 Esslingen, DE

(54) Außenrückblickspiegel für Fahrzeuge, vorzugsweise für Kraftfahrzeuge

(57) Der Außenrückblickspiegel hat einen Spiegelfuß und einen Spiegelkopf, der einen Spiegelglasträger aufweist. Der Spiegelkopf läßt sich gegenüber dem Spiegelfuß von Hand oder motorisch in Fahrtrichtung des Fahrzeuges nach hinten abklappen.
Um die Verkehrssicherheit des Fahrzeuges bei konstruktiv einfacher Ausbildung des Außenrückblickspiegels weiter zu erhöhen, sind im Spiegelkopf ein Blinklicht und wenigstens ein Empfänger für Fernsteuersignale untergebracht. Dadurch sind für die Blinkleuchte und den Empfänger keine gesonderten Einbauräume im Fahrzeug erforderlich.
Der im Spiegelkopf untergebrachte Empfänger ist vom Sender einfach zu erreichen, so daß der Fahrer von außen die Wegfahrsperre oder eine Türverriegelung ohne Schwierigkeiten betätigen kann.

DE 195 38 770 A 1

Beschreibung

Die Erfindung betrifft einen Außenrückblickspiegel für Fahrzeuge, vorzugsweise für Kraftfahrzeuge, nach dem Oberbegriff des Anspruches 1.

Es sind Außenrückblickspiegel bekannt, bei denen der Spiegelkopf gegenüber dem Spiegelfuß von Hand oder motorisch in Fahrtrichtung des Fahrzeuges nach hinten abgeklappt werden kann. Zudem läßt sich der Spiegelglasträger im Spiegelkopf in der Regel vom Inneren des Fahrzeuges aus auf den Fahrer einstellen. Dadurch ist eine einwandfreie Sicht des Fahrers gewährleistet, wodurch eine hohe Verkehrssicherheit erreicht wird.

Der Erfindung liegt die Aufgabe zugrunde, den gattungsgemäßen Außenrückblickspiegel so auszubilden, daß die Verkehrssicherheit des Fahrzeuges bei konstruktiv einfacher Ausbildung weiter erhöht wird.

Diese Aufgabe wird beim gattungsgemäßen Außenrückblickspiegel erfindungsgemäß mit den kennzeichnenden Merkmalen des Anspruches 1 gelöst.

Der erfindungsgemäße Außenrückblickspiegel weist im Spiegelkopf die Blinkleuchte sowie den Empfänger für die Fernsteuersignale auf. Dadurch sind für die Blinkleuchte und den Empfänger keine gesonderten Einbauräume im Fahrzeug notwendig. Für den Einbau dieser Teile wird der ohnehin am Fahrzeug vorhandene Spiegelkopf des Außenrückblickspiegels herangezogen. Die elektrischen Zuleitungen zum Blinklicht und zum Empfänger können durch den Spiegelfuß in den Spiegelkopf hindurchgeführt werden. Hierfür sind am Fahrzeug keine zusätzlichen Bohrungen vorzusehen, so daß die damit zusammenhängenden Probleme hinsichtlich Korrosion einfach und zuverlässig vermieden werden. Das Blinklicht ist am erfindungsgemäßen Außenrückblickspiegel deutlich sichtbar, insbesondere auch für neben dem Fahrzeug befindliche Verkehrsteilnehmer. Sie können dadurch rechtzeitig und deutlich die Absicht des Fahrers erkennen, mit seinem Fahrzeug abzubiegen. Der im Spiegelkopf untergebrachte Empfänger ist vom entsprechenden Sender, der die Fernsteuersignale aussendet, einfach zu erreichen, so daß der Fahrer beispielsweise von außen die Wegfahrsperre oder eine Türverriegelung des Fahrzeuges ohne Schwierigkeiten betätigen kann.

Weitere Merkmale der Erfindung ergeben sich aus den weiteren Ansprüchen, der Beschreibung und der Zeichnung.

Die Erfindung wird anhand eines in der Zeichnung dargestellten Ausführungsbeispieles näher erläutert. Die Zeichnung zeigt in Draufsicht und teilweise im Schnitt einen erfindungsgemäßen Außenrückblickspiegel.

Er hat einen Spiegelfuß **1**, mit dem er in bekannter Weise an der Seite eines Fahrzeuges, vorzugsweise eines Kraftfahrzeuges, befestigt wird. Der Außenrückblickspiegel hat ferner einen Spiegelkopf **2**, der quer vom Spiegelfuß **1** absteht. Der Spiegelkopf **2** kann gegenüber dem Spiegelfuß **1** abklappbar ausgebildet sein. Vorzugsweise läßt sich der Spiegelkopf **2** motorisch in Fahrtrichtung nach hinten aus der in der Zeichnung dargestellten Gebrauchslage in eine Parklage relativ zum Spiegelfuß **1** abklappen.

Eine solche Ausbildung eines Außenrückblickspiegels ist bekannt und wird darum nicht näher beschrieben.

Der Spiegelkopf **2** hat ein Spiegelgehäuse **3**, in dem ein plattenförmiger Spiegelglasträger **4** untergebracht ist. Er ist in bekannter Weise über eine Kugelgelenklagerung **5** im Spiegelgehäuse **3** verstellbar gelagert und trägt ein Spiegelglas **6**. Die Verstellung des Spiegelglasträgers **4** kann vom Innenraum des Fahrzeuges aus von Hand oder elektromotorisch erfolgen.

Das Spiegelgehäuse **3** weist auf seiner in Fahrtrichtung nach vorn weisenden Seite **7** ein lichtdurchlässiges Fenster **8** auf. Es deckt einen Einbauraum **9** ab, in dem mindestens ein Blinklicht **10** und mindestens ein Empfänger **11** untergebracht sind. Das Blinklicht **10** kann durch wenigstens eine LED, wenigstens eine Glühlampe, durch Lichtleitermaterial oder wenigstens ein Neonlicht gebildet sein. Zur Halterung des Blinklichtes **10** ist im Einbauraum **9** ein Träger **12** vorgesehen. Das Fenster **8** besteht aus lichtdurchlässigem Material, wie Glas, Kunststoff und dergleichen. Die Rückseite **13** des Fensters **8** hat vorteilhaft Linsen- bzw. Prismenelemente **14**. Durch sie wird das vom Blinklicht **10** ausgesandte Licht optimal gebrochen. Das Fenster **8** kann orange eingefärbt sein. Es ist aber auch möglich, zwischen dem Blinklicht **10** und dem Fenster **8** entsprechend eingefärbte Filter vorzusehen, so daß das vom Blinklicht **10** ausgesandte Licht die erforderliche Orangefärbung hat. In diesem Falle besteht das Fenster **8** aus glasklarem Material. Schließlich ist es möglich, das Blinklicht **10** selbst entsprechend einzufärben.

Das Fenster **8** befindet sich an dem vom Spiegelfuß **1** abgewandten Ende des Spiegelgehäuses **3**. Es erstreckt sich bis zu einem Rahmen **15**, der die dem Fahrer zugewandte und das Spiegelglas **6** enthaltende Öffnung des Spiegelgehäuses **3** umgibt. Da die Vorderseite **7** des Spiegelgehäuses **3**, in Draufsicht gesehen, in Fahrtrichtung nach hinten gekrümmt verläuft, ist das Blinklicht nicht nur von vorn, sondern auch von der Seite des Fahrzeuges aus zu erkennen. Dadurch ist eine hohe Verkehrssicherheit gewährleistet. Insbesondere neben dem Fahrzeug befindliche Verkehrsteilnehmer (Fahrrad- und Motorradfahrer sowie Fußgänger) können, auch wenn sie sich seitlich neben dem Fahrzeug befinden, die Absicht des Fahrers deutlich und frühzeitig erkennen, mit seinem Fahrzeug abzubiegen. Auch in Höhenrichtung ist das Fenster **8** ausreichend groß, so daß eine großflächige Blinkleuchte gebildet ist.

Im Einbauraum **9** sind vorteilhaft zwei Empfänger **11, 11'** vorgesehen, die auf Infrarotstrahlung, Ultraschall und dergleichen ansprechen. Diese Empfänger **11, 11'** können Bestandteil beispielsweise der Wegfahrsperre oder Türverriegelung des Kraftfahrzeuges sein. Der Fahrer des Kraftfahrzeuges kann mit einem Sender demgemäß die Wegfahrsperre oder die Türverriegelung von außen ein- oder ausschalten. Die Empfänger **11, 11'** sind in die entsprechenden Schaltkreise des Kraftfahrzeuges integriert. Um einen möglichst großen Empfangsbereich zu erreichen, sind die Empfänger **11, 11'**, wie die Zeichnung zeigt, im Bereich der beiden Enden des Fensters **8** angeordnet, in Draufsicht auf den Außenrückblickspiegel gesehen. Das Fenster **8** ist zumindest im Bereich der Empfänger **11, 11'** für die entsprechenden Signale durchlässig. Aufgrund der beschriebenen Anordnung der Empfänger **11, 11'** muß der Sender nicht genau in Richtung auf den Empfänger gerichtet sein, wodurch die Betätigung beispielsweise der Wegfahrsperre oder der Türverriegelung wesentlich erleichtert wird. Im Einbauraum **9** können selbstverständlich noch weitere Empfänger angeordnet sein, um noch unabhängiger von der Strahlrichtung des Senders zu sein.

Auch im Spiegelfuß **1** kann ein derartiger Empfänger **16** vorgesehen sein. Vorteilhaft ist er auf der in Fahrtrichtung rückwärtigen Seite **17** des Spiegelfußes **1** vorgesehen, so daß die entsprechende Einrichtung des Kraftfahrzeuges auch von der Rückseite des Außenrückblickspiegels aus betätigt werden kann. Selbstverständlich kann der Empfänger **16** auch an der in Fahrtrichtung vorn liegenden Seite **18** des Spiegelfußes **1** vorgesehen sein. Es ist auch möglich, an beiden Seiten **17** und **18** des Spiegelfußes **1** jeweils mindestens einen Empfänger **16** anzuordnen.

Da Kraftfahrzeuge in der Regel einen rechten und einen linken Außenrückblickspiegel haben, sind vorteilhaft beide Außenrückblickspiegel in der beschriebenen Weise ausgebildet. Dadurch können die entsprechenden Einrichtungen des Kraftfahrzeuges von beiden Seiten aus betätigt werden.

Die elektrische Zuleitung zum Blinklicht **10** und zu den Empfängern **11, 11', 16** erfolgt durch den Spiegelfuß **1**, der ohnehin an der dem Kraftfahrzeug zugewandten Seite zur Durchführung der entsprechenden Elemente zum Abklappen des Spiegelkopfes **2** sowie zur Verstellung des Spiegelglasträgers **4** offen ist. Darum kann diese Durchführöffnung des Außenrückblickspiegels auch für die elektrischen Zuleitungen benutzt werden. Dadurch ist es nicht erforderlich, in der Fahrzeugkarosserie zusätzliche Löcher anzubringen, die anschließend nachbehandelt werden müssen und die dennoch Probleme im Hinblick auf die Korrosion bereiten. Da der Außenrückblickspiegel ohnehin hohl ist, wird der dort vorhandene Raum zum Einbau des Blinklichtes **10** und der Empfänger **11, 11', 16** genutzt. Dabei wird durch das im Spiegelkopf **2** untergebrachte Blinklicht **10** zusätzlich die Verkehrssicherheit des Fahrzeuges wesentlich erhöht.

Das Blinklicht **10** kann in den Schaltkreis der Blinkleuchten des Kraftfahrzeuges integriert sein. In diesem Falle bildet das Blinklicht **10** eine Wiederholblinkleuchte, die beim Betätigen des Blinkers zusammen mit den Blinkleuchten des Kraftfahrzeuges aufleuchtet. Es ist aber auch möglich, für das Blinklicht **10** einen eigenen Schaltkreis vorzusehen. In diesem Falle kann sie als unabhängige Blinkleuchte eingesetzt werden. Es ist auch möglich, sofern es die gesetzlichen Bestimmungen zulassen, am Kraftfahrzeug lediglich die in den Außenrückblickspiegeln integrierten Blinklichter **10** als Blinker einzusetzen.

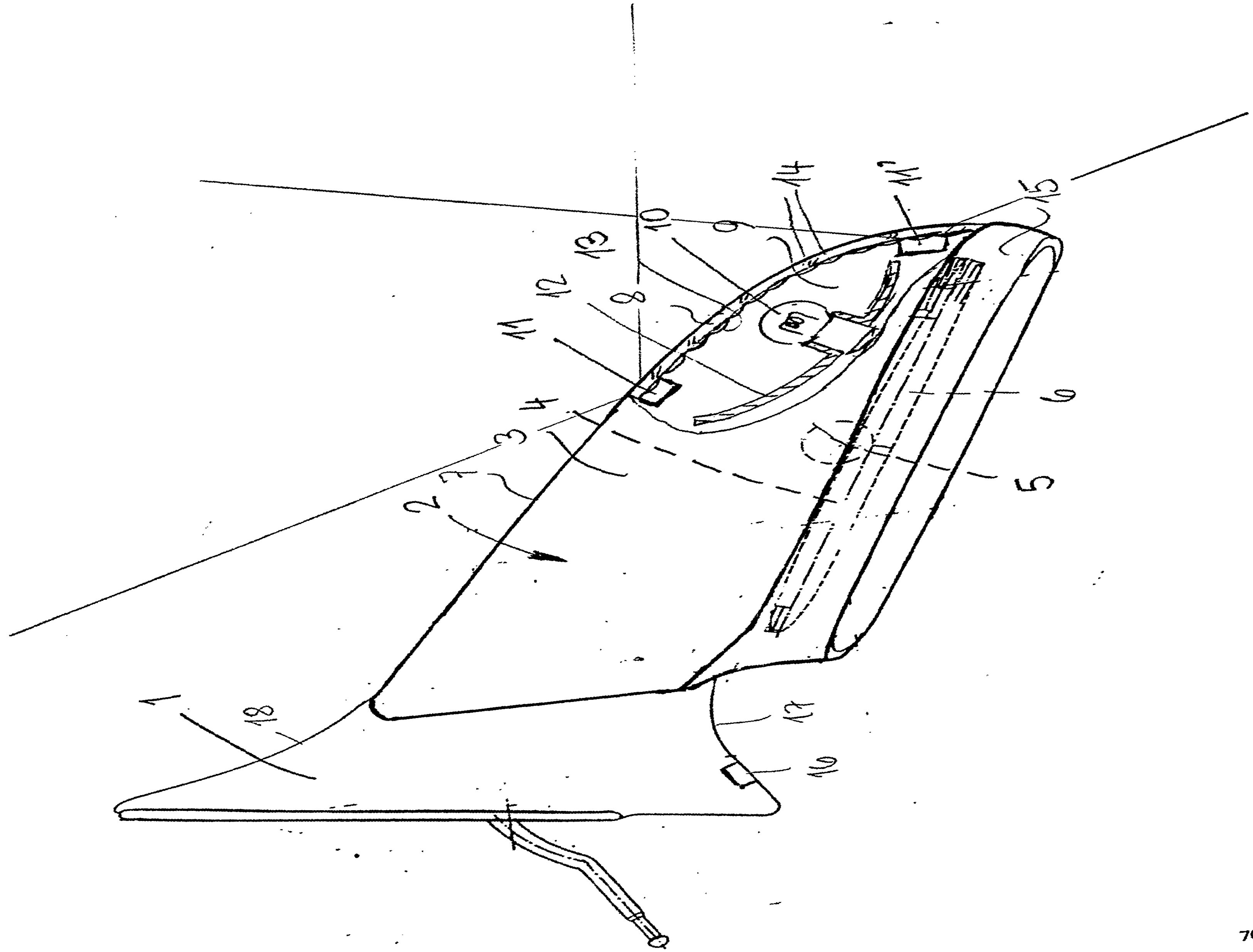
Die Außenrückblickspiegel werden mit ihrem Spiegelfuß **1** am in Fahrtrichtung vorderen Bereich des Seitenfensters der Wagentür in bekannter Weise montiert.

Patentansprüche

1. Außenrückblickspiegel für Fahrzeuge, vorzugsweise für Kraftfahrzeuge, mit einem Spiegelfuß und einem Spiegelkopf, der einen Spiegelglasträger aufweist, **dadurch gekennzeichnet,** daß im Spiegelkopf (2) ein Blinklicht (10) und wenigstens ein Empfänger (11, 11') für Fernsteuersignale untergebracht sind.
2. Außenrückblickspiegel nach Anspruch 1, dadurch gekennzeichnet, daß das Blinklicht (10) und der Empfänger (11, 11') in einem gemeinsamen Einbauraum (9) des Spiegelkopfes (2) angeordnet sind.
3. Außenrückblickspiegel nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß das Blinklicht (10) hinter einem lichtdurchlässigen Fenster (8) sitzt.
4. Außenrückblickspiegel nach Anspruch 3, dadurch gekennzeichnet, daß das Fenster (8) eingefärbt ist.
5. Außenrückblickspiegel nach Anspruch 3 oder 4, dadurch gekennzeichnet, daß das Fenster (8) an dem vom Spiegelfuß (1) abgewandten Ende des Spiegelkopfes (2) vorgesehen ist.
6. Außenrückblickspiegel nach einem der Ansprüche 3 bis 5, dadurch gekennzeichnet, daß das Fenster (8) in der Außenseite (7) des Spiegelgehäuses (3) liegt.
7. Außenrückblickspiegel nach einem der Ansprüche 3 bis 6, dadurch gekennzeichnet, daß das Fenster (8) in Richtung auf das freie Ende des Spiegelkopfes (2) in Fahrtrichtung des Fahrzeuges nach hinten gekrümmt ausgebildet ist.
8. Außenrückblickspiegel nach einem der Ansprüche 3 bis 7, dadurch gekennzeichnet, daß das Fenster (8) in Höhenrichtung gekrümmt verläuft.
9. Außenrückblickspiegel nach einem der Ansprüche 1 bis 8, dadurch gekennzeichnet, daß das Blinklicht (10) wenigstens eine LED ist.
10. Außenrückblickspiegel nach einem der Ansprüche 1 bis 8, dadurch gekennzeichnet, daß das Blinklicht (10) durch Lichtleitermaterial gebildet ist.
11. Außenrückblickspiegel nach einem der Ansprüche 1 bis 8, dadurch gekennzeichnet, daß das Blinklicht (10) durch eine Neonlampe gebildet ist.
12. Außenrückblickspiegel nach einem der Ansprüche 1 bis 11, dadurch gekennzeichnet, daß der Empfänger (11, 11') im Bereich hinter dem Fenster (8) angeordnet ist.
13. Außenrückblickspiegel nach Anspruch 12, dadurch gekennzeichnet, daß das Fenster (8) zumindest im Bereich des Empfängers (11, 11') für Fernsteuersignale durchlässig ist.
14. Außenrückblickspiegel nach einem der Ansprüche 1 bis 13, dadurch gekennzeichnet, daß im Spiegelkopf (2) zwei Empfänger (11, 11') vorgesehen sind.
15. Außenrückblickspiegel nach Anspruch 14, dadurch gekennzeichnet, daß die beiden Empfänger (11, 11') einander überlappende Empfangsbereiche haben.
16. Außenrückblickspiegel nach einem der Ansprüche 1 bis 15, dadurch gekennzeichnet, daß im Spiegelfuß (1) wenigstens ein weiterer Empfänger (16) für Fernsteuersignale angeordnet ist.
17. Außenrückblickspiegel nach Anspruch 16, dadurch gekennzeichnet, daß der weitere Empfänger (16) an der in Fahrtrichtung des Fahrzeuges rückwärtigen Seite (17) des Spiegelfußes (1) vorgesehen ist.
18. Außenrückblickspiegel nach einem der Ansprüche 1 bis 17, dadurch gekennzeichnet, daß das Blinklicht (10) in den Schaltkreis der Blinkleuchten des Fahrzeuges integriert ist.
19. Außenrückblickspiegel nach einem der Ansprüche 1 bis 17, dadurch gekennzeichnet, daß das Blinklicht (10) einen eigenen, an die Stromversorgung des Fahrzeuges angeschlossenen Schaltkreis hat.
20. Außenrückblickspiegel nach einem der Ansprüche 1 bis 19, dadurch gekennzeichnet, daß der Empfänger (11, 11', 16) Teil einer Wegfahrsperre und/oder einer Türverriegelung des Fahrzeuges ist.

Hierzu 1 Seite(n) Zeichnungen

Nummer: B 60 R
Int. Cl.^{6}:
Offenlegungstag: 24. April 1997



Espacenet

Bibliographic data: DE19601429 (C1) — 1997-04-10

Mounting for adjustable exterior mirror on motor vehicle

Inventor(s): WOEHLER HELMUT [DE] + (WOEHLER, HELMUT, 24107 KIEL, DE)

Applicant(s): MAK SYSTEM GMBH [DE] + (MAK SYSTEM GESELLSCHAFT MBH, 24159 KIEL, DE)

Classification:
- international: ***B60R1/076;*** (IPC1-7): B60R1/06
- cooperative: **B60R1/076**

Application number: DE1996101429 19960117

Priority number (s): DE1996101429 19960117

Abstract of DE19601429 (C1)

The mounting supports an adjustable exterior mirror on a motor vehicle. The mirror has a head which is joined to a pivoting rod, which is connected to the vehicle by a foot (2a). The latter has notched equipment for predetermined angular positions of the mirror. Two rotary bearings (6,7) which are joined into one unit, are arranged in the foot, and have pivot axes (X-X,Z-Z) for the mirror which are normal to one another. Each bearing has equipment for at least two adjustment positions in notches in a sleeve, with a folded rest position, an intermediate position, and an unfolded operating position of the mirror head. Each bearing also has a notched sleeve in a bearing case (11,12), which allows fine adjustment of the mirror, and which can be secured against rotation by threaded pins.

(19) BUNDESREPUBLIK DEUTSCHLAND

DEUTSCHES PATENTAMT

(12) **Patentschrift**

(10) **DE 196 01 429 C 1**

(51) Int. Cl.^{6}:
B 60 R 1/06

(21) Aktenzeichen: 196 01 429.8-51
(22) Anmeldetag: 17. 1. 96
(43) Offenlegungstag: —
(45) Veröffentlichungstag der Patenterteilung: 10. 4. 97

DE 196 01 429 C 1

Innerhalb von 3 Monaten nach Veröffentlichung der Erteilung kann Einspruch erhoben werden

(73) Patentinhaber:
MaK System Gesellschaft mbH, 24159 Kiel, DE

(74) Vertreter:
Patentanwälte HANSMANN-KLICKOW-HANSMANN, 22767 Hamburg

(72) Erfinder:
Wöhler, Helmut, 24107 Kiel, DE

(56) Für die Beurteilung der Patentfähigkeit in Betracht gezogene Druckschriften:

DE	41 41 657 A1
DE	87 02 489 U1
DE-GM	1 91 664
FR	25 69 637
US	27 01 113
US	24 88 316

JP 1-1 78 045 A mit Abstr. in Pat. Abstr. Jpn.: M-880, 1989, Vol. 13, No. 458;
JP 2-74 433 A mit Abstr. in Pat. Abstr. Jpn.: M-1990, Vol. 14, No. 262;

(54) Halterung für einen verstellbaren Außenspiegel eines Fahrzeugs

(57) Die Halterung für einen Außenspiegel umfaßt zwei Drehlager, mit denen die Möglichkeit besteht, den Außenspiegel gelenkartig in eine Ruhestellung, Zwischenstellung und Betriebsstellung zu verschwenken. Die Drehlager sind mit Rastungen versehen, so daß in diesen Stellungen der Spiegel arretierbar ist. Es besteht durch die gelenkartige Halterung die Möglichkeit, daß der Spiegel während einer Geländefahrt an die Aufbauwand schützend geklappt wird und bei einem zurückklappen die ursprünglich eingestellte Spiegelposition beibehalten wird.

DE 196 01 429 C 1

Beschreibung

Die Erfindung bezieht sich auf eine Halterung für einen verstellbar gelagerten Außenspiegel eines Fahrzeugs, insbesondere eines geländegängigen Rad- und Kettenfahrzeugs, bei der der Spiegel einen über eine Schwingarmstange verbundenen Spiegelkopf aufweist, die mittels eines Spiegelfußes am Fahrzeug befestigt ist und im Spiegelfuß Rasteinrichtung für vorgegebene Schwenkstellungen des Spiegels angeordnet sind.

Es sind Spiegelhalterungen bekannt, die beim Abschwenken eines federnd gelagerten Spiegelgehäuses nach dem Ende einer Krafteinwirkung selbsttätig in ihre vorherige Einstellage zurückkehren, wobei die möglichen Ausweichbewegungen auf eine Ebene begrenzt sind und nur das äußere Gehäuse und nicht das darin geschützt gelagerte Spiegelglas abgeschwenkt wird.

Aus dem DE-GM 87 02 489 ist eine Spiegellagerung im Spiegelfuß eines Fahrzeugspiegels mit einer Rasteinrichtung bekannt. Über diese Rasteinrichtung kann der Spiegel in verschiedene Grundpositionen verschwenkt werden, wobei insbesondere eine Lage von einer herangeklappten Position an die Fahrzeugwand in eine Betriebsstellung möglich ist.

Desweiteren ist aus dem DE-GM 19 16 654 ein Rückblickspiegel für ein Fahrzeug bekannt, der im Spiegelfuß eine verdrehbare Lagerung mit einer Rasteinrichtung aufweist, wobei die Grundeinstellung über eine Festsetzschraube erfolgt.

Bei geländegängigen schweren Fahrzeugen wird der Außenspiegel bei Beginn der Geländefahrt zur Vermeidung von Beschädigung in eine Ruhelage geklappt und nach Beendigung der Geländefahrt wieder ausgeklappt, damit die gesetzlichen Bestimmungen für eine Straßenfahrt auf öffentlichen Straßen erfüllt werden.

Der Erfindung liegt die Aufgabe zugrunde, eine Halterung für einen verstellbaren Außenspiegel eines Fahrzeugs, insbesondere eines Geländefahrzeugs zu schaffen, die eine Spiegelgrundeinstellung trotz Verschwenkung des Spiegels in Ablagestellungen gewährleistet.

Diese Aufgabe wird erfindungsgemäß durch die Merkmale des Anspruchs I gelöst. Weitere vorteilhafte Ausbildungen sind durch die Merkmale der Unteransprüche gekennzeichnet.

Die mit der Erfindung hauptsächlich erzielten Vorteile bestehen darin, daß durch eine Spiegelhalterung, bestehend aus zwei miteinander verbundenen Drehlagern, ein in zwei Ebenen verschwenkbarer Spiegel geschaffen wird. Durch diese gelenkartig ausgebildete Halterung mit zwei Drehlagern kann der Spiegel einerseits zur Einnahme einer Ruhestellung optimal geschützt und flach an einer Aufbauwand des Fahrzeugs herangeklappt werden und andererseits erfolgt bei einem Aufklappen in eine Betriebsstellung keine Veränderung der Spiegelgrundeinstellung.

Die Drehlager der Halterung sind in der Weise im Spiegelfuß vorgesehen, daß sich senkrecht aufeinander stehende Schwenkachsen ergeben. Die Lagerzapfen der Drehlager stehen jeweils unter der Spannung einer in einem Lagergehäuse gehaltenen Feder und sind über einen Kerbstift mit einer eingesetzten Rasthülse in Wirkverbindung.

Zur Fixierung der verschiedenen Stellungen des Spiegels, wie die Ruhestellung, Zwischenstellung und die Betriebsstellung, sind in der Rasthülse stirnseitig Kerben vorgesehen, in denen der Kerbstift bei einem Verschwenken des Spiegels federnd einrastet und der Spiegel in der jeweiligen Lage festgesetzt wird.

Die Halterung mit den Drehlagern ist vorzugsweise in zwei Lagergehäusen angeordnet, die zum einen aus dem Spiegelfuß bzw. einem Lagerbock und zum anderen aus einem Hülsenelement gebildet sind. In diesem ist eine Schwenkarmstange des Spiegels gehalten, welche mit ihrem freien Ende einen Lagerzapfen bildet. Ein weiterer Lagerzapfen des zweiten Drehlagers ist im Spiegelfuß vorgesehen und mit dem Hülsenelement über ein Verbindungselement fest verbunden, so daß sich eine kompakte Baueinheit aus zwei Drehlagern ergibt.

Damit eine variable Einstellung des Spiegels erfolgen kann, ist die mit Rastkerben versehene Rasthülse im Lagerbock bzw. im Hülsenelement des Drehlagers stufenlos verdrehbar und über Schrauben festsetzbar.

Die Spannung der Feder im Hülsenelement ist über eine aufschraubbare Abschlußkappe einstellbar, die gleichzeitig einen dichten Abschluß bildet, wozu ein zwischengesetzter Dichtring vorgesehen ist.

Mittels der gelenkartigen Halterung die hier aus den zwei Drehlagern gebildet wird, kann der Spiegel optimal geschützt und flach auf einer Ablagefläche am Fahrzeug durch Verschwenken abgelegt werden. Durch die vorhandenen zwei Raststellungen in der Rasthülse, wobei in jedem Lager zwei Rastungen vorgesehen sind, kann der Spiegel ohne Mühe nach dem Abklappen wieder in die optimale Stellung gebracht werden, in der er sich vor dem Abklappen befand. Bei einem auftretenden Hindernis kann der Spiegel zudem federnd in zwei Drehebenen ausweichen.

Die vorteilhafte Anordnung verknüpft die Einstellung der optimalen Ruhestellung und die Wiederherstellung der optimalen vorher fest eingestellten Betriebsstellung des Spiegelkopfes derart, daß keine Verstellungen eintreten oder auch Verstellungen wieder korrigiert werden. Die optimale Grundeinstellung des Spiegels ist deshalb bei einem Fahrzeug möglich, weil die Fahrersitzposition und der Augenpunkt in der Höhe in engen Grenzen festlegbar sind.

Bei diesem wiederholten Ab- und Aufklappen des Außenspiegels treten normalerweise Nachteile für den Fahrbetrieb auf. So kann bei einer Ablage in die Ruhestellung die Spiegeleinstellung unverändert gehalten werden, wobei der Spiegel bei rauhem Geländebetrieb dann ungeschützt so auf dem Fahrzeuggehäuse aufliegt, daß Verschmutzungen, ein Verkratzen und eine Verstellung des Spiegels eintreten können. Auch könnte bei der Ablage des Spiegels in die Ruhestellung die Spiegeleinstellung verändert werden, um eine geschützte, flach aufliegende Ablage auf dem Fahrzeuggehäuse zu erreichen. Beim Wiederaufstellen des Spiegels wird dann ein Nachstellen erforderlich, um die Spiegeleinstellung wieder so einzurichten, daß ein optimales Sichtfeld für den Fahrer eingestellt wird. Diese vorgenannten Nachteile sind durch die erfindungsgemäße Ausführung vermeidbar.

Ein Ausführungsbeispiel der Erfindung ist in der Zeichnung schematisch dargestellt. Es zeigt

Fig. 1 eine Seitenansicht eines abgeklappten Spiegels mit einer aus zwei Drehlagern bestehenden Halterung,

Fig. 2 eine Draufsicht des abgeklappten Spiegels gemäß **Fig.** 1,

Fig. 3 eine. Seitenansicht des aufgestellten Spiegels in einer Zwischenstellung und in einer abgeklappten Ruhestellung,

Fig. 4 eine Draufsicht des aufgestellten Spiegels in einer Zwischenstellung und in einer Betriebsstellung,

Fig. 5 eine Rasthülse eines Drehlagers in einer Draufsicht,

Fig. 6 eine Seitenansicht der Rasthülse gemäß **Fig.** 5,

Fig. 7 einen Schnitt durch ein erstes Drehlager in einer Ruhestellung, einer Zwischenstellung und einer Betriebsstellung,

Fig. 8 einen Schnitt durch ein zweites Drehlager in einer Ruhestellung, einer Zwischenstellung und einer Betriebsstellung,

Fig. 9 einen Schnitt durch ein in einem Hülsenelement angeordnetes Drehlager und

Fig. 10 einen Schnitt durch das Hülsenelement mit eingesetzter Rasthülse.

Ein Außenspiegel **1** eines Fahrzeugs weist einen Spiegelkopf **2** mit einer Spiegelfläche **3** und einem Spiegelfuß **2a** auf. Über eine Schwenkarmstange **4** ist der Spiegelkopf **2** mit einer Halterung **5** verbunden, die zwei Drehlager **6, 7** umfaßt. Das eine Drehlager **7** ist in einem Lagerbock **8** angeordnet, der mit einer Ablagefläche **9** mittels Verschraubungen verbunden ist. Eine umlaufende Dichtung **10** des Spiegels ergibt einen zusätzlichen Schutz für die Spiegelfläche **3**.

Die Drehlager **6, 7** sind in Lagergehäusen **11, 12** angeordnet und weisen Schwenkachsen X-X und Z-Z auf, die senkrecht zueinander stehen, so daß der Spiegelkopf **2** in zwei Ebenen verstellbar ist. Wie in **Fig.** 3 näher dargestellt, erfolgt im Drehlager **6** eine Schwenkung um die Z-Achse mit dem Winkel β und im Drehlager **7** eine Schwenkung um die X-Achse mit dem Winkel α. Die Größe der zugehörigen Schwenkwinkel α (zur X-Achse) und ß (zur Z-Achse) ist abhängig von den räumlichen Lagen der Ablageebene und der Spiegelebene in der Betriebsstellung.

Die Drehlager **6, 7** bilden insgesamt ein Gelenk und weisen jeweils einen Lagerzapfen **15, 16** auf, der über eine Feder **17** im Gehäuse **11, 12** abgestützt ist. Im Falle des Drehlagers **6** bildet das freie Ende der Stange **4** den Lagerzapfen **15**. Die Feder **17** ist zwischen eine Abschlußkappe **18** und einem Absatz **19** des Lagerzapfens **15** eingespannt und drückt einen eingesetzten Kerbstift **20** gegen eine Rasthülse **21**. Diese weist stirnseitig mehrere Rastkerben **22, 23** im Lager **6** und Rastkerben **24, 25** im Lager **7** auf, wodurch die einzelnen Stellungen, wie die Ruhestellung A, die Zwischenstellung B und die Betriebsstellung C festgelegt werden.

In den **Fig.** 7 und 8 sind Schnitte durch die Drehlager **6** und **7** mit den verschiedenen Winkelstellungen des Kerbstiftes **20** und damit auch die verschiedenen Winkellagen der Drehlager **6, 7** gezeigt. Das Drehlager **6** weist Rastkerben **22, 23** in der Rasthülse **21** und das Drehlager **7** Rastkerben **24, 25** auf. Die Lage A stellt die Ruhestellung dar, wobei B die Zwischenstellung und C die Gebrauchsstellung ist, in der beide Schwenkbewegungen ausgeführt werden.

In **Fig.** 9 ist der Aufbau des Drehlagers **6** im Schnitt näher dargestellt. Der Arm **4** ist um 360 Grad im Gehäuse **11** drehbar und durchläuft dabei die möglichen Raststellungen, wobei der Kerbstift **20** in den Rastkerben **22, 23** der Rasthülse **21** einhaken kann. Da der Schwenkarm **4** über die Feder **17** spannungsbelastet ist, wird der Lagerzapfen **15** des Armes **4** jeweils in die Rastkerben **22, 23** gedrückt. Die Schraubfeder **17** kann sich in der Abschlußkappe **18** abstützen, die über ein Gewinde mit dem Gehäuse **11** verbunden ist. Die Rasthülse **21** ist drehgesichert mittels eines Gewindestiftes **30**. Eine Abdichtung zum Schwenkarm **4** übernimmt ein Dichtring **31**. Die Schraubenfeder **17** ist einstellbar, indem die Abschlußkappe **18** im Gehäuse **11** verdreht und anschließend über eine Kontermutter **32** gesichert wird. Durch die Fixierung der Rasthülse **21** wird die Ausgangslage des Schwenkwinkels, z. B. des Winkels α, festgelegt. Auch kann die Rasthülse **21** nach Lösen der Schrauben **30** stufenlos verdreht und in einer geeigneten Position wieder festgelegt werden.

Wie in **Fig.** 9 näher gezeigt, ist das Hülsenelement **11** mit einem Verbindungsteil **35** des Lagerzapfens **16** des Drehlagers **7** festverbunden, so daß sich eine Baueinheit ergibt, die im Spiegelfuß anzuordnen ist.

Patentansprüche

1. Halterung für einen verstellbar gelagerten Außenspiegel eines Fahrzeugs, insbesondere eines geländegängigen Rad- und Kettenfahrzeugs, bei der der Spiegel einen über eine Schwingarmstange verbundenen Spiegelkopf aufweist, die mittels eines Spiegelfußes am Fahrzeug befestigt ist und im Spiegelfuß Rasteinrichtung für vorgegebene Schwenkstellungen des Spiegels angeordnet sind, **dadurch gekennzeichnet,** daß im Spiegelfuß **(2a)** eine aus zwei zu einer Einheit verbundenen Drehlagern **(6, 7)** bestehende Halterung **(5)** angeordnet ist und die beiden Drehlager **(6, 7)** senkrecht zueinander angeordnete Schwenkachsen (X-X und Z-Z) für den Spiegel aufweisen und in jedem der Drehlager **(6, 7)** eine Rasteinrichtung für mindestens zwei Rasteinstellungen in Rastkerben **(22, 23** und **24, 25)** einer Rasthülse **(21)** für eine abgeklappte Ruhestellung (A), eine Zwischenstellung (B) und eine aufgeklappte Betriebsstellung (C) des Spiegelkopfes **(2)** aufweist, wobei jedes Drehlager **(6, 7)** eine Rasthülse **(21)** im Lagergehäuse **(11, 12)** besitzt, die zur Spiegelfeineinstellung verstellbar gehalten und über Gewindestifte **(30)** drehgesichert befestigbar ist.

2. Halterung nach Anspruch 1, dadurch gekennzeichnet, daß jedes Drehlager **(6, 7)** einen Lagerzapfen **(15, 16)** aufweist, der jeweils unter der Spannung einer Feder **(17)** in einem Drehlagergehäuse **(11, 12)**, bestehend aus einem Lagerbock **(8)** und einem Hülsenelement (H) gehalten ist und die Lagerzapfen **(15, 16)** mittels eines Kerbstiftes **(20)** in Eingriff mit den Rastkerben **(22, 23** und **24, 25)** einer Rasthülse **(21)** des Gehäuses **(11** und **12)** stehen.

3. Halterung nach den Ansprüchen 1 oder 2, dadurch gekennzeichnet, daß das eine Drehlager **(6)** in dem am Fahrzeugaufbau befestigten Lagerbock **(8)** und das weitere Drehlager **(7)** in dem anschließenden Hülsenelement (H) derart vorgesehen ist, daß der Spiegelkopf **(2)** über die beiden Drehlager **(6, 7)** unabhängig voneinander in zwei Ebenen verschwenkbar ist.

4. Halterung nach den Ansprüchen 1, 2 oder 3, dadurch gekennzeichnet, daß die Schwenkarmstange **(4)** mit dem als Lagerzapfen **(15)** ausgebildeten freien Ende in dem als Hülsenelement (H) ausgeführten Gehäuse **(11)** des ersten Drehlagers **(6)** gehalten ist und der Lagerzapfen **(16)** des weiteren Drehlagers **(7)** über ein Verbindungselement **(35)** mit dem Hülsenelement (H) verbunden ist.

5. Halterung nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß das Drehlagergehäuse **(11, 12)** mit einer die Feder **(17)** abstützenden einstellbaren Abschlußkappe **(18)** versehen ist, die eine Dichtung **(31)** für die Stange **(4)** aufweist und mittels einer Kontermutter **(32)** am Hülsenelement (H) festsetzbar ist.

6. Halterung nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die Spiegellängsachse (Y-Y) parallel zu einer Längsachse (W-W) eines Endstückes des Schwenkarmes **(4)** verläuft.

7. Halterung nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die Drehlager **(6, 7)** derartig unter einem Winkel (α und β) angestellte Rastkerben **(22, 23** und **24, 25)** in der Rasthülse **(21)** aufweisen, daß die Spiegelfläche **(3)** des Kopfes **(2)** bei einem Wechsel von der abgeklappten Ruhestellung (A) in die aufgeklappte Betriebsstellung (C) eine einmal eingestellte Grundspiegeleinstellung aufweist.

Hierzu 4 Seite(n) Zeichnungen

Nummer: DE 196 01 429 C1
Int. Cl.[6]: B 60 R 1/06
Veröffentlichungstag: 10. April 1997

*

FIG.1

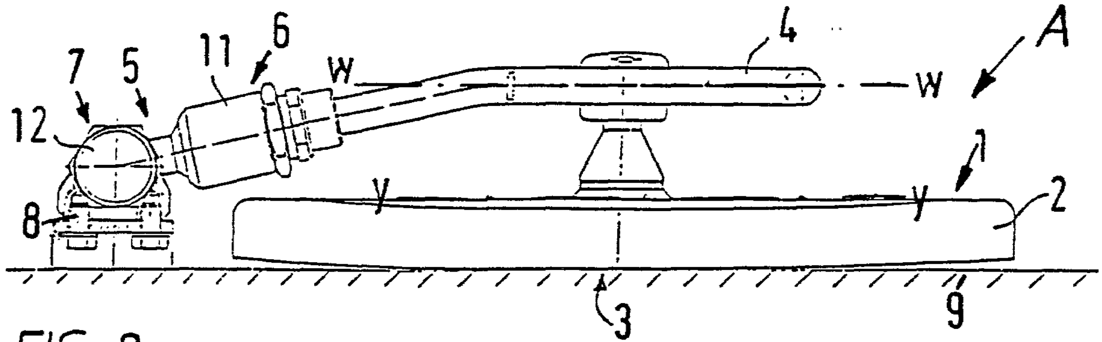
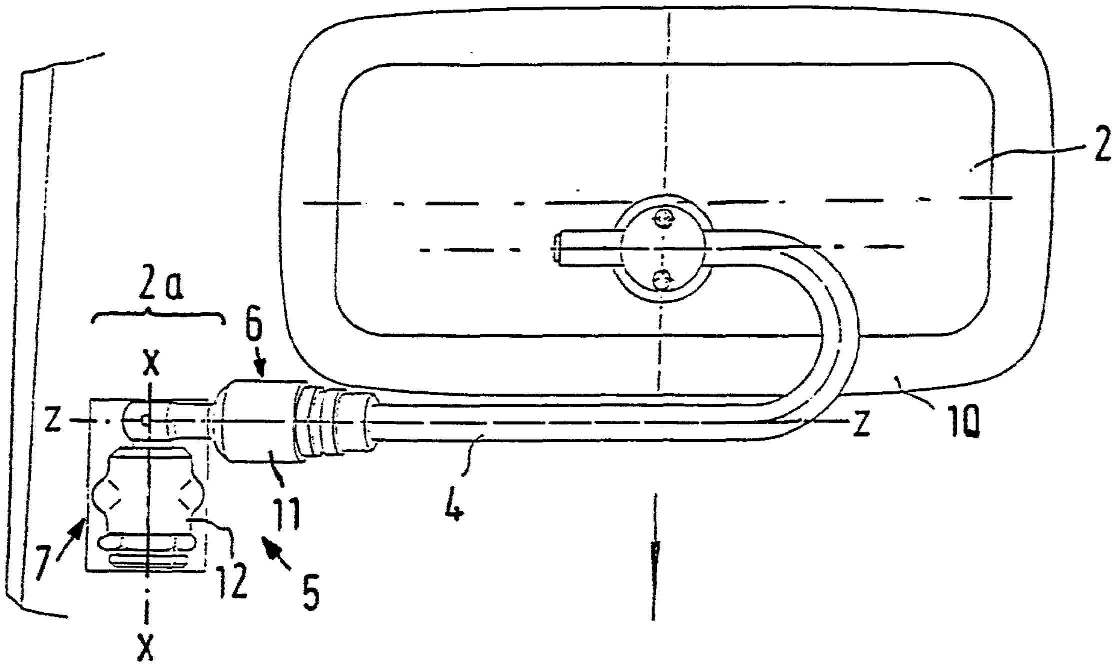


FIG. 2



Nummer: DE 196 01 429 C1
Int. Cl.⁶: B 60 R 1/06
Veröffentlichungstag: 10. April 1997

FIG. 3

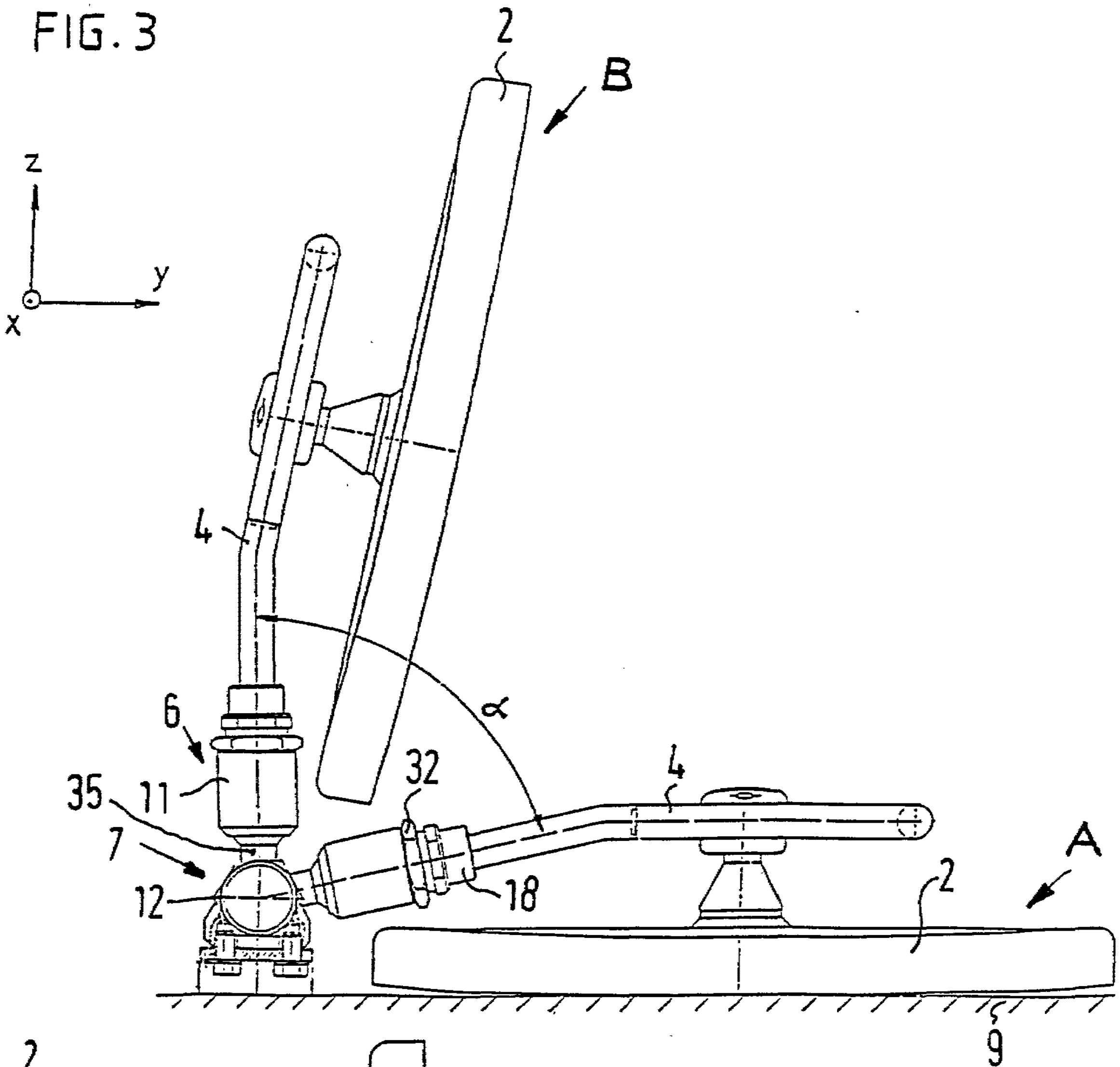
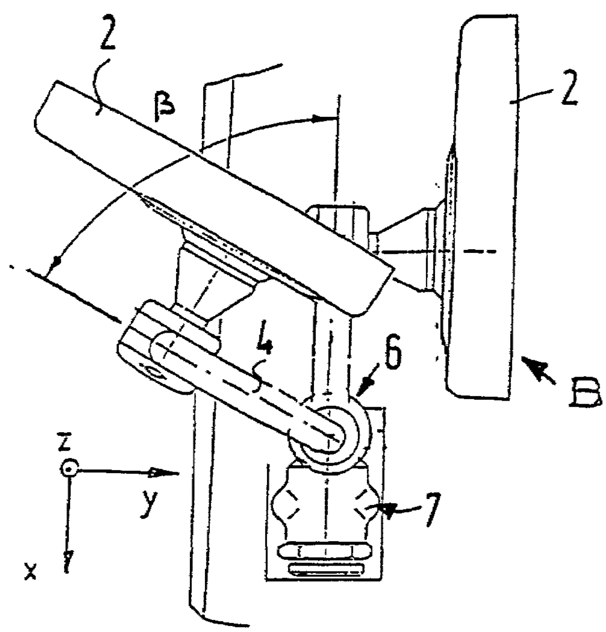


FIG. 4



702 115/391

Nummer: DE 196 01 429 C1
Int. Cl.⁶: B 60 R 1/06
Veröffentlichungstag: 10. April 1997

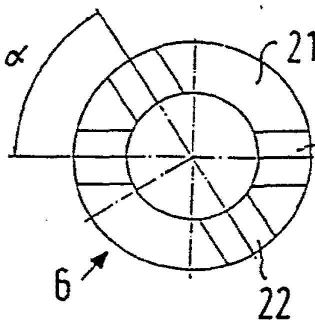


FIG.5

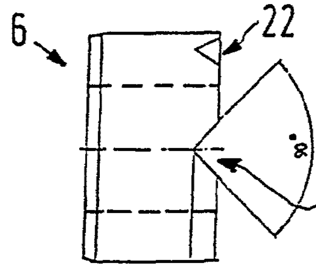


FIG.6

FIG.7

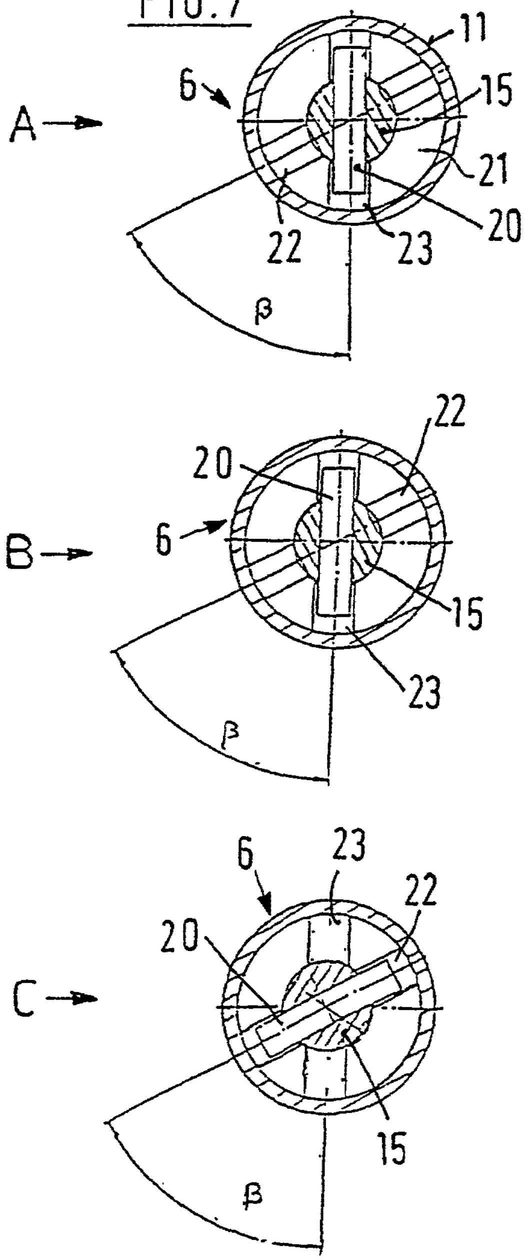
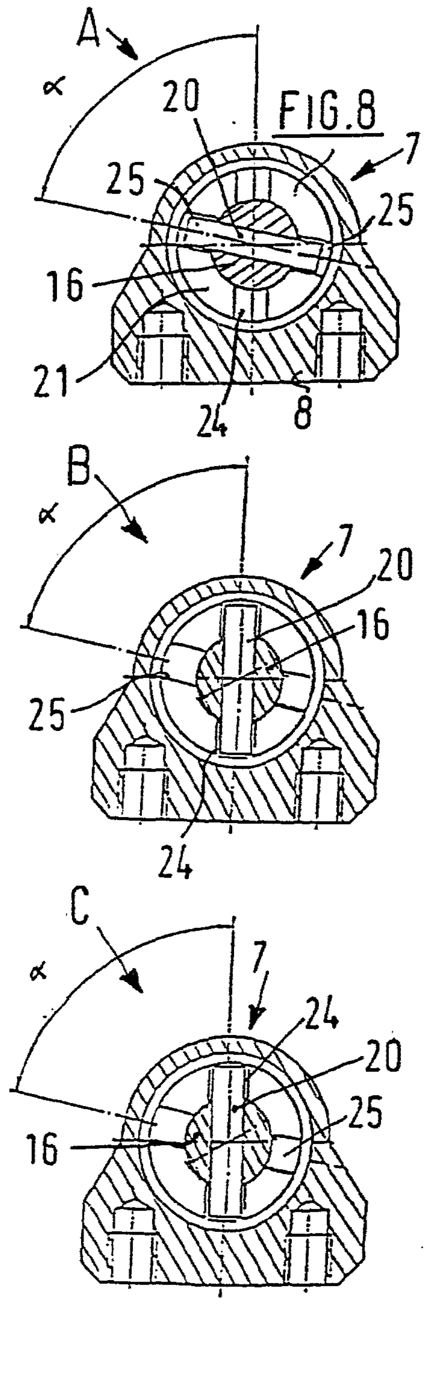


FIG.8



702 115/391

Nummer: DE 196 01 429 C1
Int. Cl.⁶: B 60 R 1/06
Veröffentlichungstag: 10. April 1997

FIG.9

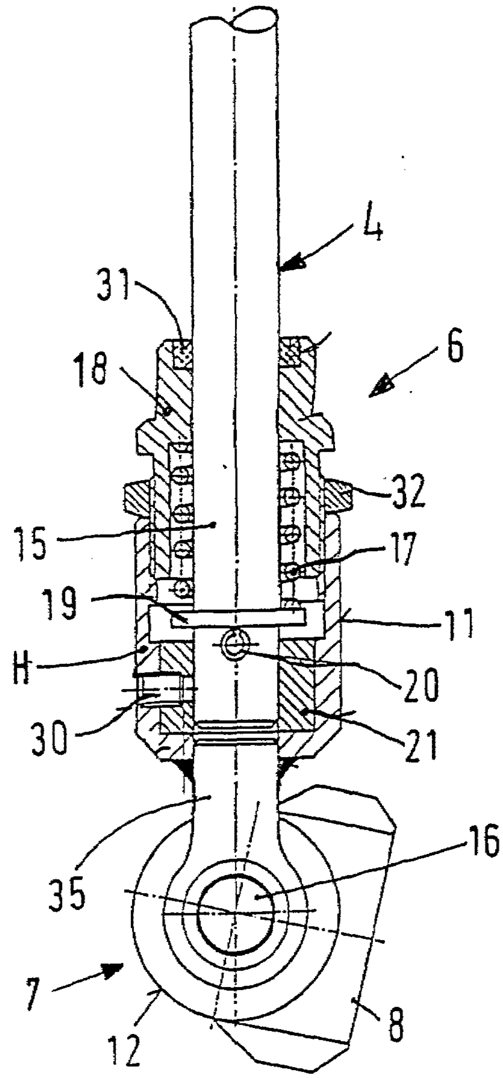
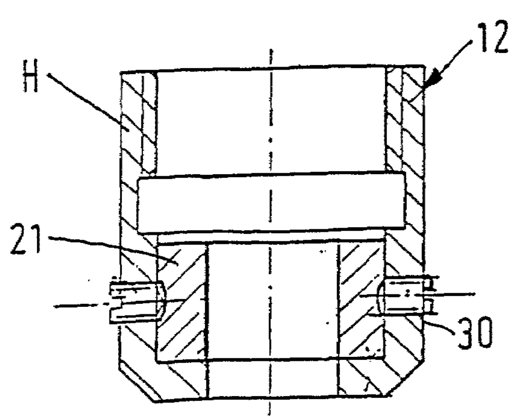


FIG.10



702 115/391

Espacenet

Bibliographic data: DE4141657 (A1) — 1992-07-16

Vehicle rear view mirror

Inventor(s):	LUPO ELIO [IT] + (LUPO, ELIO, COLLEGNO, IT)
Applicant(s):	GILARDINI SPA [IT] + (GILARDINI S.P.A., TURIN/TORINO, IT)
Classification:	**- international:** ***B60R1/06;*** (IPC1-7): B60R1/02; B60R1/06 **- cooperative:** **B60R1/0617**
Application number:	DE19914141657 19911217
Priority number (s):	IT19900053447U 19901221
Also published as:	FR2670728 (A1) FR2670728 (B1) GB2250965 (A) IT220764 (Z2) IT9053447 (U1)

Abstract not available for DE4141657 (A1)
Abstract of corresponding document: GB2250965 (A)

A vehicle rear view mirror, including a hollow body (2) housing a reflective plate (4), support means (5) adapted to be fixed to the bodywork of the vehicle and articulated connection means (10) for connecting the body (2) to the support means (5) and defining a first, substantially vertical, axis of rotation (a) and a second axis of rotation (b) substantially perpendicular to the first axis (a); the connection means (10) including a spherical head (7) fixed to the support means (5), a spherical cap portion (8) integral with a side wall of the body (2) and cooperating with the said spherical head, and retaining means (16, 23, 24, 34) for ensuring that the spherical head (7) with the spherical-cap-portion (8) of the body (2) are kept in mutual contact.

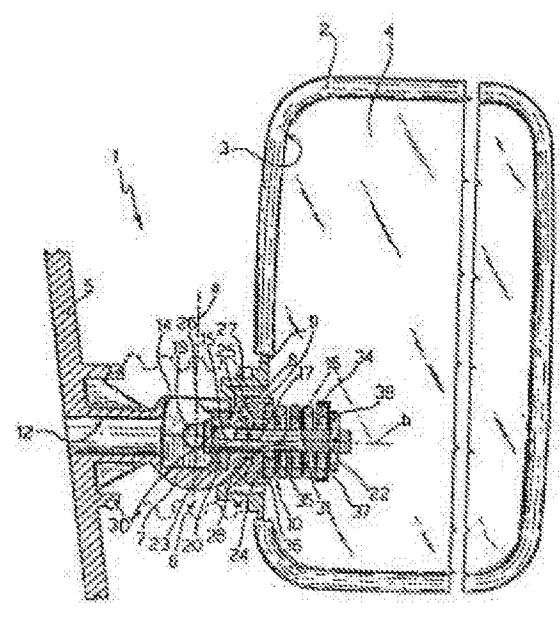


Fig.1

(19) BUNDESREPUBLIK DEUTSCHLAND

DEUTSCHES PATENTAMT

(12) **Offenlegungsschrift**

(10) **DE 41 41 657 A 1**

(51) Int. Cl.[5]:
B 60 R 1/02
B 60 R 1/06

(21) Aktenzeichen: P 41 41 657.0
(22) Anmeldetag: 17. 12. 91
(43) Offenlegungstag: 16. 7. 92

DE 41 41 657 A 1

(30) Unionspriorität: (32) (33) (31)
21.12.90 IT 53447/90 U

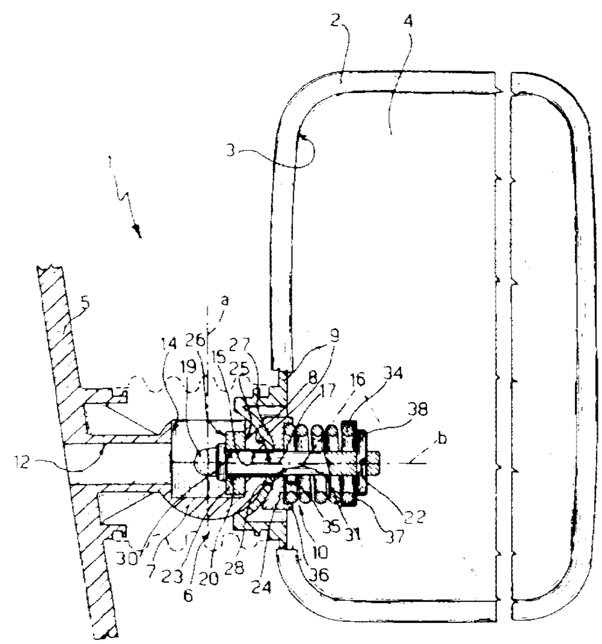
(71) Anmelder:
Gilardini S.p.A., Turin/Torino, IT

(74) Vertreter:
Neidl-Stippler, C., Dipl.-Chem.Dr.phil.nat., Pat.-Anw., 8000 München

(72) Erfinder:
Lupo, Elio, Collegno, IT

(54) Fahrzeug-Rückspiegel

(57) Fahrzeugrückspiegel, bestehend aus: einem Hohlkörper (2), in dem eine reflektierende Platte (4) untergebracht ist; am Fahrzeugkörper befestigbaren Fußvorrichtungen (5); und gelenkigen Verbindungseinrichtungen (10), die den Körper (2) mit der Fußvorrichtung (5) verbinden. Die gelenkigen Verbindungsmittel (10) besitzen eine erste im wesentlichen vertikale Rotationsachse (a) und eine zweite Rotationsachse (b), die im wesentlichen zur ersten Achse (a) senkrecht steht. Die Verbindungsmittel (10) bestehen aus einem sphärischen Kopf (7), der an den Fußeinrichtungen (5) befestigt ist; einem sphärischen Schalenteil (8), das in der Seitenwand des Körpers (2) integriert ist und mit dem sphärischen Kopf kooperiert, sowie Zusammenhalteeinrichtungen (16, 23, 24, 34), die sicherstellen, daß sphärischer Kopf (7) und sphärisches Schalenteil (8) vom Körper (2) in Kontakt gehalten sind.



DE 41 41 657 A 1

Beschreibung

Die Erfindung betrifft Fahrzeugrückspiegel und insbesondere, aber nicht ausschließlich, Außenrückspiegel für handelsübliche Fahrzeuge.

Unter den Rückspiegeln gibt es bekanntlich solche, die die aus einem Körpergehäuse, einer reflektierenden Platte, einem am Fahrzeugkörper fixierbaren Fußteil und einer angelenkten Verbindungseinrichtung bestehen. Die Verbindungseinrichtung verbindet hierbei den Spiegelkörper mit dem Fußteil und ist derart gestaltet, daß der Spiegelkörper zu seiner Neigungseinstellung um eine im wesentlichen vertikale Achse und zumindest in gewissem Umfang um eine im wesentlichen horizontale Achse parallel zur reflektierenden Platte drehbar ist.

Die Verbindungseinrichtungen weisen in der Regel ein im Fußteil integriertes, erstes sphärisches Gelenkteil und ein am Körper fixiertes zweites sphärisches Gelenkteil auf. Die sphärischen Gelenkteile bestehen im allgemeinen aus Metall, und das zweite Gelenkteil ist mit dem Spiegelkörper, der im Gegensatz dazu aus Kunststoffmaterial besteht, durch gemeinsames Umformen verbunden.

Die bislang bekannten Spiegel vom obigen Typ besitzen verschiedene Nachteile. Insbesondere das gemeinsame Umformen des Körpers auf das zweite Gelenkteil führt zu einer Strukturschwäche. Darüber hinaus ist der Zusammenbau dieser gelenkigen Verbindungseinrichtung im allgemeinen sehr schwierig.

Es ist daher Aufgabe der Erfindung, einen Fahrzeugaußenrückspiegel zur Verfügung zu stellen, der die oben genannten Nachteile der bekannten Spiegel nicht aufweist. Diese Aufgabe wird erfindungsgemäß durch einen Fahrzeugrückspiegel gelöst, bestehend aus:

– einem vorne offenen Hohlkörper;
– einer in der Öffnung des Körpers angeordneten reflektierenden Platte;
– einer am Fahrzeug fixierbaren Fußeinrichtung; und
– Vorrichtungen, um den Körper an die Trägereinrichtung anzulenken und die, erstens, eine im wesentlichen vertikale Rotationsachse und, zweitens, eine zur ersten Achse im wesentlichen senkrecht stehende zweite Rotationsachse für den Körper vorgeben, wobei die Verbindungseinrichtung ein erstes, fest mit der Fußeinrichtung verbundenes sphärisches Gelenkteil, ein zweites, fest mit dem Spiegelkörper verbundenes sphärisches Gelenkteil sowie erstes und zweites Gelenkteil zusammenhaltende Einrichtungen aufweisen und dadurch gekennzeichnet ist, daß das zweite Gelenkteil durch einen Abschnitt des Körpers gegeben ist.

Zum besseren Verständnis der vorliegenden Erfindung wird nunmehr eine bevorzugte Ausführungsform beispielhaft — ohne die Erfindung hierauf begrenzen zu wollen — unter Bezug auf die anhängenden Zeichnungen beschrieben. Es zeigen:

Fig. 1 eine teilweise geschnittene Frontansicht des erfindungsgemäßen Spiegels; und

Fig. 2 eine teilweise geschnittene Ansicht und — in Vergrößerung — ein Prinzipschema des Spiegels der **Fig.** 1.

Der Außenrückspiegel für handelsübliche Fahrzeuge ist in den Zeichnungen allgemein mit 1 beziffert.

Der Spiegel **1** weist einen Körper **2** auf, der im wesentlichen die Form einer hohlen Schale, bei der die Apertur **3** nach vorne zeigt, besitzt. Der Körper **2** ist

leicht durch Formen von Kunststoffmaterial erhältlich. Die reflektierende Platte **4** ist in der Apertur **3** des Körpers **2** untergebracht.

Der Spiegel **1** weist ferner ein im wesentlichen plattenähnliches Fußelement **5** auf, das zur festen Verbindung mit einem Teil des Fahrzeugkörpers konstruiert ist; und ferner mit **6** bezifferte Verbindungseinrichtungen, die den Körper **2** mit dem Fußelement **5** verbinden.

Die angelenkten Verbindungseinrichtungen **6** weisen im wesentlichen auf: einen im Fußelement **5** integrierten sphärischen Kopf **7**; einen konkaven sphärischen Sitz **8**, der von einem sphärisch-kappenförmigen, in der Seitenwand des Körpers **2** integrierten, zum Fußelement **5** zeigenden Abschnitt **9** gebildet ist; und Zusammenhaltevorrichtungen **10**, die sicherstellen, daß sphärische Kopf **7** und Sitz **8** in gegenseitigem Kontakt gehalten sind.

Der sphärische Kopf **7** steht genauer gesagt aus dem Ende des rohrförmigen Teils **11**, das aus dem Fußelement **5** freitragend hervorsteht, hervor. Der Kopf besitzt mittig eine nach oben hin offene Kammer **14**, die eine im wesentlichen vertikale Achse "a" besitzt. Der sphärische Kopf **7** besitzt ferner in dem zum Spiegelkörper **2** gerichteten Abschnitt einen Durchlaßschlitz **15**, der sich in einer Ebene senkrecht zur Achse "a" über einen Winkel von etwas mehr als 180° erstreckt.

Die Zusammenhaltevorrichtung **10** weist einen Stift **16**, der eine im wesentlichen horizontale Achse "b" besitzt, auf. Der Stift **16** ist in einem mittigen Durchgangsloch **17** des Sitzes **8** untergebracht und greift verschieblich mit dem Schlitz **15** im sphärischen Kopf **7** ein. Am Ende des Stifts **16** innerhalb der Kammer **14** des sphärischen Kopfes **7** ist ein Kopf **19** mit einer axialen Schulter **20** angeordnet. Und der Stift besitzt ferner ein diametrales Durchgangsloch **22** nahe seinem anderen Ende innerhalb des Körpers **2** des Spiegels **1**. Der Durchmesser vom Inneren **12** des rohrförmigen Teiles **11** ist größer als der des Kopfes **19**. Und das Innere **12** ist mit der Kammer **14** im Kopf **7** verbunden, so daß der Stift **16** einführbar ist.

Die Zusammenhaltevorrichtung **10** beinhaltet ferner ein paar Gleitblöcke **23**, **24**, die passend aus Kunststoffmaterial mit niederem Reibungskoeffizient bestehen. Diese Blöcke sind entsprechend in der Kammer **14** des sphärischen Kopfes **7** und innerhalb des Körpers **2** unter Kontakt mit dessen Sitz **8** angeordnet. Der Block **23** besitzt genauer gesagt ein Durchgangsloch **30**, in das der Stift **16** eingreift. Der Block besitzt die Form eines Zylinderteiles, wobei die zylindrische Fläche **25** an die äußere Wand der Kammer **14** und die ebene Fläche **26** an die axiale Schulter des Stiftes **16** anstoßen. Der Block **24** ist scheibenförmig und besitzt einen sphärischen, kappenförmigen Sitz **28** an der Vorderseite **27**. Dieser kooperiert mit der konvexen Seite des Abschnitts **9** vom Körper **2** innerhalb des Körpers selbst. Der Block **24** besitzt ferner mittig ein Durchgangsloch **31**, in das der Stift **16** eingreift.

Die mit dem Stift **16** koaxiale helikale Feder **34** ist zwischen der Fläche **35** des Blocks **24** und der gegenüberliegenden Fläche **28** eingespannt. Die Fläche **35** ist zu diesem Zweck mit einem ringförmigen äußeren Führungsvorsprung **36** ausgestattet. Und eine Kappe **37** mit mittiger Apertur ist auf dem Stift **16** angeordnet. Der Rückhaltestift **38** greift in das diametrale Loch **22** des Stiftes **16** und stellt so einen axialen Stopp für die Kappe **37**.

Die Verbindungsmittel **6**, die den Körper **2** mit dem Trägerelement **5** verbinden, sind einfach über eine rohrförmige Balgmanschette **39** aus elastomerem Material zu schützen. Die Manschette ist schematisch durch eine unterbrochene Linie dargestellt und ist an ihren Enden am jeweiligen Sitz des Fußelements **5** und des Körpers **2** befestigt.

Der Spiegel **1** funktioniert wie folgt:

Die gelenkigen Verbindungsmittel **6** — sie verbinden den Spiegelkörper **2** mit dem Fußelement — erlauben, daß sich der Körper um die Achse "a" der Kammer **14** und um die Achse "b" des Stiftes **16** drehen kann. Dies ist durch Pfeile in **Fig.** 2 deutlich gezeigt.

Der Stift **16** gleitet während der Drehung im Schlitz **15** des sphärischen Kopfes **7** um die Achse "a". Dabei gleiten der Block **23** und der Sitz **8** über die Seitenwand der Kammer **14** bzw. über die äußeren Oberfläche des Kopfes **7**. Der Umfang der Rotation wird vom Anschlag des Stifts **25** am Ende des Schlitzes **5** bestimmt und liegt bei ca. 180°. Bei einem unabsichtlichen Stoß (oder bei einem absichtlichen Bewegen) ist daher der Spiegel nach vorne oder nach hinten zum Fahrzeugkörper hin faltbar. Die elastische Einspannung durch die Feder **34** ist derart, daß der Spiegelkörper **2** in allen Winkelpositionen gehalten ist und Vibrationen bei der Fahrt vermieden sind.

Die Rotation um die Achse "b" des Stifts **16** erfolgt durch Gleiten im Sitz **8** zwischen der äußeren Oberfläche des sphärischen Kopfes **7** und dem Sitz **28** auf dem Block **24**. Diese Rotation erlaubt die Einstellung der Neigung des Körpers **2** und somit der reflektierenden Platte **4** in Abhängigkeit von der Größe des Benutzers. Der Umfang dieser Rotation kann daher begrenzt sein, z. B. auf 10 bis 20°, beispielsweise mit Hilfe von bekannten Stoppvorrichtungen (nicht gezeigt) auf dem sphärischen Kopf **7** und auf dem Körper **2**, z. B. durch einen Zahn und eine entsprechende Kerbe.

Die mit der vorliegenden Erfindung erreichten Vorteile sind aus den Merkmalen leicht ersichtlich. Es wird vor allem eine gelenkige Verbindung von Spiegelkörper **2** und Fußteil **5** ohne die Verwendung gemeinsam umformter Teile erreicht, wobei aber ein Teil des Spiegelkörpers unmittelbar auf dem sphärischen Kopf gleitet. Die Verbindung ist daher sehr zuverlässig, und bei Gebrauch besteht nicht die Gefahr einer Material- und Strukturschwäche. Ferner ist die Herstellung und der Zusammenbau des Spiegels **1** sehr einfach und wirtschaftlich.

Es ist offensichtlich, daß der erfindungsgemäße Spiegel **1** ohne vom Erfindungsgedanken abzuweichen modifizier- und veränderbar ist.

Patentansprüche

1. Fahrzeugrückspiegel (**1**), bestehend aus: einem Hohlkörper (**2**) mit einer nach vorne liegenden Öffnung (**3**);
einer reflektierenden Platte (**4**), die in der Öffnung (**3**) des Körper (**2**) untergebracht ist;
Fußvorrichtungen (**5**), die am Fahrzeugkörper befestigbar sind; und
Vorrichtungen (**6**), die den Körper (**2**) an die Fußvorrichtungen (**5**) anlenken und die eine Drehung des Körpers (**2**) um eine (i) im wesentlichen vertikale Achse (a) und um eine (ii) im wesentlichen zur ersten Achse (a) senkrecht stehende zweite Achse (b) erlauben, wobei die Verbindungsmittel (**6**) ein erstes fest mit den Fußeinrichtungen verbundenes sphärisches Gelenkteil (**7**), ein zweites fest mit dem Spiegelkörper (**2**) verbundenes sphärisches Gelenkteil (**8**) und Mittel (**10**), die erste und zweite Gelenkteile (**7**, **8**) zusammenhalten, aufweisen, **dadurch gekennzeichnet,** daß das zweite Gelenkteil (**8**) von einem Abschnitt (**9**) des Körpers (**2**) gegeben ist.

2. Rückspiegel gemäß Anspruch 1, dadurch gekennzeichnet, daß das erste Gelenkteil ein fest mit den Fußvorrichtungen (**5**) verbundener sphärischer Kopf (**7**) ist und daß das zweite Gelenkteil ein sphärischer Sitz (**8**) ist, der von einem sphärisch-kappenförmigen Abschnitt (**9**) der Seitenwand des Körpers (**2**) gegeben ist und mit der äußeren Fläche des sphärischen Kopfes (**7**) kooperiert.

3. Spiegel gemäß Anspruch 1 oder 2, dadurch gekennzeichnet, daß die Zusammenhalteeinrichtungen (**10**) mit elastischen Mitteln (**34**) eine hinreichende Kraft auf erste und zweite Gelenkteile (**7**, **8**) ausüben, so daß sphärischer Kopf (**7**) und sphärisches Kappenteil (**9**) vom Körper (**2**) in gegenseitigem Kontakt gehalten sind.

4. Spiegel gemäß Anspruch 2 oder 3, dadurch gekennzeichnet, daß die Zusammenhalteeinrichtungen (**10**) einen Stift (**16**) aufweisen, der: nach der zweiten Rotationsachse (b) ausgerichtet ist; in das mittige Loch (**17**) des sphärischen Kappenteils (**9**) vom Körper (**2**) eingreift; in den sich in einer Ebene senkrecht zur ersten Rotationsachse (a) erstreckenden Schlitz (**15**) des sphärischen Kopfes (**7**) angeordnet ist; so daß der Stift (**16**) gezwungenermaßen nur um die erste Rotationsachse (a) drehbar ist.

5. Spiegel gemäß Anspruch 4, dadurch gekennzeichnet, daß der sphärische Kopf (**7**) eine entlang der ersten Rotationsachse (a) ausgerichtete zylindrische Kammer (**14**) aufweist und diese mit dem Schlitz (**15**) verbunden ist.

6. Spiegel gemäß Anspruch 5, dadurch gekennzeichnet, daß die Zusammenhalteeinrichtungen (**10**) ein Paar Gleitblöcke (**23**, **24**) aufweisen, die mit entsprechenden Durchlässen (**30**, **31**) zur Aufnahme des Stifts (**16**) geformt sind, wobei:
der erste Block (**23**) in der zylindrischen Kammer (**14**) vom sphärischen Kopf (**7**) untergebracht ist und eine mit der äußeren Wand der Kammer kooperierende äußere zylindrische Oberfläche (**25**) besitzt;
der in dem Körper (**2**) untergebrachte zweite Block (**24**) einen sphärisch-kappenförmigen Sitz (**28**) aufweist und mit dem sphärisch-kappenförmigen Abschnitt (**9**) vom Körper (**2**) kooperiert;
von den Blöcken einer (**23**) mit der ersten axialen Stoppeinrichtung (**20**) auf dem Stift (**16**) und der andere (**24**) mit der elastischen Vorrichtung (**34**) kooperiert.

7. Spiegel gemäß Anspruch 6, dadurch gekennzeichnet, daß die elastische Vorrichtung eine mit dem Stift (**16**) koaxiale helikale Feder (**34**) aufweist und diese zwischen dem zweiten Block (**24**) und der zweiten axialen Stoppvorrichtung (**37**) auf dem Stift (**16**) kompressiert ist.

8. Spiegel gemäß Anspruch 7, dadurch gekennzeichnet, daß die zweite axiale Stoppvorrichtung eine mit dem Stift (**16**) koaxiale Kappe (**37**) aufweist und diese mit der Feder (**34**) und einem dem Stift (**16**) gegenüber gelegenen Rückhaltestift (**38**) kooperiert.

9. Spiegel gemäß einem der Ansprüche 5 bis 8, dadurch gekennzeichnet, daß der sphärische Kopf (**7**) aus einem Ende des aus der Trägervorrichtung (**5**) frei vorspringenden rohrförmigen Teils (**11**) her-

vorsteht, daß das Innere (**12**) des rohrförmigen Abschnittes (**11**) mit der zylindrischen Kammer (**14**) des sphärischen Kopf (**7**) verbunden ist, wobei dieser einen größeren Durchmesser besitzt als die transversale Abmessung der ersten axialen Stoppvorrichtung (**20**) auf dem Stift (**16**).

Hierzu 2 Seite(n) Zeichnungen

Nummer: DE 41 41 657 A1
Int. Cl.⁵: B 60 R 1/02
Offenlegungstag: 16. Juli 1992

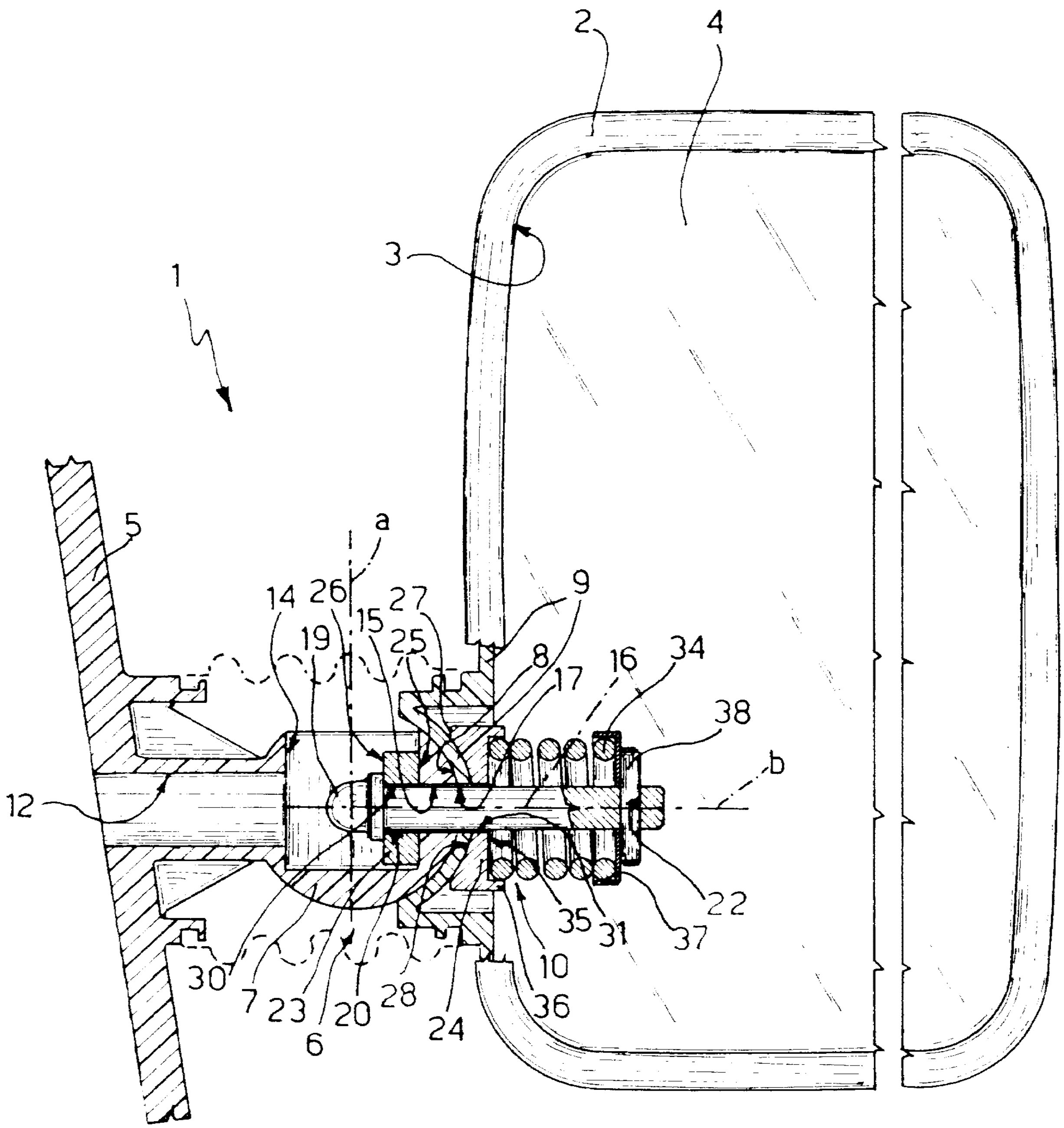


Fig. 1

208 029/345

Nummer: DE 41 41 657 A1
Int. Cl.5: B 60 R 1/02
Offenlegungstag: 16. Juli 1992

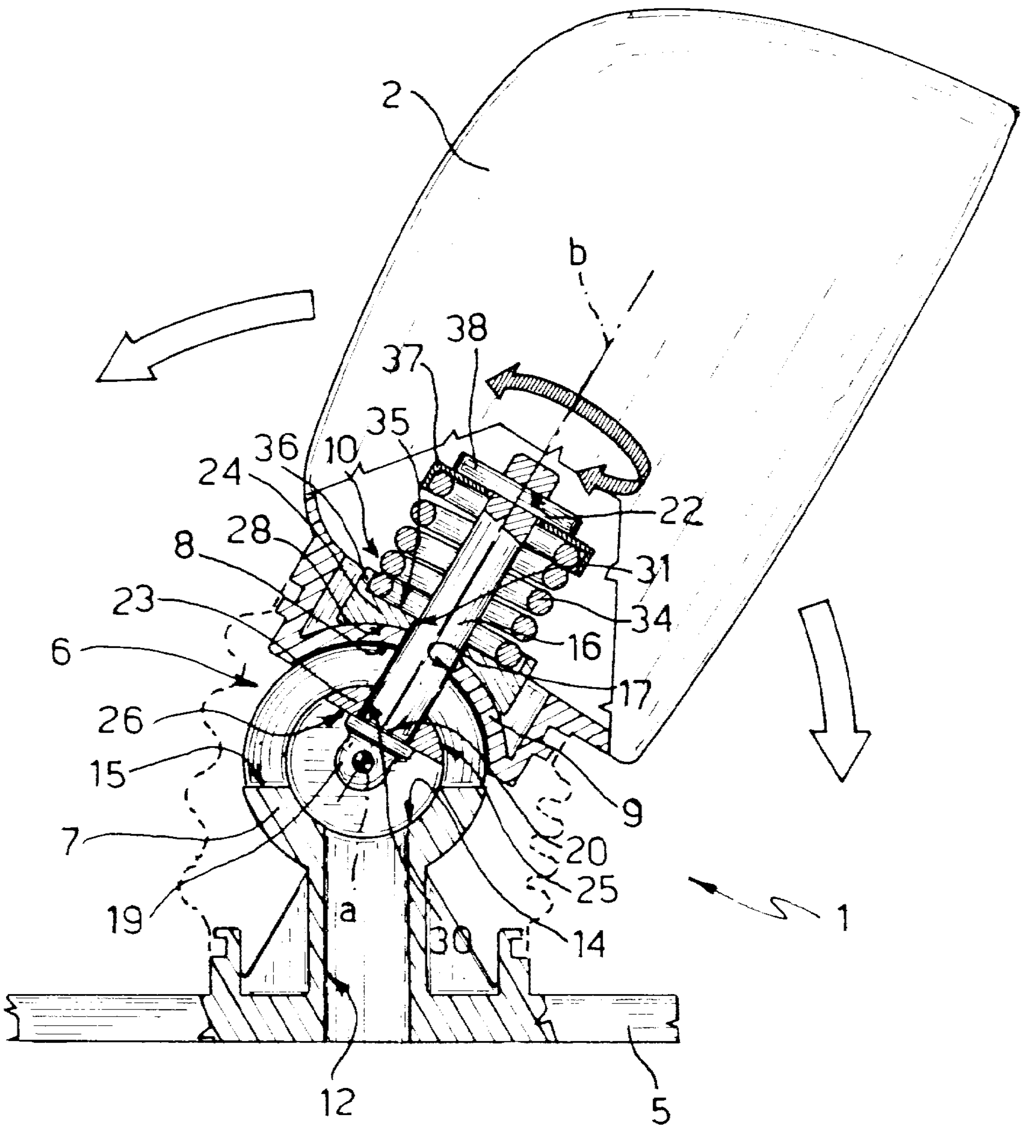


Fig. 2

208 029/345

Espacenet

Bibliographic data: EP0064421 (A1) — 1982-11-10

Remote control device for a vehicle's rear view mirror.

Inventor(s):	MANZONI STEPHANE + (MANZONI, STEPHANE)
Applicant(s):	MANZONI STEPHANE + (MANZONI, STEPHANE)
Classification:	**- international:** ***B60R1/06; B60R1/07;*** (IPC1-7): B60R1/06 **- cooperative:** **B60R1/07**; Y10T74/20432
Application number:	EP19820400489 19820318 Global Dossier
Priority number (s):	FR19810007272 19810410
Also published as:	EP0064421 (B1) FR2503647 (A1) FR2503647 (B1) JPS57178951 (A) JPS57191142 (A) more

Abstract of EP0064421 (A1)

Device for remote control of a vehicle mirror mirror fixed to a housing enclosing a control mechanism. It comprises a support member secured to the vehicle body and extending inside the housing (3) through an opening, said member having a first axis (XX1) about which is pivotally mounted a spacer (13) on which is pivotally mounted on a second axis (YY1) perpendicular to the first axis (XX1) the housing (3) carrying the mirror, a displacement control means (16) arranged along the second axis (YY1) being provided between the body of support (2) and the spacer (13) and another displacement control means (22) being arranged offset relative to the second axis (YY1) between the spacer (13) and the housing (3).

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Numéro de publication: **0 064 421**
A1

(12) **DEMANDE DE BREVET EUROPEEN**

(21) Numéro de dépôt: **82400489.9**

(51) Int. Cl.³: **B 60 R 1/06**

(22) Date de dépôt: **18.03.82**

(30) Priorité: **10.04.81 FR 8107272**

(43) Date de publication de la demande:
10.11.82 Bulletin 82/45

(84) Etats contractants désignés:
DE IT

(71) Demandeur: **Manzoni, Stéphane**
1, rue Pasteur
F-39200 Saint-Claude(FR)

(72) Inventeur: **Manzoni, Stéphane**
1, rue Pasteur
F-39200 Saint-Claude(FR)

(74) Mandataire: **Moulines, Pierre et al,**
Cabinet BEAU de LOMENIE 55, rue d'Amsterdam
F-75008 Paris(FR)

(54) **Dispositif de commande à distance d'un miroir de rétroviseur pour véhicule.**

(57) Dispositif de commande à distance d'un miroir de rétroviseur pour véhicule fixé sur un boîtier renfermant un mécanisme de commande. Il comprend un organe de support solidaire de la carrosserie du véhicule et s'étendant à l'intérieur du boîtier (3) par une ouverture, ledit organe présentant un premier axe (XX_1) autour duquel est montée pivotante une entretoise (13) sur laquelle est monté pivotant suivant un deuxième axe (YY_1) perpendiculaire au premier axe (XX_1) le boîtier (3) portant le miroir, un moyen de commande de déplacement (16) disposé suivant le second axe (YY_1) étant prévu entre l'organe de support (2) et l'entretoise (13) et un autre moyen de commande (22) de déplacement étant disposé de façon décalée par rapport au second axe (YY_1) entre l'entretoise (13) et le boîtier (3).

EP 0 064 421 A1

./...

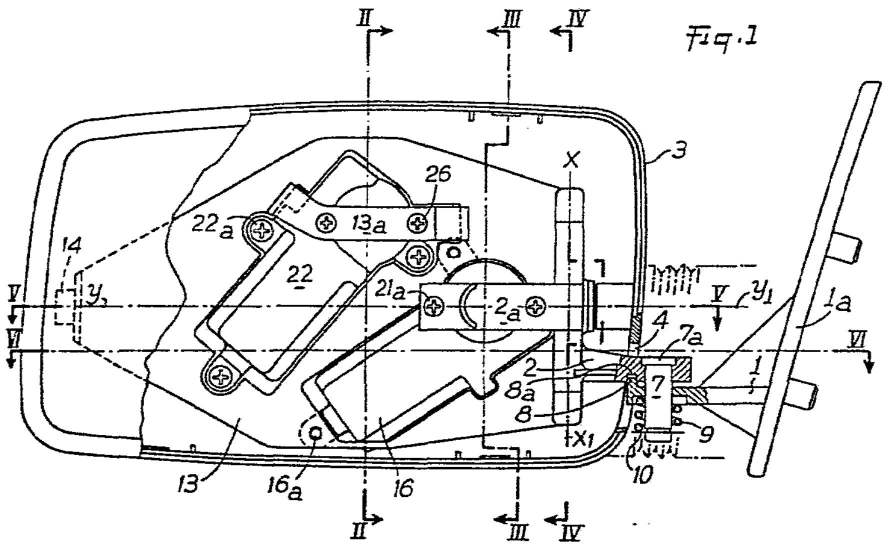


Fig.1
II
III
IV
X
X1
3
26
13a
22a
22
21a
2a
14
y,
y1
V
VI
1a
4
7a
2
8a
8
7
1
9
10
13
16a
16

Dispositif de commande à distance d'un miroir de rétroviseur pour véhicule.

La présente invention a pour objet un dispositif de commande à distance d'un miroir de rétroviseur pour véhicule.

Il est connu d'utiliser des rétroviseurs dans lesquels le miroir, commandé à distance, est monté de façon mobile à l'intérieur de son boîtier ainsi que les moyens d'articulation et de commande par moteur électrique ou par un organe actionné manuellement.

Toutefois, ces rétroviseurs ne donnent pas entière satisfaction en ce qui concerne la protection intérieure des organes mécaniques contre la poussière et les intempéries.

Il est connu d'utiliser un dispositif comprenant un organe de support solidaire de la carrosserie du véhicule et s'étendant à l'intérieur du boîtier par une ouverture, ledit organe présentant un premier axe autour duquel est montée pivotante une entretoise sur laquelle est monté pivotant, suivant un deuxième axe perpendiculaire au premier axe, le boîtier portant le miroir, un moyen de commande de déplacement disposé suivant le second axe étant prévu entre l'organe de support et l'entretoise et un autre moyen de commande de déplacement étant disposé de façon décalée par rapport au second axe entre l'entretoise et le boîtier.

Dans ce dispositif, le miroir étant assujetti au boîtier et non mobile à l'intérieur de celui-ci, on obtient une étanchéité parfaite contre la poussière et les intempéries. Un soufflet de conception très simple assure l'obturation de l'ouverture ménagée dans le boîtier afin de permettre les débattements angulaires de celui-ci.

Conformément à la présente invention, l'organe de support est constitué d'un bras en deux parties reliées entre elles par un organe d'effacement à crabotage, l'une des parties du bras étant fixée sur la carrosserie du véhicule et l'autre partie s'étendant à l'intérieur du boîtier comportant deux paliers d'axe vertical dans lesquels sont montées deux broches sur lesquelles est articulée l'entretoise qui présente deux tourillons disposés suivant un axe horizontal et engagés dans des paliers prévus sur le boîtier.

Le mécanisme ainsi monté dans le boîtier permet de réaliser une forme de celui-ci présentant une épaisseur relativement faible.

Enfin, un tel rétroviseur peut être monté indifféremment sur la portière ou sur le gousset de portière d'un véhicule.

D'autres caractéristiques et avantages de l'invention seront mieux compris à la lecture de la description qui va suivre d'un mode de réalisation et en se référant aux dessins annexés, sur lesquels :

- la figure 1 est une vue en élévation d'un mode de réalisation d'un rétroviseur suivant l'invention, le miroir étant enlevé;
- la figure 2 est une vue en coupe suivant la ligne II-II de la figure 1;
- la figure 3 est une vue en coupe suivant la ligne III-III de la figure 1;
- la figure 4 est une vue en coupe suivant la ligne IV-IV de la figure 1;
- la figure 5 est une vue en coupe suivant la ligne V-V de la figure 1;
- la figure 6 est une vue en plan du rétroviseur et en coupe partielle suivant la ligne VI-VI de la figure 1;
- la figure 7 est une vue en coupe longitudinale d'un mode de réalisation d'un moyen de commande de déplacement;
- la figure 8 est une vue en coupe suivant la ligne VIII-VIII de la figure 7;
- la figure 9 est une vue en coupe suivant la ligne IX-IX de la figure 7; et
- les figures 10, 10a sont des vues en coupe montrant le détail d'un mode de réalisation de paliers.

Aux figures 1 à 6, on a représenté un mode de réalisation d'un rétroviseur d'un véhicule automobile plus particulièrement destiné à être monté sur le gousset d'une portière.

Le dispositif comprend un organe de support dont une partie 1 présente une plaque 1a destinée à être fixée sur la portière du véhicule et l'autre partie 2 s'étend à l'intérieur d'un boîtier 3 de rétroviseur à travers une ouverture 4 du boîtier qui porte sur sa face avant un miroir 5 monté au moyen d'un jonc porte-miroir 6.

La partie 1 de l'organe de support est reliée à la partie 2 par un axe 7 dont la tête 7a, présentant une forme hexagonale, est solidaire de la partie 2 de l'organe de support, ledit axe 7 étant monté rotatif dans la partie 1 de l'organe de support qui présente au moins un organe de crabotage 8 engagé dans un logement 8a de la partie 2 sous l'action d'un ressort 9 en appui d'un côté contre la partie 1 du support et de l'autre côté contre une rondelle 10 engagée dans une gorge de l'axe 7 (figures 1 et 6). La partie 2 de l'organe de support, disposée à l'intérieur du boîtier, présente deux alésages 11, 11a dans lesquels sont montées pivotantes par l'une de leurs extrémités des broches 12, 12a solidaires à leur autre extrémité d'une entretoise 13 (figure 4).

L'entretoise 13 est ainsi articulée suivant un premier axe vertical XX_1 sur la partie 2 de l'organe de support et elle est munie à ses deux extrémités de tourillons 14, 14a (figure 5) qui sont engagés dans des logements cylindriques ou paliers 15, 15a prévus à l'intérieur du boîtier 3. Les tourillons 14, 14a et les paliers 15, 15a sont disposés suivant un même axe, de telle sorte que le boîtier 3 est monté pivotant sur l'entretoise 13 suivant un deuxième axe horizontal YY_1.

Sur l'entretoise 13, est fixé, au moyen de vis 16a, un moyen de commande 16 du déplacement de l'entretoise par rapport à l'organe de support 2.

Ce moyen de commande 16 qui sera décrit plus en détail ultérieurement comporte une tête mobile 17 présentant une rotule 18 munie de deux tétons 19, 19a, ladite rotule étant disposée dans un logement prévu entre un bras 2a solidaire de l'organe de support et une plaque 20 fixée sur le bras 2a au moyen de vis 21 (figures 1 et 3). La rotule 18 est disposée suivant l'axe YY_1 pour faire pivoter l'entretoise autour de l'axe XX_1 par rapport à l'organe de support 1, 2. De la même manière, un moyen de commande 22 est fixé au moyen de vis 22a sur le fond du boîtier 3 et présente une tête mobile 23 (figures 1, 2 et 5) comportant une rotule 24 munie de deux tétons comme ci-dessus, ladite rotule étant disposée dans un logement sphérique prévu entre un bras 13a solidaire de l'entretoise 13 et une plaque 25 fixée sur le bras au moyen de vis 26.

Aux figures 7, 8, 9, on a représenté un mode de réalisation des moyens de commande de déplacement 16 et 22 qui comprennent chacun un carter 27 dans lequel est fixé un moteur électrique 28 dont l'arbre de sortie porte un pignon 29 qui engrène avec un pignon 30 calé sur un axe 31 monté rotatif dans le carter et qui est conformé pour constituer une vis sans fin 32 engrenant avec une roue tangente 33 qui est solidaire en rotation d'une tige 34 à filet hélicoïdal ou tige filetée dans laquelle est engagée la partie médiane de deux étriers élastiques 35, 35a solidaires d'un fourreau 36 disposé autour de la tige 34 et dont la tête 17 ou 23 porte une rotule 18 ou 24 munie de tétons 19, 19a.

Le dispositif fonctionne de la manière suivante : lorsqu'on alimente le moteur 28, on entraîne en rotation, par les pignons 29, 30, la vis 32 et la roue tangente 33, la tige 34, par son filet hélicoïdal ou tige filetée, entraînant en translation les étriers 35, 35a et le fourreau 36.

En conséquence, si on actionne le moyen de commande 16, on déplace l'entretoise 13 par rapport à l'organe de support 1, 2, de telle sorte que l'entretoise et le boîtier 3, portant le miroir 5, se déplacent autour de l'axe vertical XX_1 suivant un mouvement gauche-droite.

D'autre part, en actionnant le moyen de commande 22, on déplace le boîtier 3 portant le miroir 5 autour de l'axe YY_1 suivant un mouvement ciel-terre.

Suivant un autre mode de réalisation représenté aux figures 10, 10a, dans sa partie médiane l'entretoise 59 présente deux tourillons 63, 63a qui sont montés pivotants dans des logements 64, 64a du boîtier ouverts d'un côté où ils sont maintenus par une lame élastique 65, notamment en acier, en appui contre des organes de support 66, 66a solidaires du boîtier 54.

De cette manière, le boîtier 54 est monté pivotant suivant un axe horizontal YY_1 sur l'entretoise 59.

Bien que l'on ait décrit et représenté des moyens de commande utilisant des moteurs électriques, il est bien évident que le déplacement des organes du rétroviseur peut être obtenu par tout autre moyen mécanique et notamment par un câble qui est actionné de l'intérieur du véhicule par un organe de commande manuelle.

Bien entendu, diverses modifications pourront être apportées par l'homme de l'art aux dispositifs qui viennent d'être décrits uniquement à titre d'exemples non limitatifs sans sortir du cadre de l'invention.

R E V E N D I C A T I O N S

1. Dispositif de commande à distance d'un miroir de rétroviseur pour véhicule fixé sur un boîtier renfermant un mécanisme de commande comprenant un organe de support solidaire de la carrosserie du véhicule et s'étendant à l'intérieur du boîtier par une ouverture, ledit organe présentant un premier axe (XX_1) autour duquel est montée pivotante une entretoise sur laquelle est monté pivotant suivant un deuxième axe (YY_1) perpendiculaire au premier axe (XX_1) le boîtier portant le miroir, un moyen de commande de déplacement disposé suivant le second axe (YY_1) étant prévu entre l'organe de support et l'entretoise et un autre moyen de commande de déplacement étant disposé de façon décalée par rapport au second axe (YY_1) entre l'entretoise et le boîtier, caractérisé en ce que l'organe de support est constitué d'un bras en deux parties (1, 2) reliées entre elles par un organe d'effacement à crabotage (7, 8, 9), l'une des parties (1) du bras étant fixée sur la carrosserie du véhicule et l'autre partie (2) s'étendant à l'intérieur du boîtier (3) comportant deux paliers (11, 11<u>a</u>) d'axe vertical dans lesquels sont montées deux broches (12, 12<u>a</u>) sur lesquelles est articulée l'entretoise (13) qui présente deux tourillons (14, 14<u>a</u>) disposés suivant un axe horizontal et engagés dans des paliers (15, 15<u>a</u>) prévus sur le boîtier (3).

2. Dispositif suivant la revendication 1, caractérisé en ce que les paliers prévus sur le boîtier sont constitués chacun par un logement (64) ouvert d'un côté et dans lequel est maintenu un tourillon (15, 63) de l'entretoise (13, 59) sous l'action d'une lame élastique (65) dont les deux extrémités sont en appui contre deux organes de support (66, 66<u>a</u>) solidaires du boîtier (3, 54).

3. Dispositif suivant la revendication 1, caractérisé en ce que les moyens de commande (16, 22) de déplacement sont constitués chacun d'un carter (27) fixé sur l'entretoise ou sur le boîtier et dans lequel est disposé un moteur électrique (28) entraînant en rotation par un moyen de transmission (30, 31, 32, 33) une tige (34), à filet hélicoïdal dans lequel est engagée la partie médiane d'au moins

un étrier élastique (35, 35a), qui est solidaire d'un fourreau (36) disposé autour de la tige et dont une extrémité est montée de façon articulée au moyen d'une rotule (18, 24) sur l'organe de support ou sur l'entretoise.

4. Dispositif suivant la revendication 1, caractérisé en ce que les moyens de commande de déplacement des organes sont constitués chacun d'un câble de commande dont l'une des extrémités est reliée au boîtier (3, 54) ou à l'entretoise (13, 59) et dont l'autre extrémité est reliée à un organe de manoeuvre manuel disposé dans le véhicule.

0064421

1/4

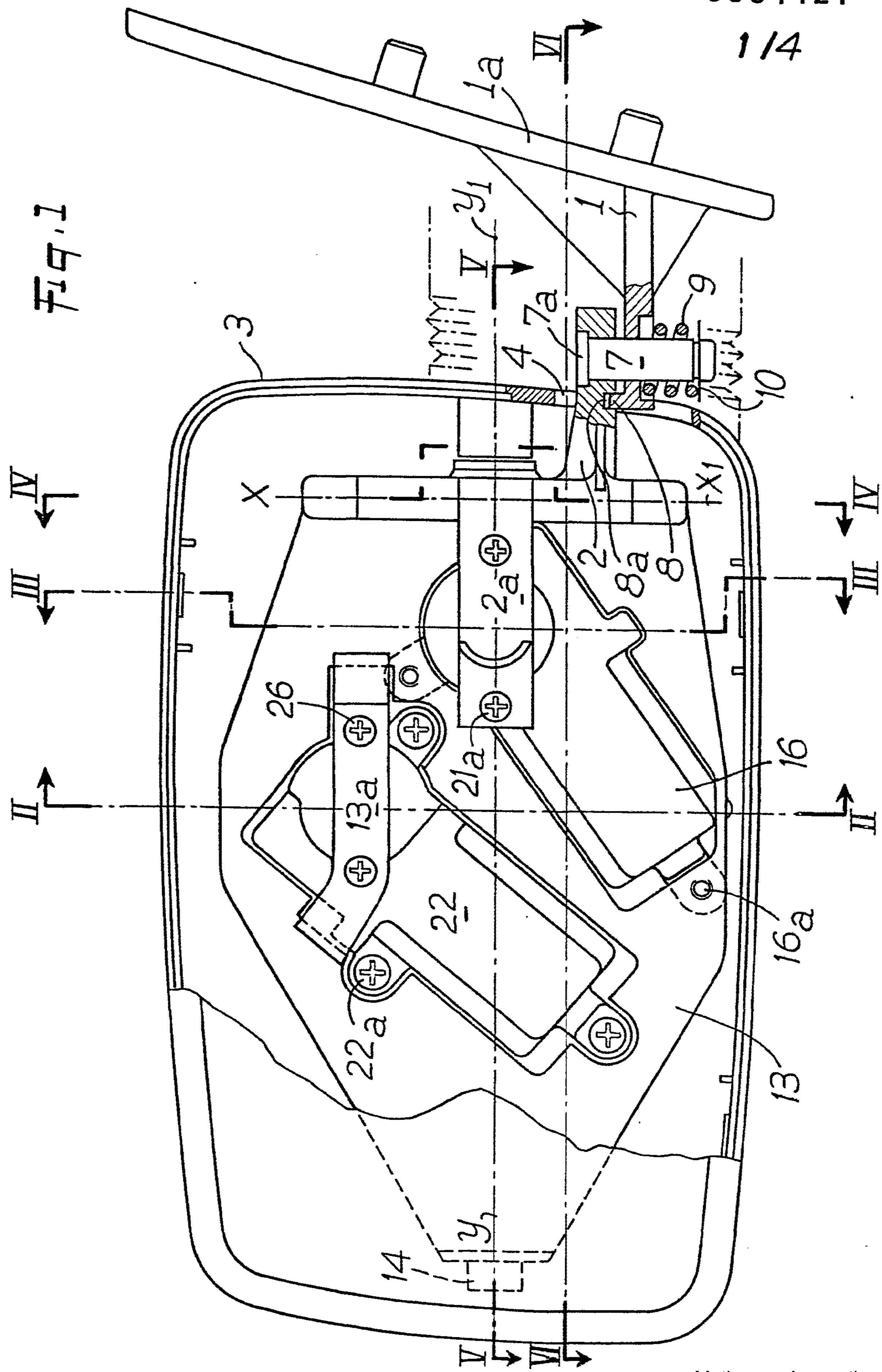


Fig. 1

Fig. 2

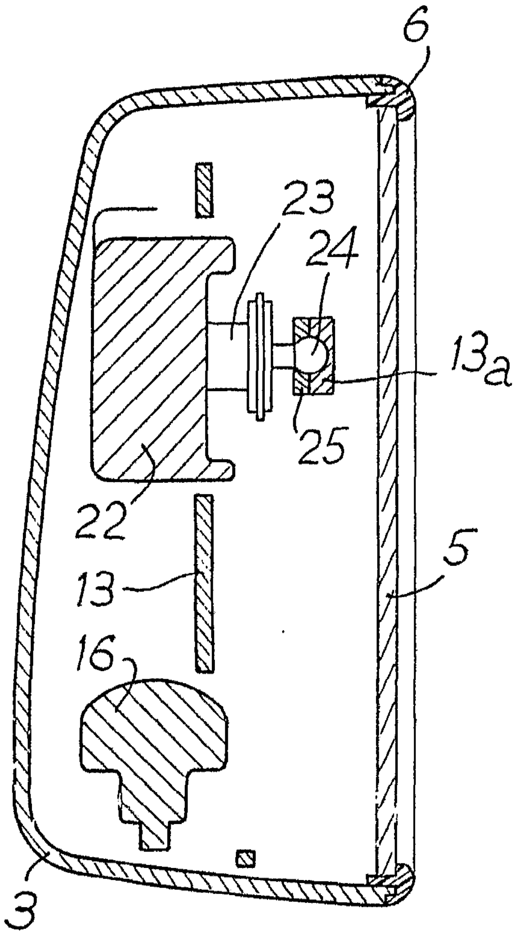


Fig. 3

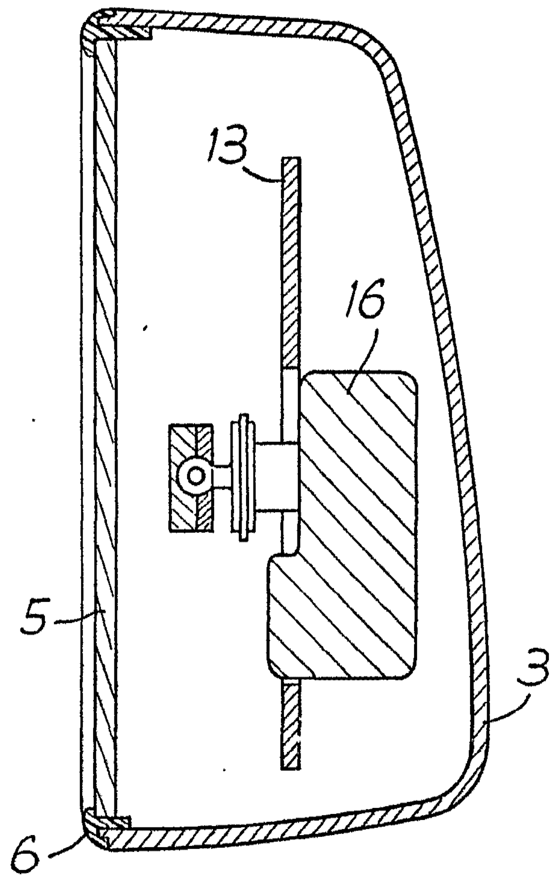
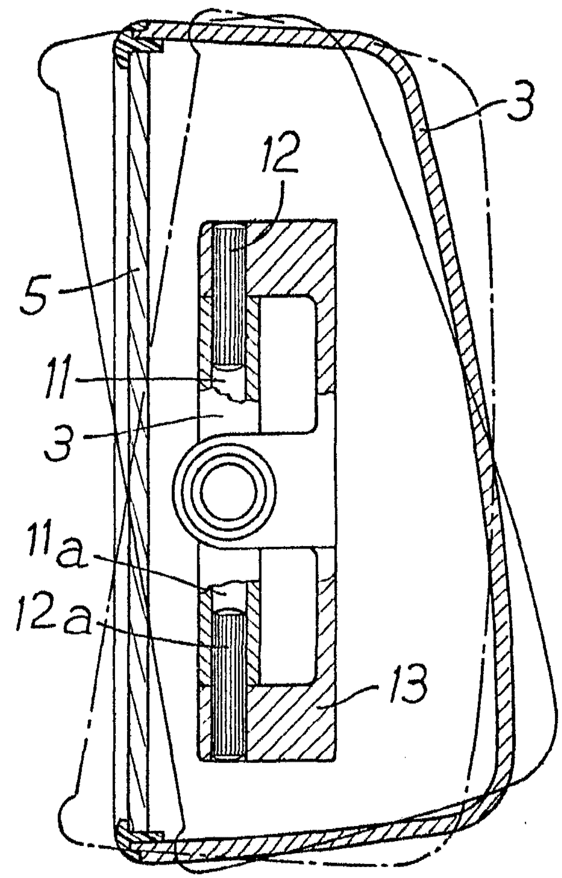


Fig. 4



0064421

2/4

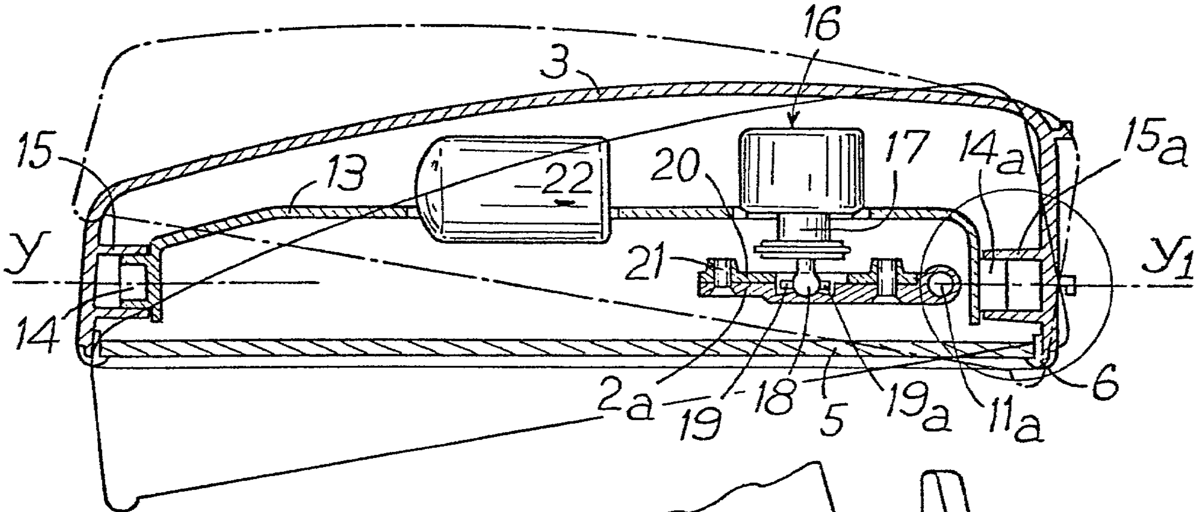


Fig.5

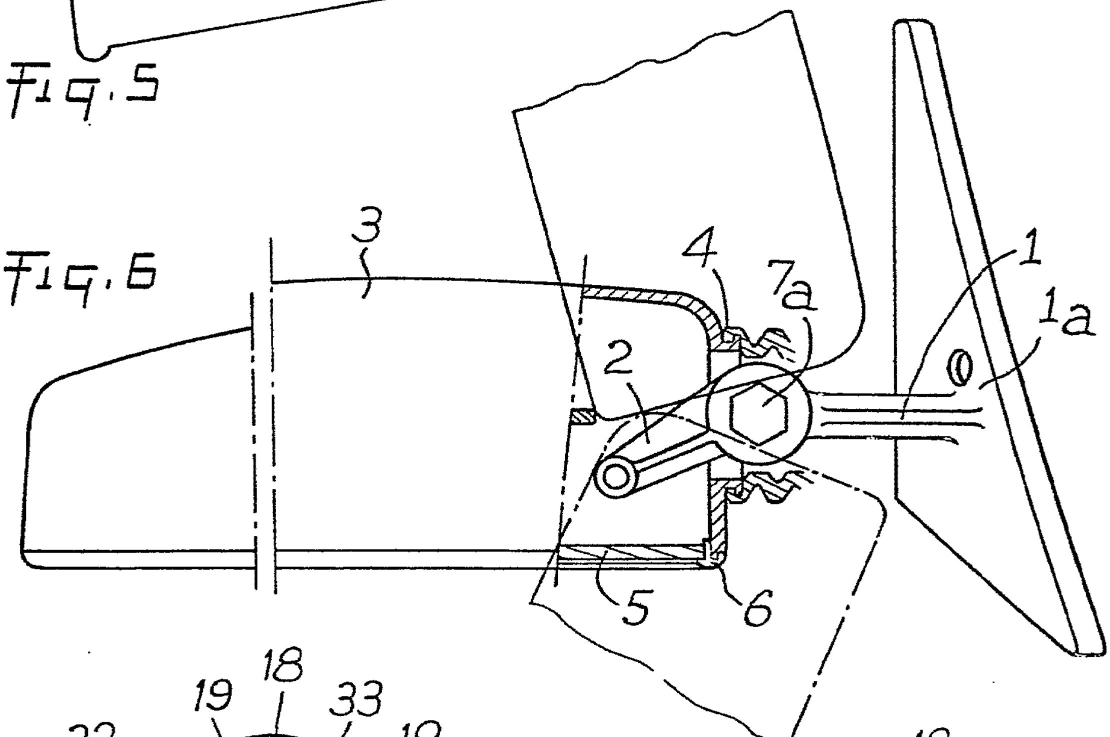


Fig.6

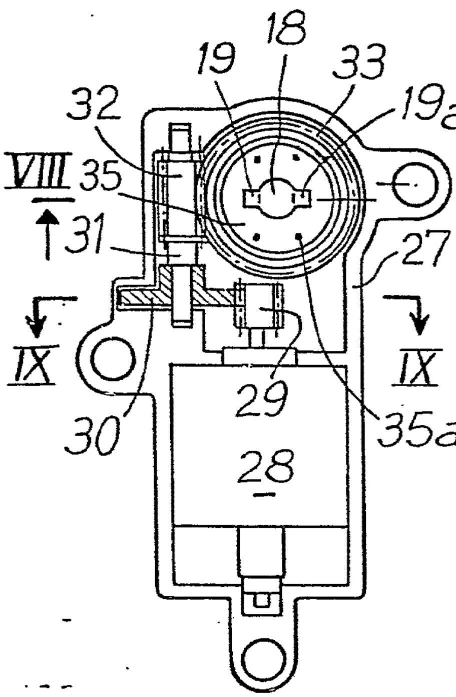


Fig.7

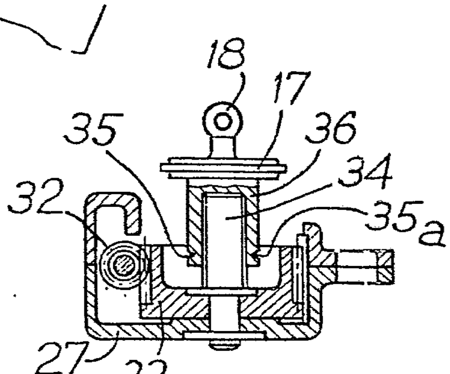


Fig.8

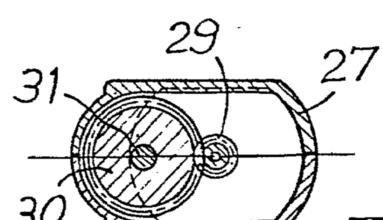


Fig.9

Fig. 10

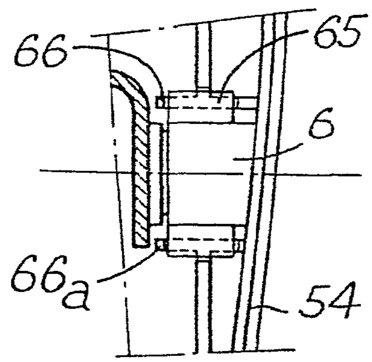
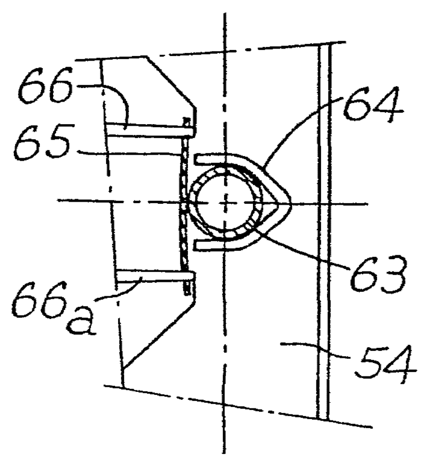


Fig. 10a



Office europeen des brevets

RAPPORT DE RECHERCHE EUROPEENNE

0064421
Numero de la demande

EP 82 40 0489

DOCUMENTS CONSIDERES COMME PERTINENTS			
Categorie	Citation du document avec indication, en cas de besoin, des parties pertinentes	Revendication concernee	CLASSEMENT DE LA DEMANDE (Int. Cl. ³)
A	DE - A - 2 906 102 (THERMOPLAST)		B 60 R 1/06
	* figure 1, revendications 1,8,12, 15,16 *	1,3	
	--		
A	DE - A - 2 840 789 (WEISS)		
	* figure 1, revendication 1 *	1,3	
	--		
A	FR - A - 2 437 322 (MURAKAMI)		
	* revendications 3,6 *	1,3	
	--		DOMAINES TECHNIQUES RECHERCHES (Int. Cl. ³)
P	US - A - 4 286 841 (DESHAW)		
	* en entier *	1,3	B 60 R 1/06
	--		
E	DE - A - 3 039 343 (USAMI et al.)		
	* revendications 1-7 *	1,3	

Le present rapport de recherche a ete etabli pour toutes les revendications

Lieu de la recherche	Date d achevement de la recherche	Examinateur
LA HAYE	13-07-1982	SCHMITTER

CATEGORIE DES DOCUMENTS CITES

X : particulierement pertinent a lui seul
Y : particulierement pertinent en combinaison avec un autre document de la même categorie
A : arriere-plan technologique
O : divulgation non-ecrite
P : document intercalaire
T : theorie ou principe à la base de l invention
E : document de brevet anterieur, mais publie à la date de depôt ou apres cette date
D : cite dans la demande
L : cite pour d autres raisons
& : membre de la meme famille, document correspondant

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 314 839 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **87202174.6**

(51) Int. Cl.4: **B25J 9/00 , F16H 25/02**

(22) Date of filing: **06.11.87**

(43) Date of publication of application: **10.05.89 Bulletin 89/19**

(84) Designated Contracting States: **AT BE CH DE ES FR GB GR IT LI LU NL SE**

(71) Applicant: **DE HAAN MECHATRONICS B.V.**
Schoolkade 93
Musselkanaal(NL)

(72) Inventor: **Rosenthal, Dov**
Rishon 1e Zion Street 23
Tel Aviv 42.275(IL)

(74) Representative: **van der Beek, George Frans et al**
Nederlandsch Octrooibureau
Scheveningseweg 82 P.O. Box 29720
NL-2502 LS 's-Gravenhage(NL)

(54) Positioning apparatus.

(57) Positioning means include at least two axially elongatable elements (90, 112, 124, 132, 134, 136, 188, 190, 192), pivotably mounted to a support and at least in part pivotably mounted to the element to be positioned. Such elongatable elements may be positioned in one plane to give an X Y-positioning, or in different planes, in which latter case there is preferably a base (180) with a first element (182) pivotable thereon, a second element (186) pivotably mounted to the first element about a pivot axis (at 187) perpendicular to the pivot axis of the first element, and axially elongatable means on the base to move the first and second elements in at least two mutually perpendicular directions. The axially elongatable elements are preferably electrically actuable by having a cylinder with internal screw threading and a piston with external screw threading, and an electric motor to rotate one of these parts so as to vary the length of the element.

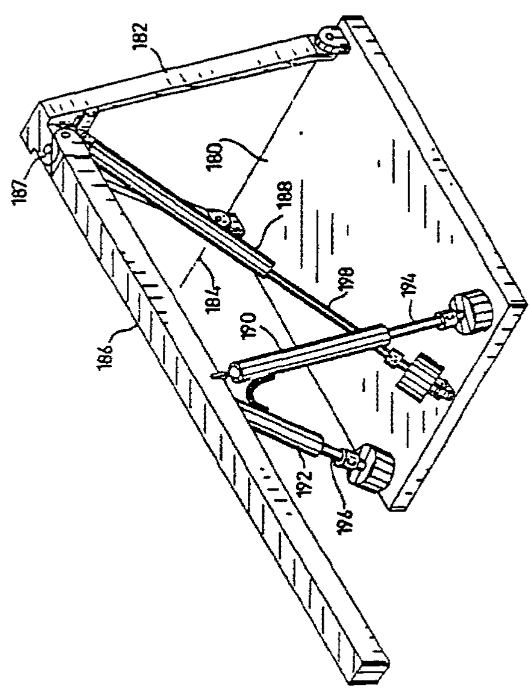


FIG 11A

EP 0 314 839 A1

Positioning Apparatus

FIELD OF THE INVENTION

The present invention relates to mechanical devices generally and more specifically to positioning apparatus including electrically actuable pistons and two and three dimensional positioners.

BACKGROUND OF THE INVENTION

X-Y tables of various designs are known and typically comprise a plurality of screw drives arranged along perpendicular axes. Due to the requirement for independent X, Y motion, part of the drives, including their power sources, are required to move. As a result, X-Y tables are generally complex and expensive.

Robots of various designs are known. Typically, prior art robots comprise extensible members which are arranged for selectable extension along relatively perpendicular axes.

Various types of positioning apparatus are known on the market. Specifically, electrically actuable cylinders are known. One typical device of this type is a Model 15D manufactured by Industrial Devices Corporation of Novato, California, U.S.A.. This electric cylinder includes a fixed outer housing, a fixed screw thread rotatably mounted in the housing and a translatable riding member which translates axially in response to rotation of the screw thread. A piston extension member is mounted for movement together with the translatable riding member.

The above-described device is lubricated with grease, and cannot, as a matter of practicality, be filled with oil because too many seals would be required and no provision was made for accomodating the change in interior volume due to differing displacements of the piston.

Electrically acutuable cylinders of the type described hereinabove are relatively expensive due to their complexity. Due to the fact that they are lubricated with grease, having relatively poor heat distribution characteristics as compared with oil, their mechanical efficiency and operating lifetime are relatively low.

SUMMARY OF THE INVENTION

The present invention seeks to improve such known positioning apparatus as to simplicity, versatility, applicability and reliability and to improve such electrically actuable cylinders to overcome the described disadvantages of the prior art cylinders and to make them most suitable for use in such positioning apparatus such as X Y-tables and RR and RRR-robots.

There is thus in accordance with the present invention provided positioning apparatus comprising an element to be positioned, and first and second axially elongatable elements mounted onto the element to be positioned at first and second locations thereat and to support locations, at least one of the first and second axially elongatable elements being pivotably mounted onto the element to be positioned and at least one of the first and second axially elongatable elements being pivotably mounted onto a support location.

Additionally in accordance with an embodiment of the present invention, at least three axially elongatable elements are employed.

Further in accordance with an embodiment of the present invention there is provided a three dimensional positioning device comprising a base, a first element pivotably mounted with respect to the base for pivotable positioning relative to the base about a first pivot axis, a second element pivotably mounted with respect to the first element for pivotable positioning relative thereto about a second pivot axis perpendicaular to the first pivot axis, first axially elongatable means mounted onto the base and either of the first and second elements for selectable positioning of the second element about the first pivot axis and second axially elongatable means mounted onto the base and the second element for selectable positioning of the second element with respect to both the first and second pivot axes.

In accordance with a preferred embodiment of the present invention, the second axially elongatable means comprises two axially elongatable elements arranged in a plane typically parallel to the first pivot axis and having elongation axes which are angled with respect to each other. In accordance with a preferred embodiment of the invention, the two axially elongatable elements operate in a differential mode of operation.

In accordance with an embodiment of the invention, at least some of the base, first element, second element, first axially elongatable means and second axially elongatable means are pivotably interconnected by universal joints.

Further, in accordance with a preferred embodiment of the present invention an electrically actuable cylinder comprises a first element defning a cylinder housing and defining an interior generally cylindrical screw threading, a second element defining an interior member and located within the cylinder housing and defining an exterior generally cylindrical screw threading which cooperates with the interior generally cylindrical screw threading of the first element, whereby relative rotation of the first and second elements in a first rotation direction produces translation of the second element relative to the first element in a first axial direction, and relative rotation of the first and second elements in a second, opposite, rotation direction, produces translation of the second element relative to the first element, in a second axial direction, opposite to the first axial direction.

Additionally in accordance with an embodiment of the present invention, the first and second elements are each provided with mounting elements for secure attachment thereof to driving or driven elements.

Further in accordance with an embodiment of the present invention, the interior of the first element is filled with lubricating fluid.

Additionally in accordance with a preferred embodiment of the invention, a lubricating fluid reservoir is provided in communication with the interior of the first element and is sealed from the exterior thereof.

Further in accordance with an embodiment of the present invention, the lubricating fluid reservoir communicates with the interior of the first element through a plurality of apertures formed along the length thereof.

Additionally in accordance with an embodiment of the present invention, the lubricating fluid reservoir includes a resiliently flexible portion for adapting to the varying interior volume of the first element as a function of the relative location of the second element therein.

Further in accordance with an embodiment of the invention, the electrically actuable cylinder includes means operative to reduce backlash. In one such embodiment, the second element comprises at least first and second threaded elements flexibly joined.

Additionally in accordance with a preferred embodiment of the present invention, the first and second elements are axially tensioned.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be understood and appreciated more fully from the following detailed description taken in conjunction with the drawings in which:

Figs. 1A and 1B are side sectional illustrations of an electrically actuable cylinder constructed and operative in accordance with an embodiment of the present invention in respective extended and retracted orientations;

Figs. 2A, 2B and 2C are sectional illustrations of three embodiments of the cylinder of Figs. 1A and 1B taken along the lines II - II of Fig. 1B;

Fig. 3 is a side sectional illustration of an electrically actuable cylinder constructed and operative in accordance with a preferred embodiment of the present invention;

Fig. 4 is a sectional illustration of the cylinder of Fig. 3, taken along the lines IV - IV of Fig. 3;

Figs. 5A and 5B are respective side and side sectional illustrations of an anti-backlash type of interconnection preferably employed in the cylinder of Figs. 1 - 4;

Fig. 6 is a sectional illustration of a rigid coupling useful in various embodiments of the present invention;

Fig. 7 is a pictorial illustration of a slotted threaded collar member useful in the embodiment of Fig. 6;

Fig. 8 is an illustration of a cylinder of the type illustrated in Figs. 1 - 4 in a typical operating orientation;

Figs. 9A, 9B, 9C, 9D and 9E are top view illustrations of an X-Y table constructed and operative in accordance with one preferred embodiment of the invention in various operative orientations;

Figs. 10A, 10B, 10C, 10D, 10E, 10F and 10G are top view illustrations of an X-Y table constructed and operative in accordance with another preferred embodiment of the invention in various operative orientations;

Figs. 11A, 11B and 11C are respective pictorial, side and end view illustrations of a robot constructed and operative in accordance with a preferred embodiment of the present invention;

Figs. 12A, 12B, 12C and 12D are side view illustrations of the robot of Figs. 11A - 11C in four alternative operative orientations; and

Figs. 13A and 13B are end view illustrations of the robot of Figs. 11A - 11C in two alternative operative orientations.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference is now made to Figs. 1A and 1B which illustrate an electrically actuable cylinder constructed and operative in accordance with an embodiment of the present invention and suitable for horizontal disposition. The cylinder comprises a cylinder housing 10 having inwardly facing screw threading 12, an externally threaded piston mounting member 14 and a piston 16, mounted onto mounting member 14.

The cylinder housing 10 is preferably formed with a mounting portion 18 including a mounting aperture 20, for fixed mounting thereof, in a manner which will be described hereinafter in connection with Fig. 8. The cylinder housing 10 is also formed with a lubrication inlet and outlet aperture 22, communicating with the interior of the cylinder housing 10 and having an associated plug 24. Disposed interior of the cylinder housing is a liquid lubricant, typically oil.

At the opposite end of the cylinder housing from aperture 22 there is provided a piston seal 25 and bushing 26, typically held in place by a sealing ring 28, all of conventional construction.

A comparison of Figs. 1A and 1B illustrates the relative displacement of the mounting member 14 and piston 16 axially along the longitudinal axis 30 of the cylinder. It will be appreciated that relative rotation of the piston mounting member 14 and of cylinder housing 10 in a first rotational direction produces axial displacement of the piston relative to the housing in a first axial direction along axis 30, while relative rotation of the piston mounting member 14 and the cylinder housing 10 in an opposite rotational direction produces axial displacement in an opposite direction.

Considering now Figs. 2A - 2C, it is seen that there are a number of alternatives for the configuration of the cylinder housing 10. Three of these alternatives are illustrated, it being noted that the embodiment of 2A shows a square cross section, in which four corner spaces 32 are left between the piston mounting member 14 and the housing to permit oil to pass therethrough as the mounting member 14 moves axially along axis 30.

Fig. 2B shows a triangular configuration of housing 10 providing three corner spaces 34. Fig. 2C shows a generally rounded configuration having a mounting member 14 having a plurality of axial slots 35 formed therein to permit passage therethrough of lubricating fluid, such as oil. Such slots or similar means may also be present in all other embodiments of the cylinder to avoid jamming by enclosed quantities of lubricating fluid to one side of the piston mounting member.

Reference is now made to Figs. 3 and 4 which illustrate an alternative embodiment of an electrically actuable cylinder constructed and operative in accordance with a preferred embodiment of the present invention. Similarly to the embodiment of Figs. 1A and 1B, the cylinder comprises a cylinder housing 40 having inwardly facing screw threading 42, an externally threaded piston mounting member 44 and a piston 46, mounted onto mounting member 44.

The cylinder housing 40 is preferably formed with a mounting portion 48 including a mounting aperture 50, for fixed mounting thereof, in a manner which will be described hereinafter in connection with Fig. 8. The cylinder housing 40 is also formed with a lubrication inlet and outlet aperture 52, communicating with the interior of the cylinder housing 40 and having an associated plug 54. Filling the interior of the cylinder housing is a liquid lubricant, typically oil.

At the opposite end of the cylinder housing from aperture 52 there is provided a piston seal 55 and bushing 56, typically held in place by a sealing ring 58, all of conventional construction.

In contrast to the embodiment of Figs. 1A and 1B, the embodiment of Figs. 3 and 4 is characterized in that it is provided with means for accomodating excess oil which is expelled from the interior of the cylinder housing 40, when the piston 46 is retracted, thereinto, thereby reducing the interior volume. Accordingly, the embodiment of Figs. 3 and 4 may be used at any desired orientation, not necessarily horizontal.

The means for accomodating excess oil typically comprises a bladder 60 formed of a resilient material, such as rubber, which surrounds the cylinder housing 40 and is fixedly attached thereto at the extreme ends thereof 62 and 64.

The interior of the blader 60 typically communicates with the interior of the cylinder housing 40 via a series of apertures 66 formed along the length of the cylinder housing 40. The bladder 40 is enclosed by a relatively rigid cover member 68. It is a particular feature of the invention that adjacent to the rear portion of the cylinder housing 40, i.e. near plug 54, no apertures 66 are defined. Thus, when the mounting member 44 is fully retracted, it does not tend to get stuck in the retracted orientation, due to a deposit of compressed lubricating oil disposed between the mounting member 44 and the rear wall 69 of the cylinder. Another advantage of this construction is to cushion impacts at the extreme positions of the mounting member 44.

Similarly to the operation of the apparatus of Figs. 1A and 1B, relative displacement of the mounting member 44 and piston 46 axially along the longitudinal axis 70 of the cylinder is produced by relative rotation of the piston mounting member 44 and of cylinder housing 40.

It has been appreciated that problems of backlash sometimes occur in electrically actuable cylinders of the type considered herein. In order to overcome this problem, a special construction is provided in accordance with the present invention, and illustrated in Figs. 5A and 5V whereby a piston mounting member 74 (which may be substituted for members 14 and 44) is formed to define a flexible mounting for a corresponding piston 76 (which may be substituted for members 16 and 46).

In the illustrated embodiment of Figs. 5A and

5B, a piston mounting member 74 is formed with transverse slots 78 which effectively define two portions 80 and 82 thereof, which are somewhat flexible with respect to each other along axis 84 but rigid with respect to tortional displacement relative thereto. The piston 76 is fixedly mounted onto poriton 82 and an arrangement is provided whereby portions 80 and 82 are tensioned with respect to each other along longitudinal axis 84, as by a tensioning screw 86 forcing portions 80 and 82 apart.

Reference is now made to Fig. 8, which illustrates the environment in which the cylinders of Figs. 1 - 7 operate. Here such a cylinder 90 is shown having the cylinder housing 92 pivotably but not rotatably mounted onto a movable element 94. The piston 96 is mounted, typically via a rigid coupling 98 to the spindle 99 of an electric motor 100, whose base is pivotably, but not rotatably mounted onto a fixed mounting support 102. Rotation of the piston 96 about its longitudinal axis 104 in either direction provides either extension or retraction of the piston 96 relative to housing 92, thus providing displacement of member 94 along arrows 106.

Rigid coupling 98 is illustrated in Figs. 6 and 7 which comprises a threaded axially slotted sleeve 107 which is arranged to overlie two shafts, which may be of different diameters and to be tightened thereover by corresponding pairs of nuts 109 and 111. Each nut of a pair of nuts is forcibly tightened against the other nut of the pair to provide axial tension on the sleeve thereunder, forcing the sleeve 107 radially inwardly.

Reference is now made to Figs. 9A - 9E, which illustrate an X - Y table constructed and operative in accordance with a preferred embodiment of the present invention. According to a preferred embodiment of the invention, the X - Y table comprises a table member 110 arranged for motion in an X - Y plane and having fixed thereto a first electrically actuable cylinder 112. Cylinder 112 is preferably a cylinder of the type described hereinabove in connection with Figs. 1 - 8 but may alternatively be a prior art cylinder or any other suitable cylinder.

A piston 114 of cylinder 112 is mounted, typically via coupling 116, typically of the type shown in Figs. 6 and 7, to the spindle 118 of an electric motor 120, whose base is pivotably, but not rotatably, mounted onto a fixed mounting support 122.

Pivotably mounted onto table member 110 about a pivot axis perpendicular to the X - Y plane and extending generally perpendicular to cylinder 112 is an electrically actuable cylinder 124. Cylinder 124 is preferably a cylinder of the type described hereinabove in connection with Figs. 1 - 8 but may alternatively be a prior art cylinder or any other suitable cylinder.

A piston 125 of cylinder 124 is mounted, typically via a coupling 126, typically of the type shown in Figs. 6 and 7, onto the spindle 128 of an electric motor 130, whose base is pivotably, but not rotatably, mounted onto a fixed mounting support 132.

Fig. 9A shows the table member 110 in a nominal intermediate position, with both pistons 114 and 125 partially retracted. Fig. 9B shows the orientation when pistion 114 is fully extended; Fig. 9C shows the orientation when piston 114 is fully retracted; Fig. 9D shows the orientation when piston 125 is fully retracted; and Fig. 9E shows the orientation when piston 125 is fully extended.

It is appreciated that when table member 110 is out of its nominal position, it is skewed in the X - Y plane. For applications wherein the rotational orientation of the table member 110 is of significance, an alternative construction of an X - Y table is provided, as illustrated in Figs. 10A - 10G.

According to a preferred embodiment of the invention, the X - Y table of Figs. 10A - 10G comprises a table member 130 arranged for motion in an X - Y plane and having pivotably mounted thereto about pivot axes lying perpendicular to the X - Y plane three electrically actuable cylinders 132, 134 and 136, each preferably a cylinder of the type described hereinabove in connection with Figs. 1 - 8 but alternatively a prior art cylinder or any other suitable cylinder.

Cylinders 132 and 134 are arranged in generally parallel orientation to a first side of table member 130, while cylinder 136 is arranged generally perpendicularly to cylinders 132 and 134 to a second side of table member 130, separated from the first side by 90 degrees.

Pistons 142 and 144 of respective cylinders 132 and 134 are each mounted via respective couplings 146 and 148, typically of the type shown in Figs. 6 and 7, to spindles 150 and 152 of respective electric motors 154 and 156, whose bases are pivotably, but not rotatably, mounted onto fixed mounting supports 158 and 160.

A piston 162 of cylinder 136 is mounted, typically via a coupling 164, typically of the type shown in Figs. 6 and 7, to the spindle 166 of an electric motor 168, whose base is pivotably, but not rotatably, mounted onto a fixed mounting support 170.

Fig. 10A shows the table member 130 in a nominal intermediate position, with pistons 142, 144 and 162 partially retracted. Fig. 10B shows the orientation when pistons 142 and 144 are fully extended; Fig. 10C shows the orientation when pistons 142 and 144 are fully retracted; Fig. 10D shows the orientation when piston 162 is fully retracted; Fig. 10E shows the orientation when piston 162 is fully extended; Fig. 10F shows rotation of the table member 130 about its nominal position of Fig. 10A in a first direction and Fig. 10G shows rotation of the table member 130 about its nominal position of Fig. 10B in an opposite direction.

Reference is now made to Figs. 11A - 11C which illustrate 3-dimensional positioning apparatus constructed and operative in accordance with a preferred embodiment of the invention and comprising a base 180 and a first element 182, typically in the form of a sawhorse bracket, pivotably mounted with respect to the base 180 for pivotable positioning relative to the base about a first pivot axis 184, typically lying parallel to the plane of the base 180.

A second element 186, typically in the form of a beam, is pivotably mounted with respect to the first element 188, preferably by a universal joint 187, which permits rotation of the second element 186 about the first pivot axis and also with respect to a second pivot axis perpendicular to the first pivot axis.

First axially elongatable means 188, typically in the form of an electrically actuable cylinder of the type described above and illustrated in Figs. 1 - 8, but alternatively any suitably elongatable means, is mounted onto the base 180 and the first element 182 for selectable positioning of the first element about the first pivot axis, in much the same arrangement illustrated in Fig. 8 hereinabove.

Second axially elongatable means, typically in the form of a pair of electrically actuable cyliners 190 and 192, are mounted onto the base 180 and onto the second element 186 for selectable positioning of the second element with respect to both the first and second pivot axes. It is noted that each of the electrically actuable cylinders is provided with a driving and coupling assembly of the type shown in Fig. 8. It is appreciated that the cylinders 190 and 192 may operate in phase or out of phase, thus providing an additional degree of freedom. Thus both up and down motion and right to left motion may be provided thereby.

According to an alternative embodiment of the invention, cylinder 188 may be coupled directly to element 186 instead of being coupled to element 182. In such alternative embodiment, the three cylinders 188, 190 and 192 may all be joined to element 186 at the same general location.

Figs. 11A-11C illustrate the positioning apparatus in a nominal position with all of the pistons in intermediate positions. Fig. 12A illustrates the positioning apparatus in a raised position, wherein pistons 194 and 196 of respective cylinders 190 and 192 are fully extended. Fig. 12B illustrates the postioning apparatus in a lowered position, wherein pistons 194 and 196 of respective cylinders 190 and 192 are fully retracted.

Fig. 12C illustrates the positioning apparatus in a backward position, wherein piston 198 of cylinder 188 is fully extended, and Fig. 12D illustrates the positioning apparatus in a forward position, wherein piston 198 of cylinder 188 is fully retracted.

Fig. 13A illustrates the positioning apparatus in a left-sided orientation wherein piston 196 is extended more than piston 194 while Fig. 13B illustrates the positioning apparatus in a right-sided orientation wherein piston 194 is extended more than piston 196.

The table 110 and the beam 186 may be used for any suitable purpose in positioning parts, e.g. to be machined, or to position tools or measuring and sensing means, as is known as such in the art, e.g. in robots for handling and machining. The free end of beam 186, to be positioned accurately in space as described, may carry gripping means not shown and known as such, to grip articles to be treated, machined or operated on in any other manner, to move such articles to a treatment zone, to hold them during treatment if so desired, and to move them back to the point where they were thus gripped, or only to convey articles from one point to another etc. The purpose may be to save manual labor, to avoid heavy loads having to be moved by personnel, to speed up treatments, to obtain more accurate positioning of articles, to hold them exactly in place during longer time intervals and/or to exert any of such operations in an environment dangerous to men or not easily accessible to personnel etc.

It will be appreciated by persons skilled in the art that the examples provided above are merely illustrative of the structure and operation of the apparatus of the present invention. The present invention is not defined by what is described hereinabove but rather the scope of the invention is limited only by the claims which follow.

Claims

1. Positioning apparatus comprising an element to be positioned, and first and second axially elongatable elements mounted onto the element to be positioned at first and second locations thereat and to support locations, at least one of the first and second axially elongatable elements being pivotably mounted onto the element to be positioned and both of the first and second axially elongatable elements being pivotably mounted onto a support location.

2. Apparatus according to claim 1 and comprising at least three axially elongatable elements mounted onto the element to be positioned.

3. A three dimensional positioning device comprising a base;
a first element pivotably mounted with respect to the base for pivotable positioning relative to the base about a first pivot axis;
a second element pivotably mounted with respect to the first element for pivotable positioning relative thereto about a second pivot axis generally perpendicular to the first pivot axis;
first axially elongatable means mounted onto the base and to either the first element or the second element for selectable positioning of the second element about the first pivot axis; and
second axially elongatable means mounted onto the base and the second element for selectable positioning of the second element with respect to both the first and second pivot axes.

4. Apparatus according to claim 3 and wherein said second axially elongatable means comprises two axially elongatable elements arranged in a plane generally parallel to the first pivot axis and having elongation axes which are angled with respect to each other.

5. Apparatus according to claim 3 or claim 4 and wherein at least ome of the base, first element, second element, first axially elongatable means and second axially elongatable means are pivotably interconnected by universal joints.

6. Apparatus according to claim 1 or claim 2, in which the elongatable members are positioned, pivoted and connected to the element to be positioned so as move it in one plane.

7. An electrically actuable cylinder comprising a first element defining a cylinder housing and defining an interior generally cylindrical screw threading;
a second element defining an interior member located within the cylinder housing and defining an exterior generally cylindrical screw threading which cooperates with the interior generally cylindrical screw threading of the first element, whereby relative rotation of the first and second elements in a first rotation direction produces translation of the second element relative to the first element in a first axial direction, and relative rotation of the first and second elements in a second opposite rotation direction, produces translation of the second element relative to the first element in a second axial direction, opposite to the first axial direction.

8. Apparatus according to claim 7 and wherein said first and second elements are each provided with mounting elements for secure attachment thereof to driving or driven elements.

9. Apparatus according to claim 7 or claim 8, and wherein the interior of the first element is filled with lubricating fluid.

10. Apparatus according to any of claims 7 to 9 inclusive and wherein a lubricating fluid reservoir is provided in communication with the interior of the first element and is sealed from the exterior thereof.

11. Apparatus according to claim 10 and wherein said lubricating fluid reservoir communicates with the interior of the first element through a plurality of apertures formed along the length thereof.

12. Apparatus according to either of claims 10 and 11 and wherein said lubricating fluid reservoir includes a resiliently flexible portion for adapting to the varying interior volume of the first element as a funciton of the relative location of the second element therein.

13. Apparatus according to any of claims 7 to 12 inclusive and also comprising means operative to reduce backlash.

14. Apparatus according to any of claims 7 to 13 inclusive and wherein said second element comprises at least first and second threaded portions flexibly joined.

15. Apparatus according to claim 14 and wherein said first and second portions are axially tensioned.

16. A rigid coupling comprising a threaded cylindrical sleeve having a plurality of axial slits formed therein and threaded nut means arranged for threaded engagement with the threaded sleeve, when the sleeve is fitted over elements to be coupled, for tight friction engagement of the sleeve over the elements.

17. An apparatus according to any of claims 1 to 6, in which at least one of the elongatable elements is an electrically actuable cylinder according to any of claims 7 to 15.

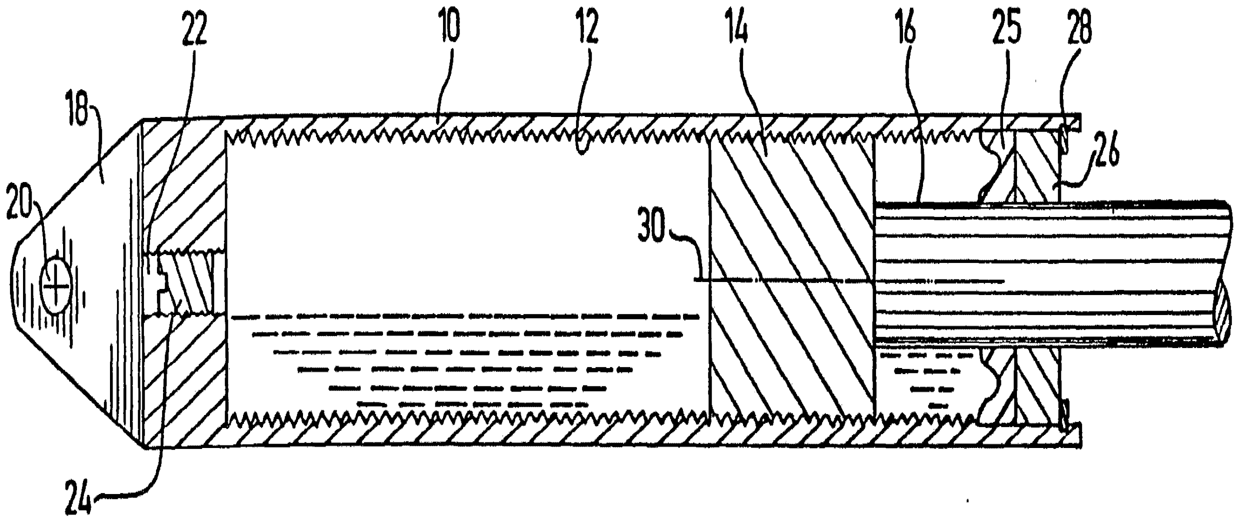


FIG 1A

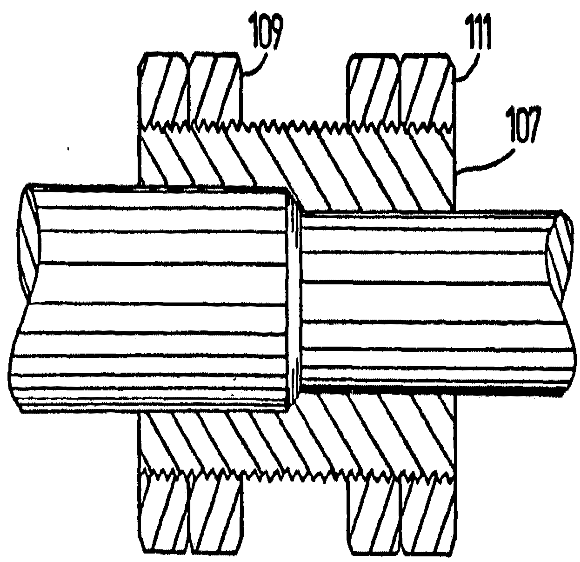


FIG 6

EP 0 314 839 A1

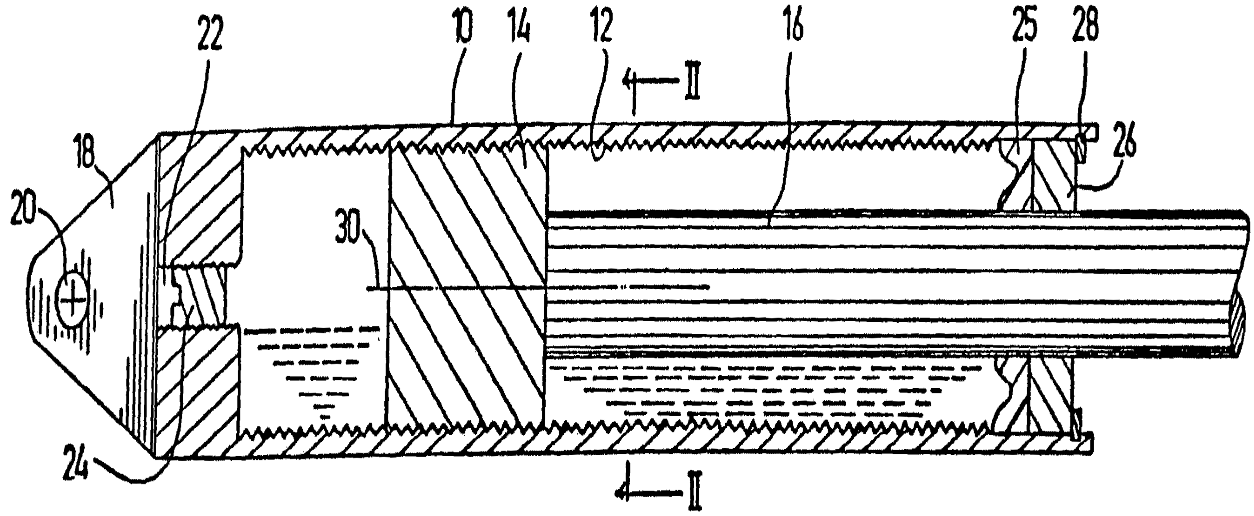


FIG 1B

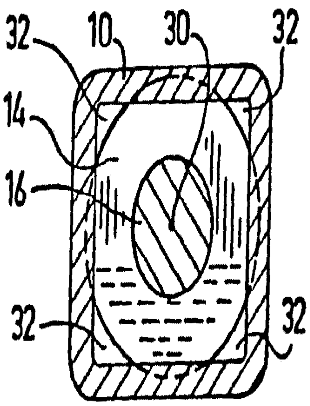


FIG 2A

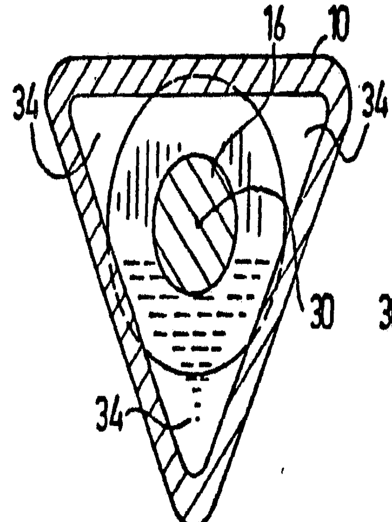


FIG 2B

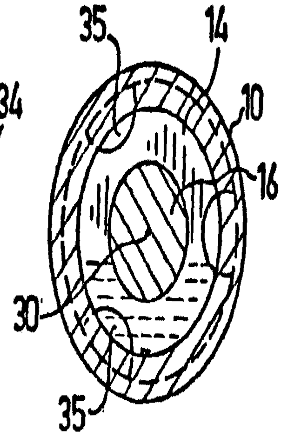


FIG 2C

EP 0 314 839 A1

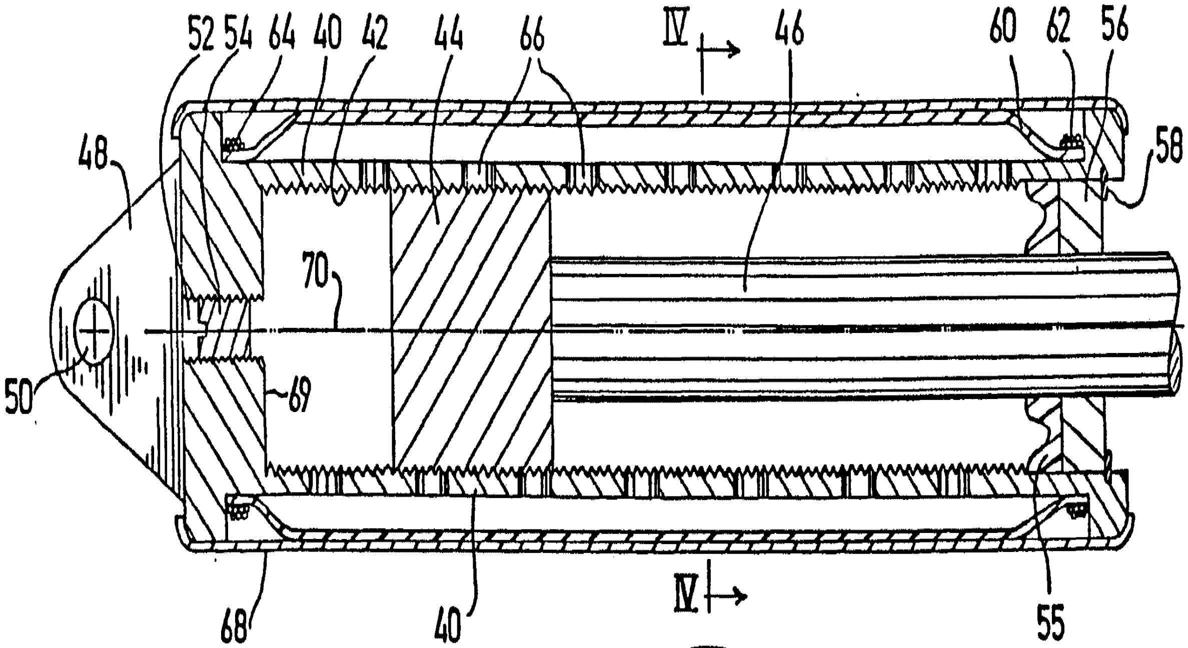

52 54 64 40 42 44 66
IV
46
60 62 56
48
58
70
50
69
68
40
IV
55

FIG 3

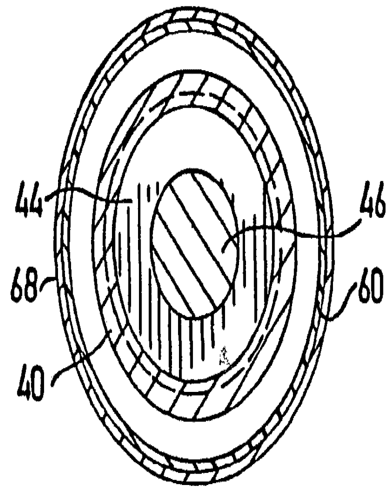

44
46
68
60
40

FIG 4

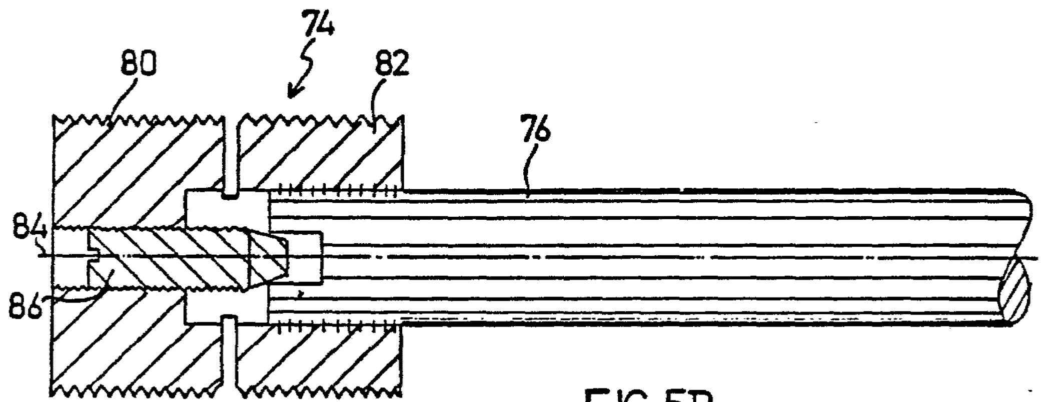


FIG 5B

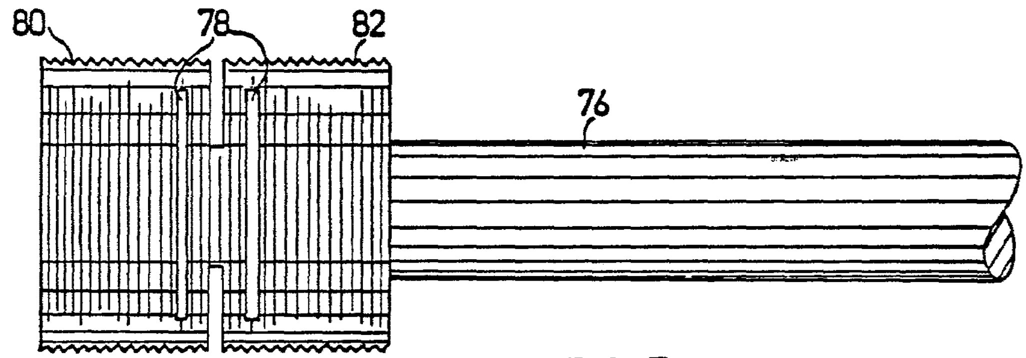


FIG 5A

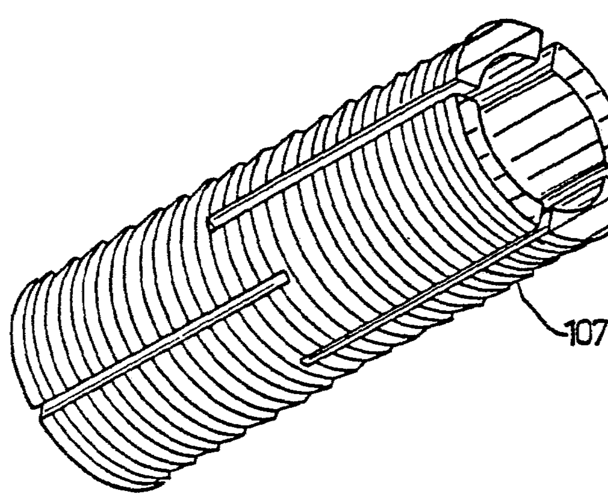


FIG 7

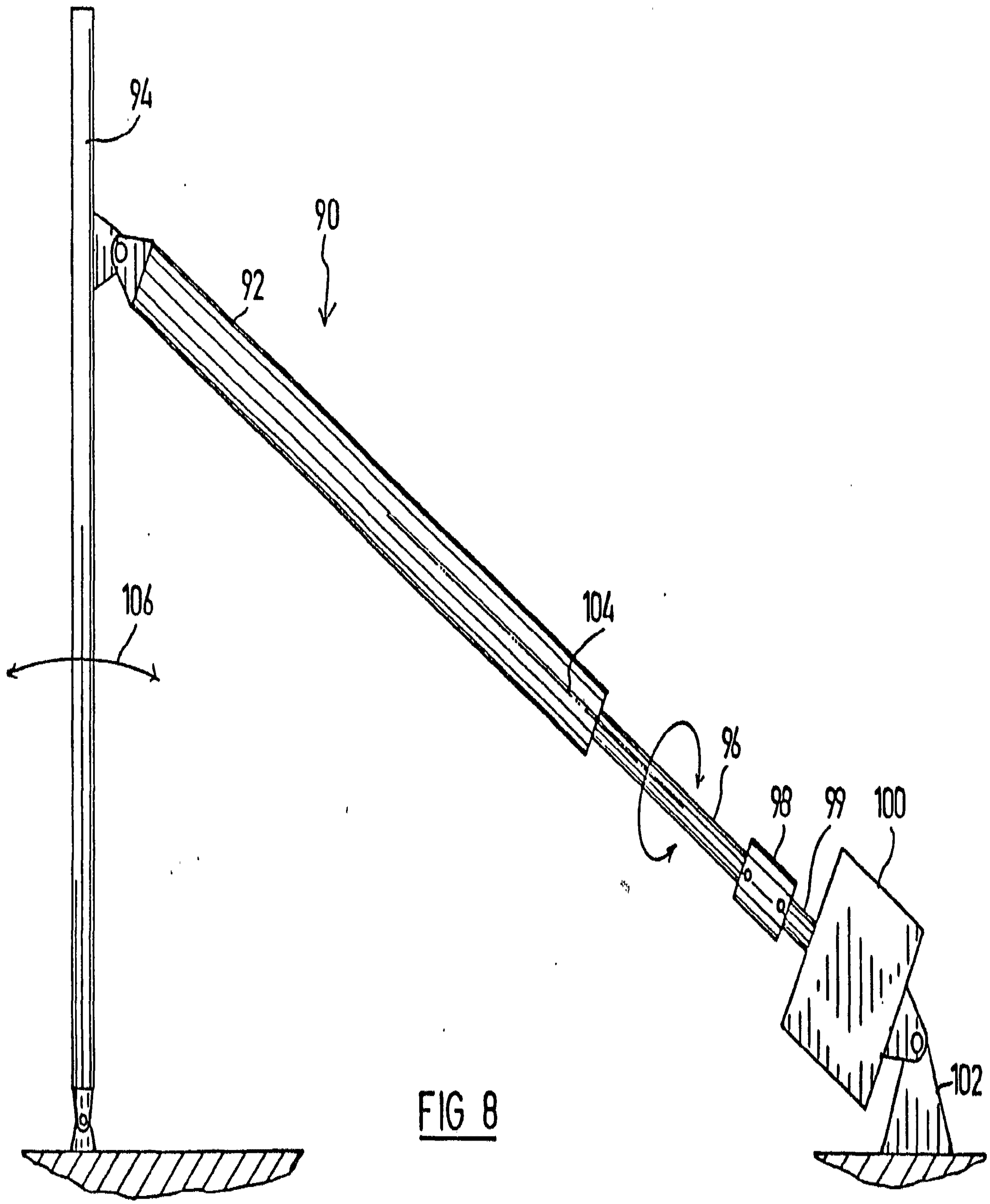


FIG 8

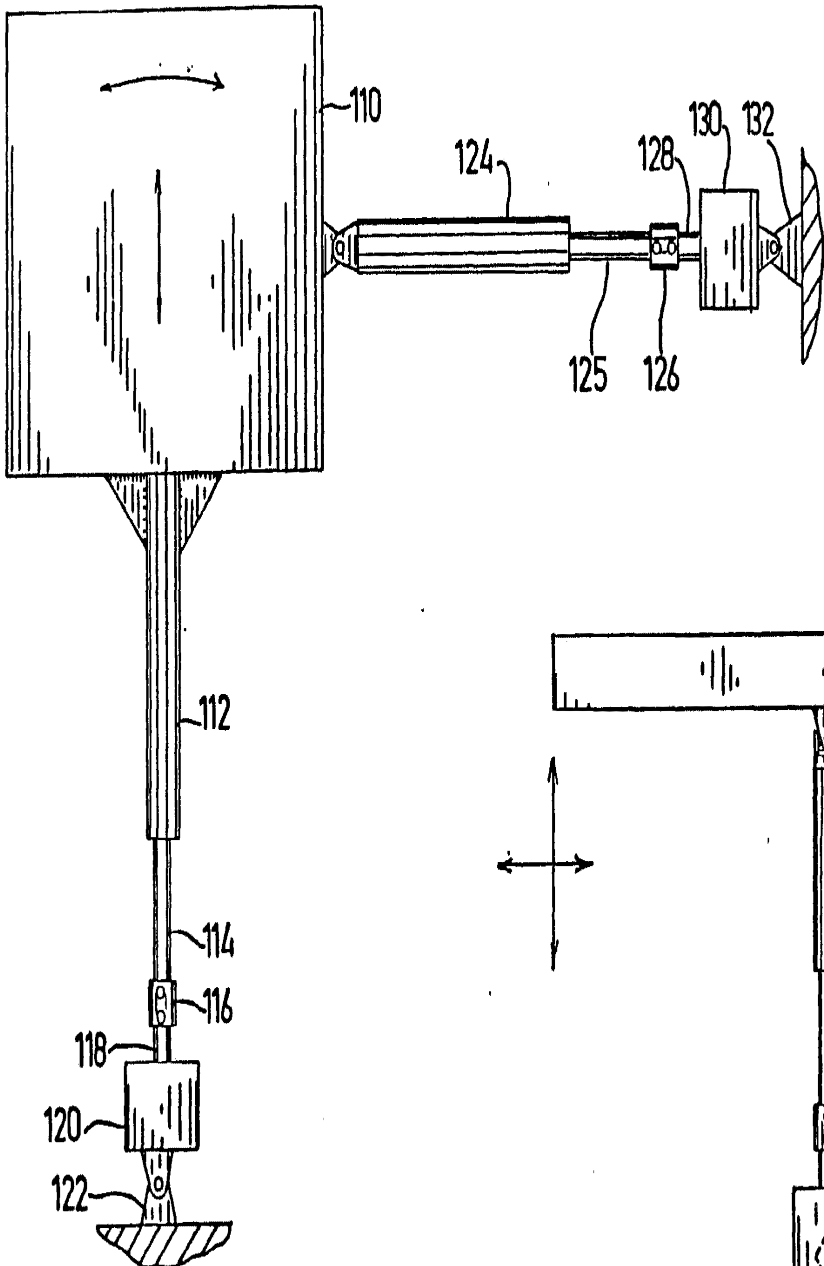


FIG 9A

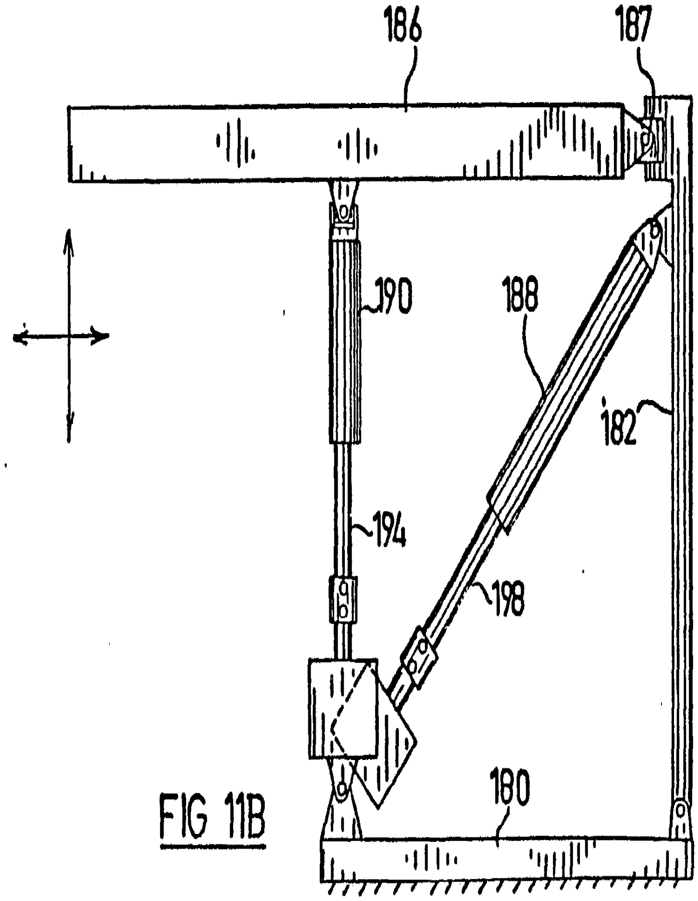


FIG 11B

EP 0 314 839 A1

EP 0 314 839 A1

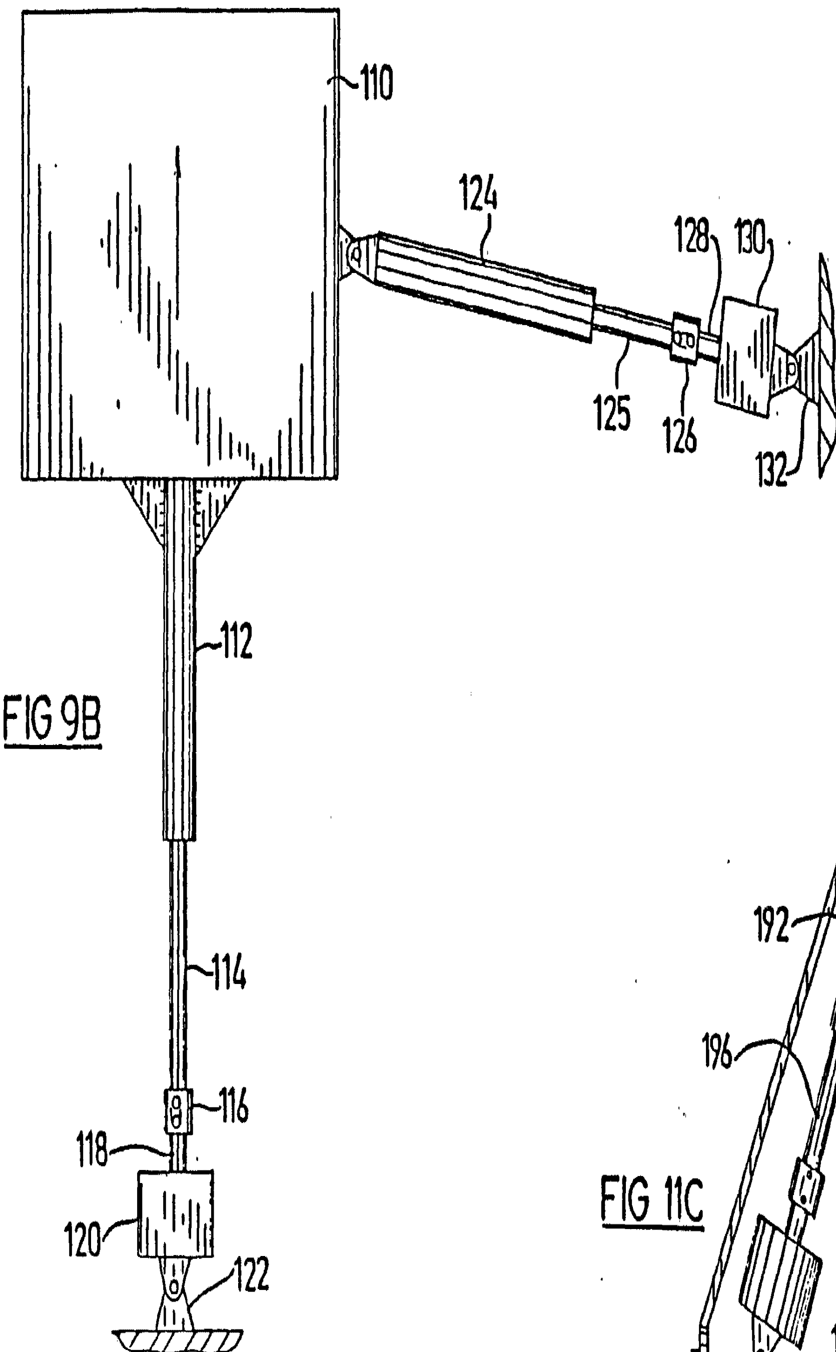


FIG 9B

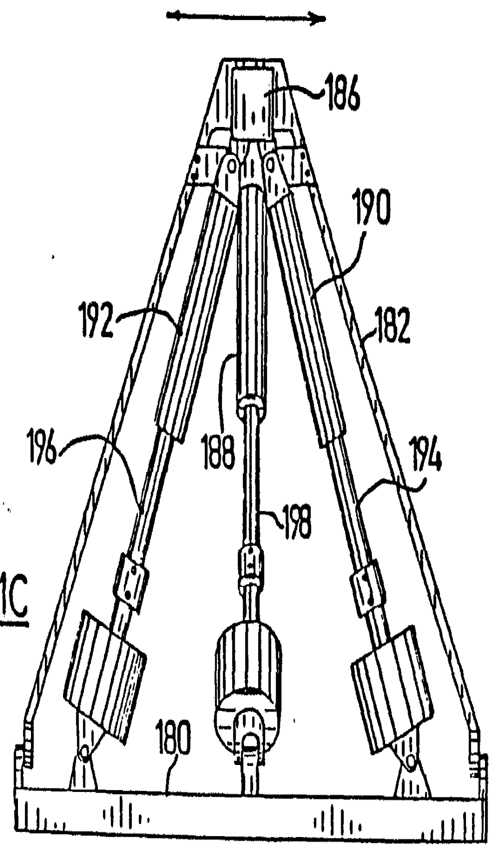


FIG 11C

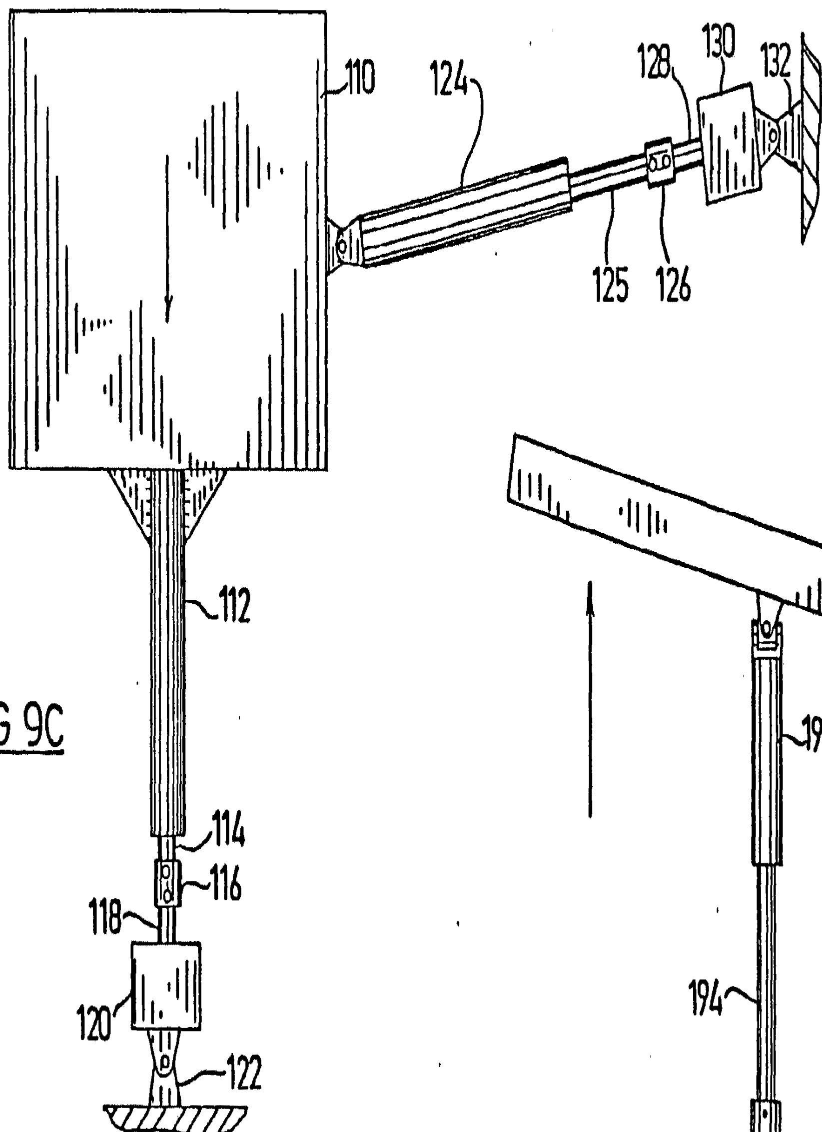


FIG 9C

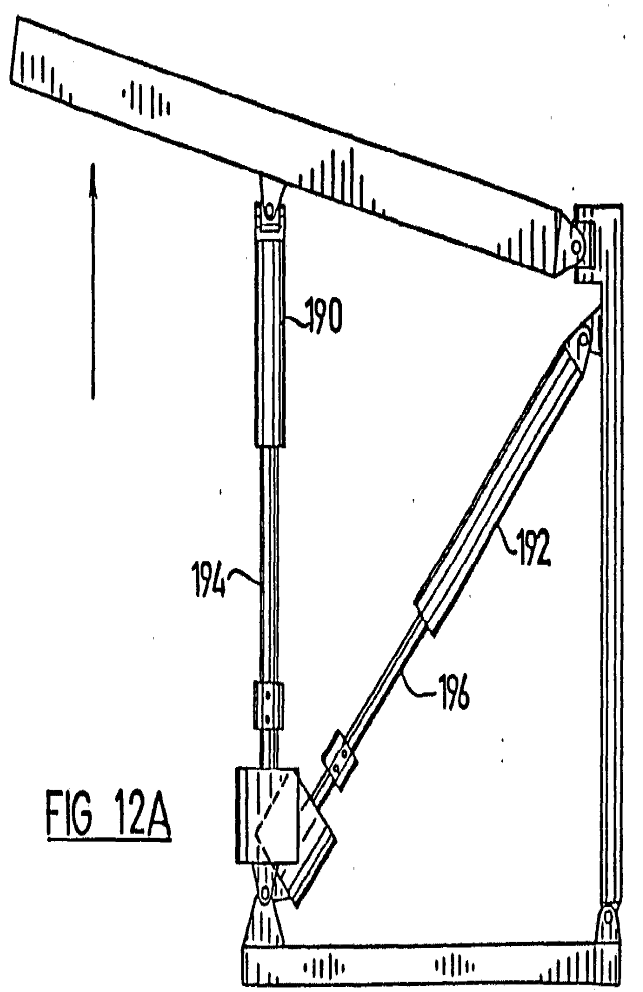


FIG 12A

EP 0 314 839 A1

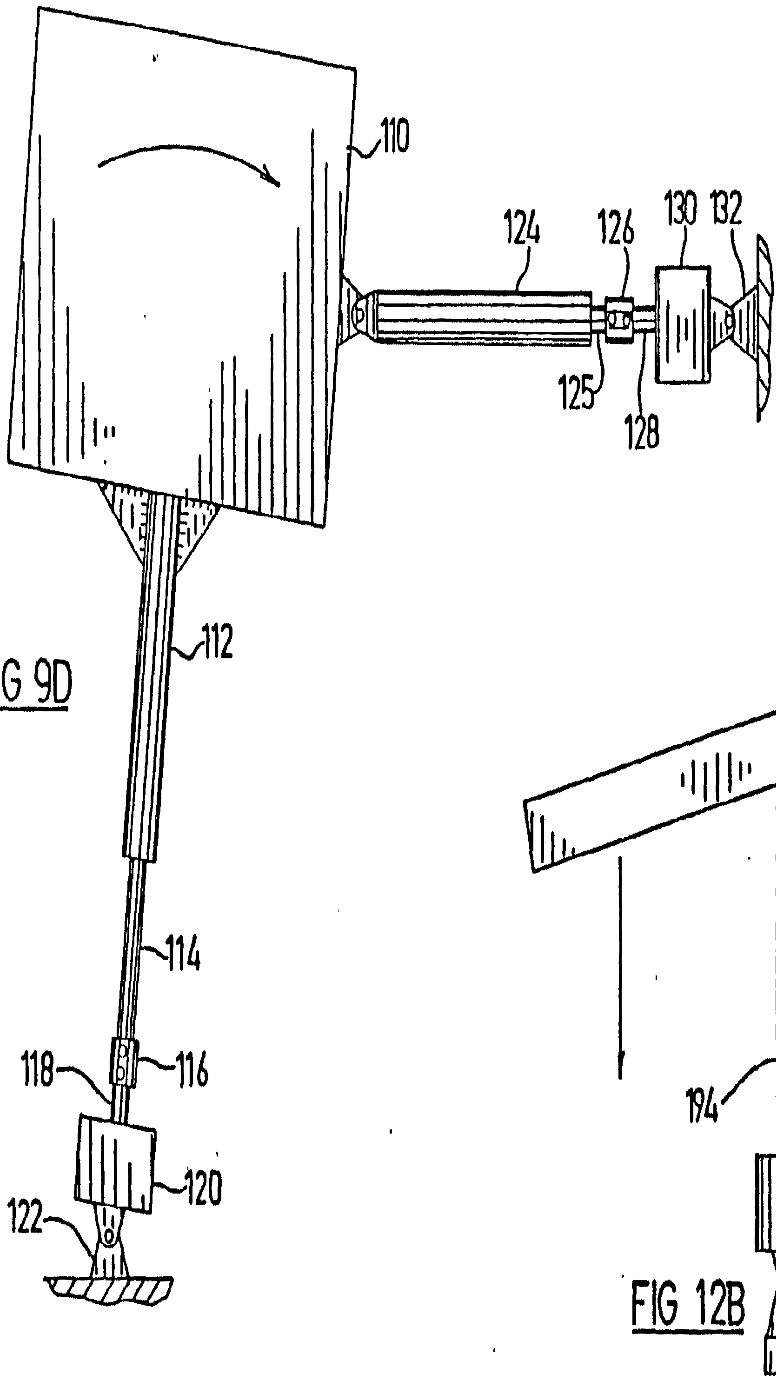


FIG 9D

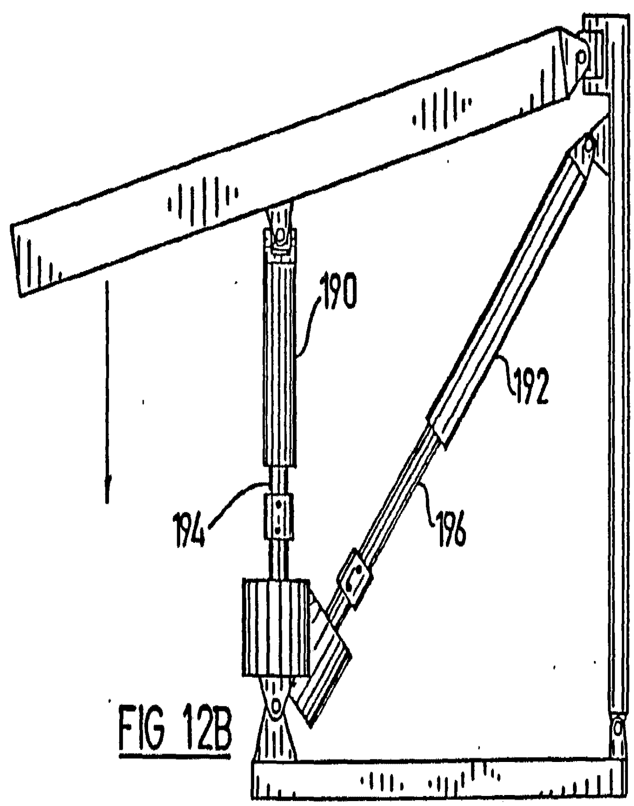


FIG 12B

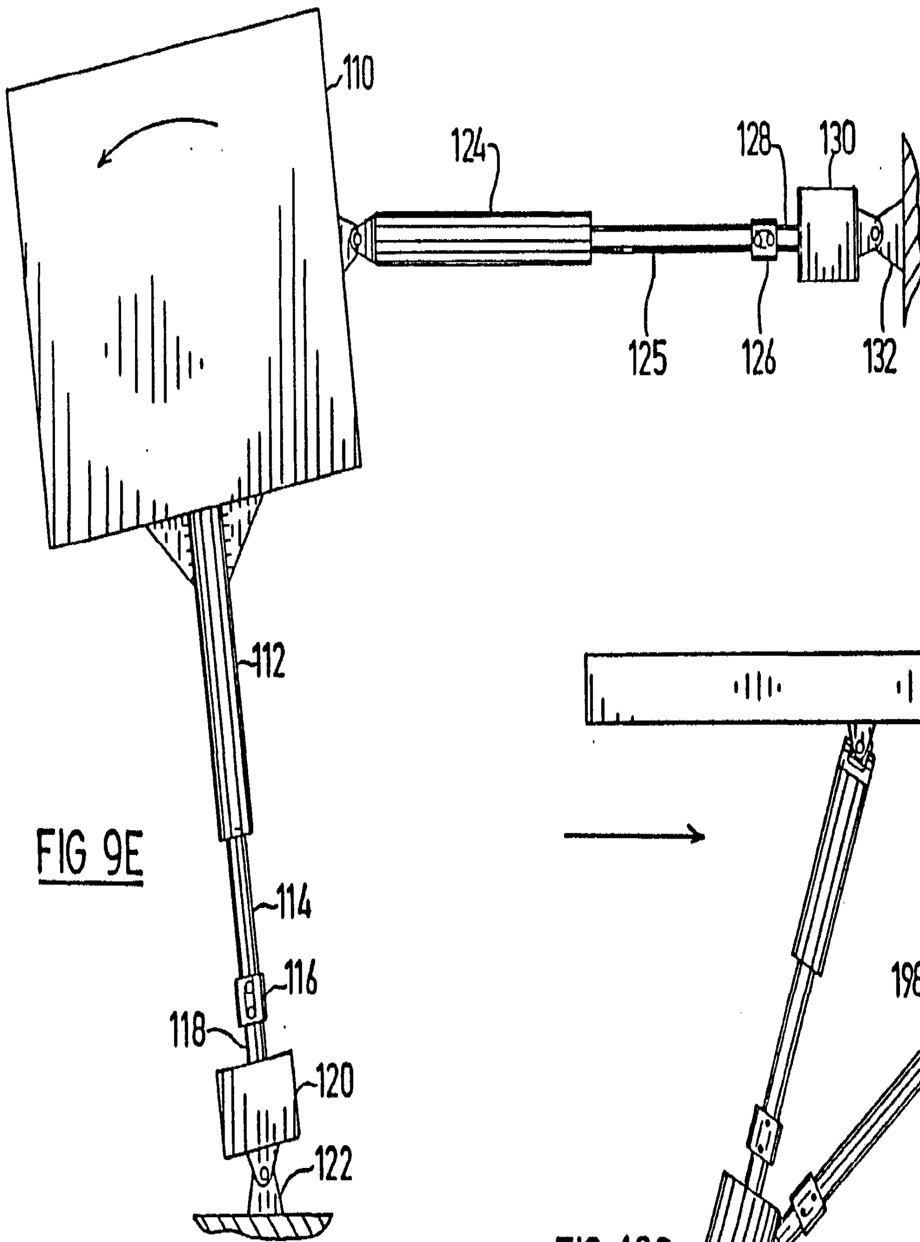


FIG 9E

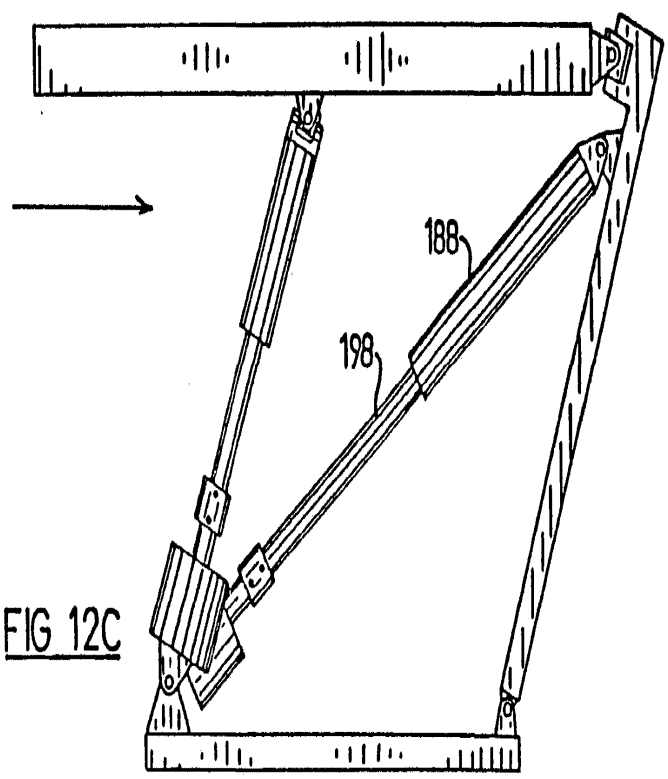


FIG 12C

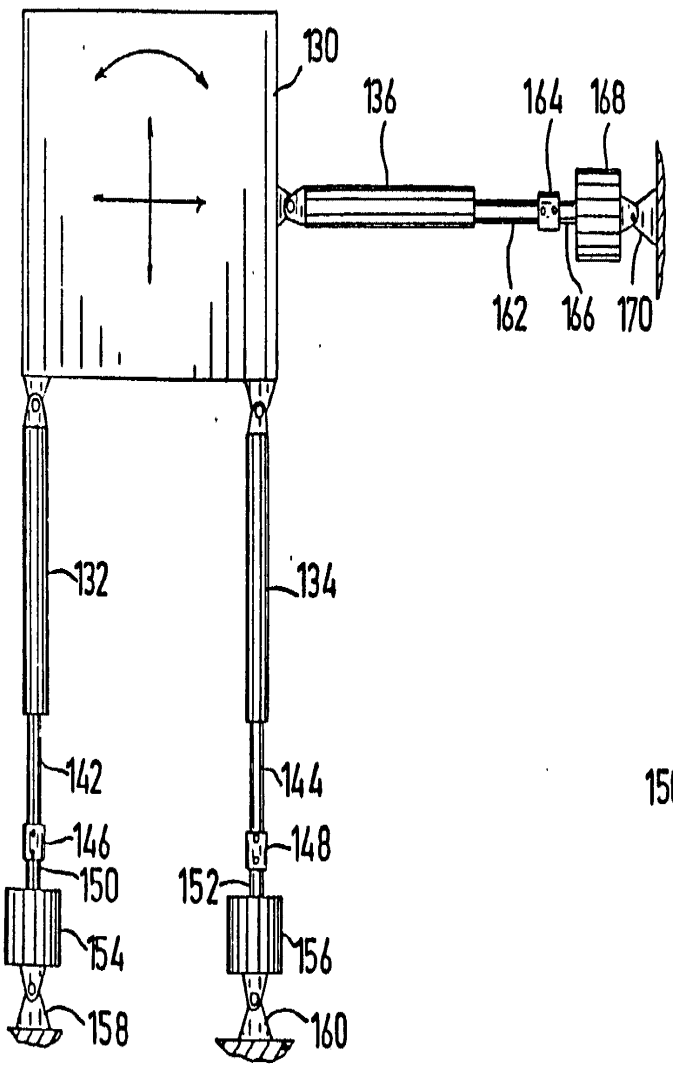


FIG 10A

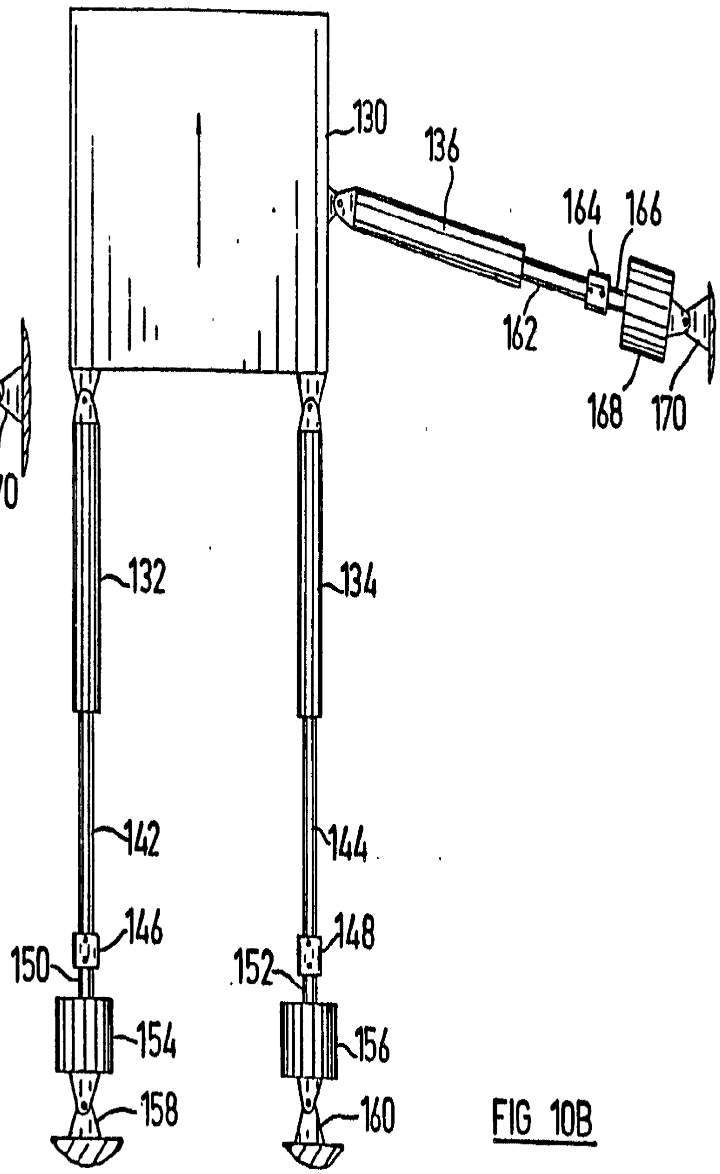


FIG 10B

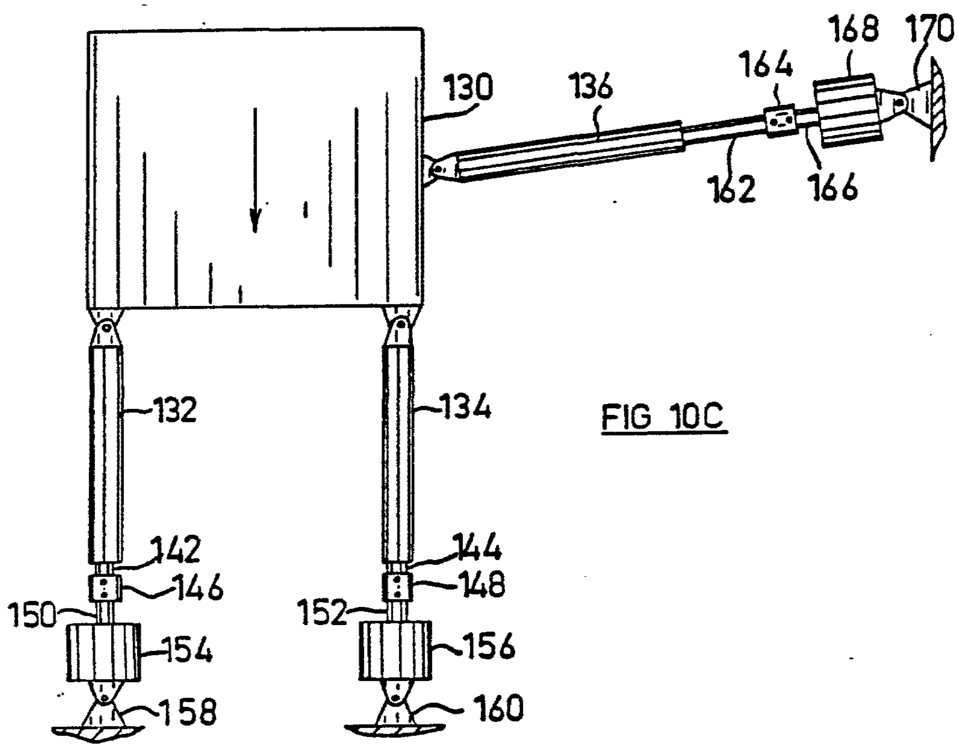


FIG 10C

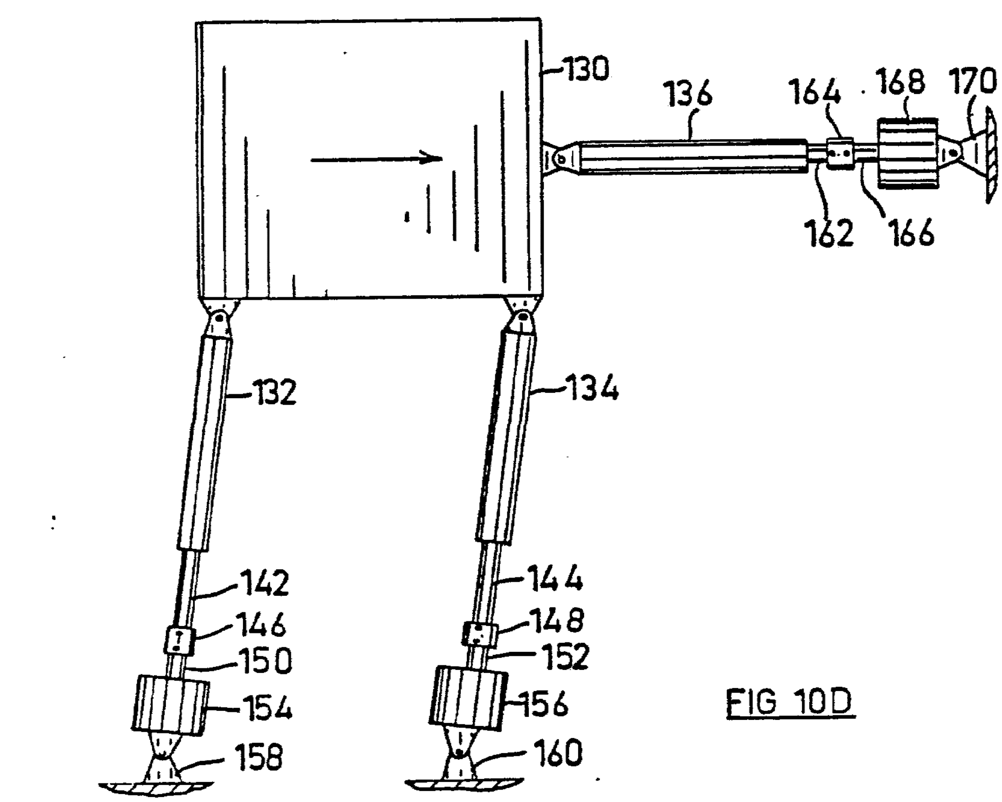


FIG 10D

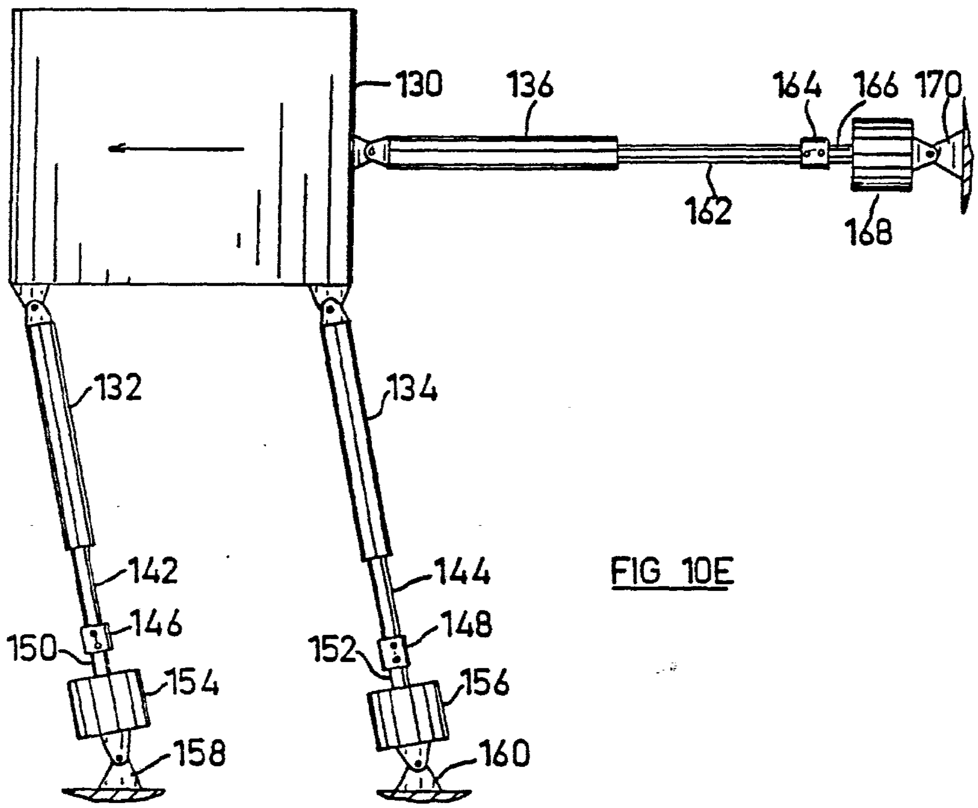


FIG 10E

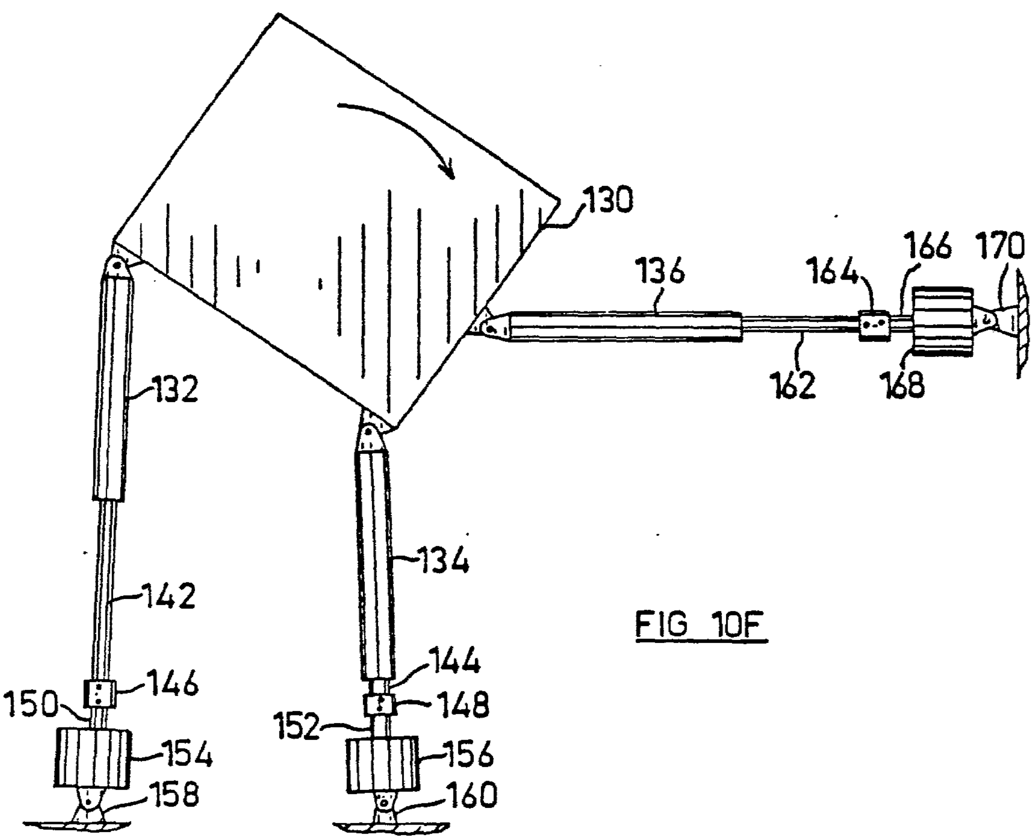


FIG 10F

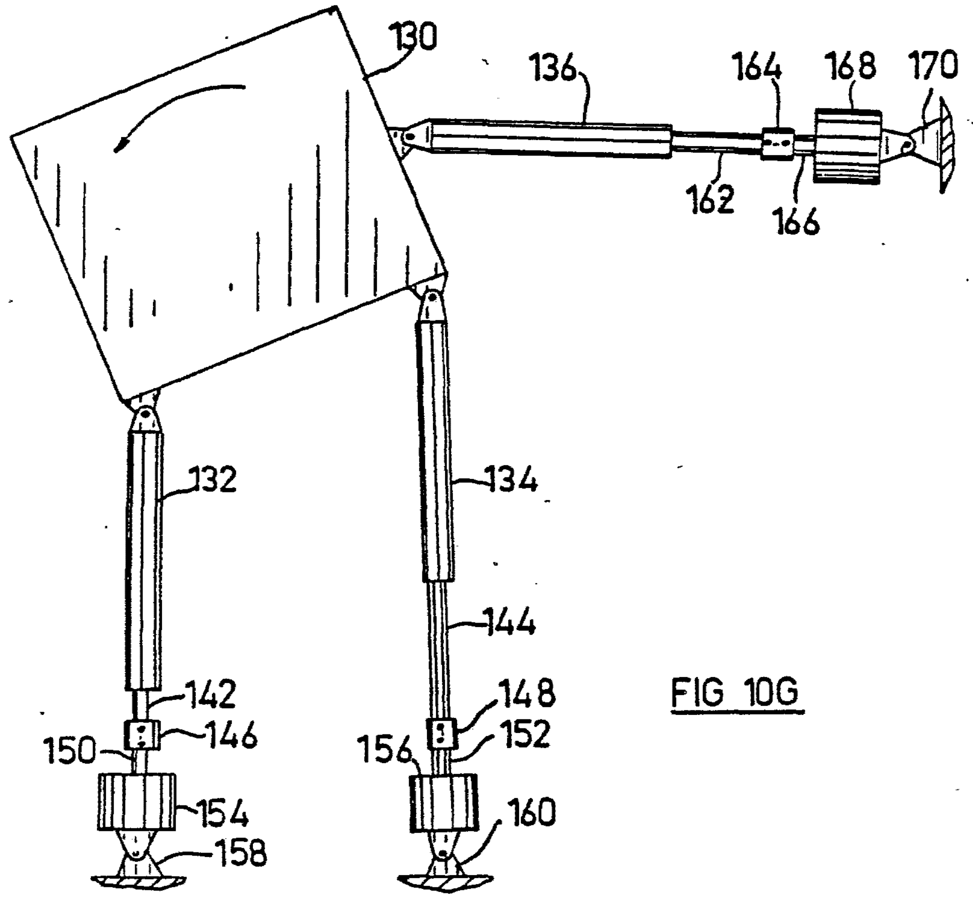


FIG 10G

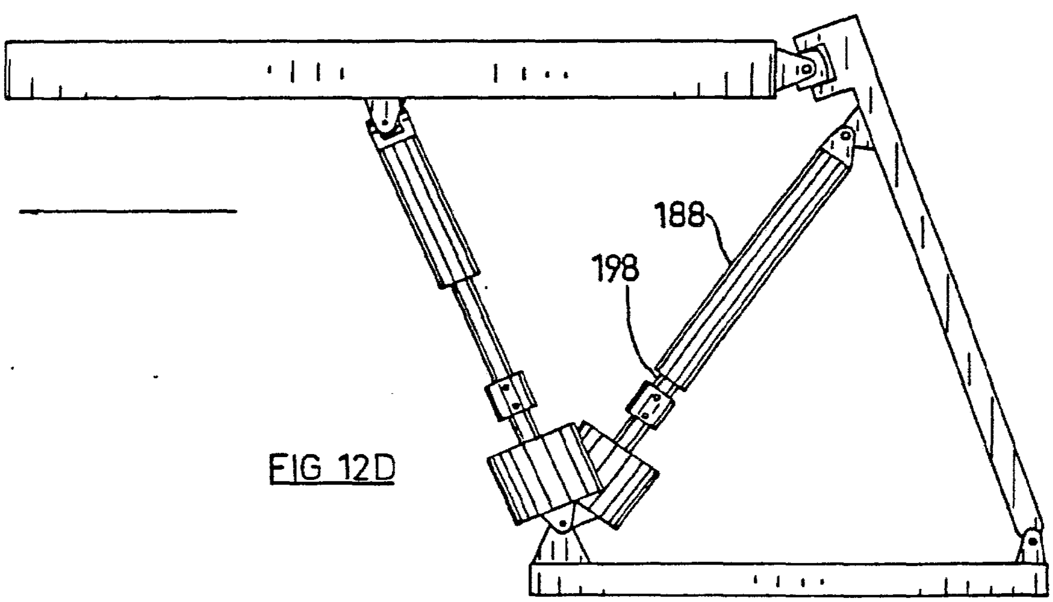


FIG 12D

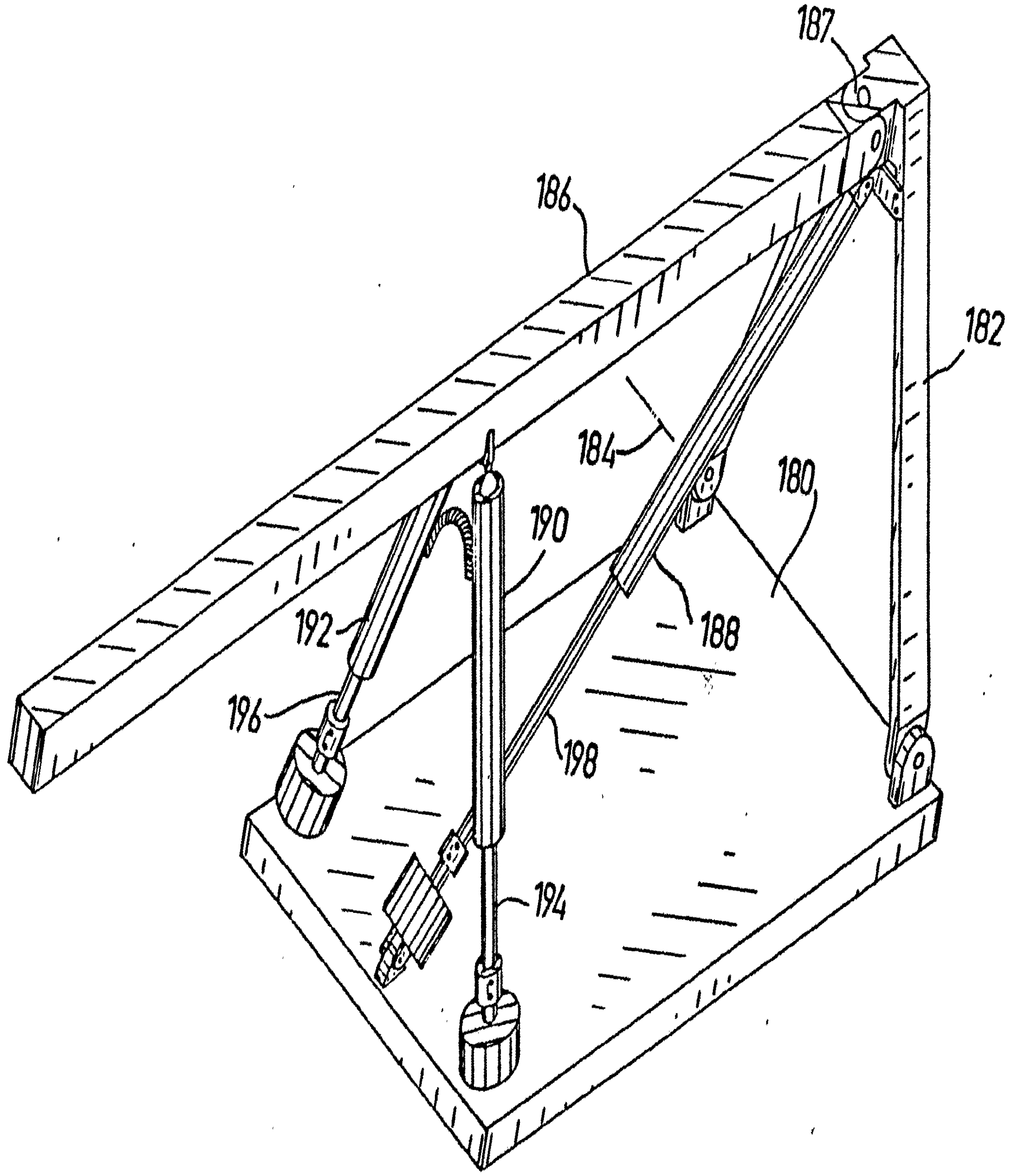


FIG 11A

EP 0 314 839 A1

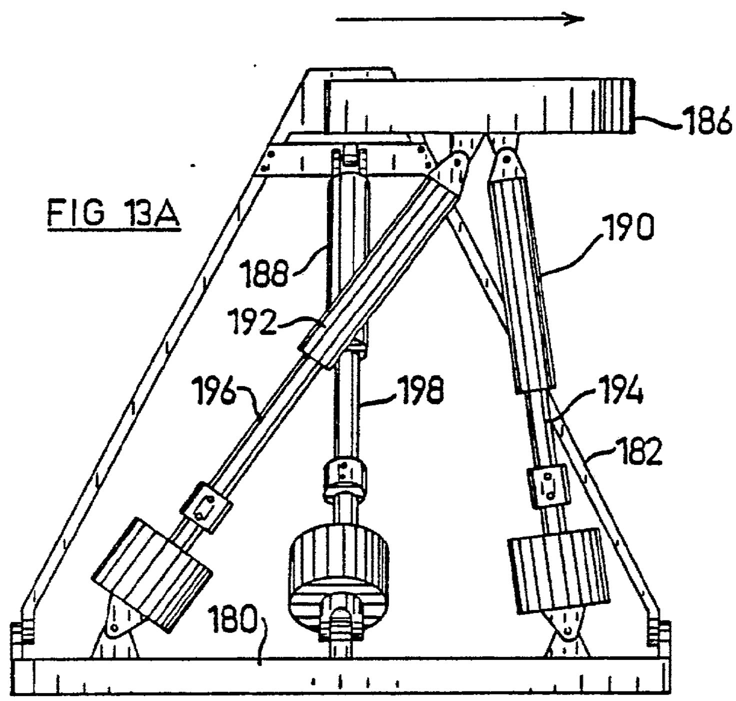


FIG 13A

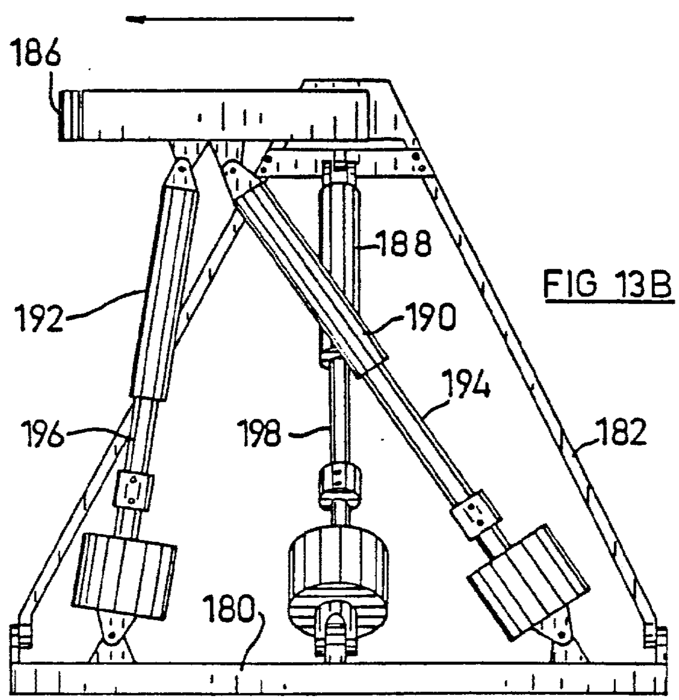


FIG 13B

European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 87 20 2174

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	EP-A-0 109 201 (THE FRANKLIN INST.)		B 25 J 9/00
	* Page 13, lines 10-36; figures 5, 6 *	1-4,6	F 16 H 25/02
	--		
A	IBM TECHNICAL DISCLOSURE BULLETIN, vol. 28, no. 12, May 1986, pages 5582-5583; New York, US "Six-axis presicion positioning system"		
	* Page 5582 *	1,3	
	--		
X	US-A-3 831 460 (F.M. LINLEY)		
	* Abstract; figure 8 *	7,13	
Y		14,15	
	--		
Y	DE-C- 953 569 (FRITZ WERNER)		TECHNICAL FIELDS SEARCHED (Int. Cl.4)
	* Figure 1; page 3, lines 35-80 *	14,15	
A		7,13	B 25 J 9/00
	--		F 16 H 25/00
A	FR-A-2 394 724 (MICRO-CONTROLE)		F 16 H 57/00
	* Whole document *	7,13-15	B 23 Q 16/00
			F 15 B 15/00
	--		
A	FR-A-2 231 265 (GEVARSKY et al.)		
	* Whole document *	7,9-11	
	--		
A	US-A-2 794 517 (J.V. KEITH)		
	* Figures 1,2 *	7,9,10	

	~~XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX~~		

Place of search	Date of completion of the search	Examiner
Berlin	20-06-1988	GERTIG

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO Form 1503 03 82

European Patent Office

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- [ ] All claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for all claims.
- [ ] Only part of the claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid,

  namely claims:
- [ ] No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

X LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirement of unity of invention and relates to several inventions or groups of inventions,

namely:

1. Claims 1-15,17: Positioning apparatus
2. Claim 16: Shaft connecting device

- [ ] All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- [ ] Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid,

  namely claims:
- [x] None of the further search fees has been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims,

  namely claims: 1-15,17

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 000 807 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
17.05.2000 Bulletin 2000/20

(51) Int Cl.^{7}: B60R 1/06

(21) Application number: 99122332.2

(22) Date of filing: 09.11.1999

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: 11.11.1998 JP 32102498
11.11.1998 JP 32102598
11.11.1998 JP 32102698
11.11.1998 JP 32102998

(71) Applicant: ICHIKOH INDUSTRIES LIMITED
Shinagawa-ku Tokyo 141 (JP)

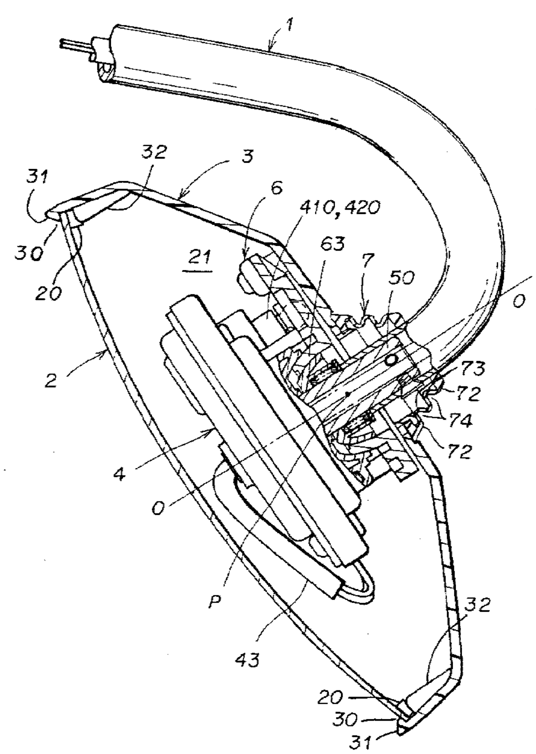
(72) Inventor: Tsuyama, Osamu,
c/o Ichikoh Industries, Ltd.
Isehara-shi, Kanagawa-ken 259-1192 (JP)

(74) Representative: Grünecker, Kinkeldey,
Stockmair & Schwanhäusser Anwaltssozietät
Maximilianstrasse 58
80538 München (DE)

(54) Remote-controlled mirror apparatus for vehicles

(57) A power unit (4) is attached on one end of a stay (1) as an angle adjustment mechanism, with a mirror holder (3) that has a configuration of housing mounted on the power unit (4) to be capable of tilting, while the mirror holder (3) holds the mirror body (2) and the power unit (4) is housed in a chamber defined by the mirror body (2) and the mirror holder (3), so that the mirror body (2) and the mirror holder (3) are tilted with respect to the stay (1) and the power unit (4) by the power unit (4), thereby adjusting the angle.

FIG.5



EP 1 000 807 A2

Description

BACKGROUND OF THE INVENTION

a) Field of the Invention

[0001] The present invention relates to a remote-controlled mirror apparatus for vehicles that, when attached to a vehicle such as one-box car or recreational vehicle, allows it to view and perceive in a predetermined field around a desired direction by means of the reflection of a mirror body, and makes it possible to change the direction of view by changing the angle of the mirror body through remote control, and particularly to a remote-controlled mirror apparatus for vehicles that is free from obstacles to the view associated with the adjustment of the mirror body angle and is capable of ensuring wider field of view.

b) Description of the Prior Art

[0002] A remote-controlled mirror apparatus for vehicles of the prior art comprises, as shown in Fig.1, a stay 100 one end of which is attached to a vehicle body, a mirror housing 102 fastened on the other end of the stay 100, a power unit 103 mounted as an angle adjusting mechanism in the mirror housing 102, a mirror holder (back board) 104 attached, to be capable of adjusting the angle thereof, to the power unit 103 via a pivot mechanism 105 and an advance-retract rod 106, and a mirror body 101 held on the mirror holder 104.

[0003] An example of the remote-controlled mirror apparatus for vehicles described above is disclosed in Japanese Patent Application Laid-open No.H8-26031. The remote-controlled mirror apparatus for vehicles disclosed in this publication is used as side mirrors for heavy duty vehicles such as truck and bus, and is attached to the vehicle body via a cylindrical support arm instead of the stay 100.

[0004] The mirror body 101 is limited in size so as not to obstruct the field of view when a driver looks back directly. But even when the mirror body 101 is limited in size, a wide field of view can be ensured by decreasing the radius of curvature of the reflecting surface.

[0005] The above mentioned power unit 103 is provided with, in addition to the advance-retract rod 106 for vertical adjustment shown in the drawings, an advance-retract rod for horizontal adjustment, for example, not shown.

[0006] An example of application of the remote-controlled mirror apparatus for vehicles of the prior art mentioned above will now be described below with reference to Fig.2 through Fig.4.

[0007] In this application, the remote-controlled mirror apparatus is used as an electrically powered and remote-controlled rear under mirror apparatus for automobiles, being mounted by attaching an end of the stay 100 on the rear top of a vehicle body such as one-box car or recreational vehicle C.

[0008] The remote-controlled mirror apparatus for vehicles enables it to view a range indicated by dashed line in a lower portion at the back of vehicle C such as one-box car or recreational vehicle, from the eye point E.P. of the driver via the mirror body 101. Namely, it becomes possible to view and perceive within a predetermined field around a desired direction by means of the reflection of the mirror body 101.

[0009] When the advance-retract rod 106 for vertical adjustment is moved forward by the power unit 103, the mirror body 101 is driven via the mirror holder 104 to tilt down (position indicated by alternate dot and dash line in Fig.1) about a horizontal axis (line connecting the center of the pivot mechanism 105 and the center of the advance-retract rod for horizontal adjustment). This changes the field of view (range which can be viewed and perceived) in a lower portion at the back of vehicle C such as one-box car or recreational vehicle from that indicated by dashed line in Fig.2 to that indicated by alternate dot and dash line in Fig.2. That is, viewing direction is changed to backward.

[0010] When the advance-retract rod 106 for vertical adjustment is moved backward, the mirror body 101 tilts upward (position indicated by alternate double-dot and dash line in Fig.1) about the horizontal axis and the field of view changes from that indicated by dashed line in Fig.2 to that indicated by alternate double-dot and dash line in Fig.2, and the viewing direction changes to forward.

[0011] Further, when the advance-retract rod for horizontal adjustment is moved forward (or backward), the mirror body 101 tilts to the left about a vertical axis (line connecting the center of the pivot mechanism 105 and the center of the advance-retract rod 106 for vertical adjustment), and the field of view changes from that indicated by dashed line in Fig.3 and Fig.4 to that indicated by alternate dot and dash line in Fig.3 and Fig.4, so that the viewing direction changes to the left.

[0012] Also when the advance-retract rod for horizontal adjustment is moved backward (or forward), the mirror body 101 tilts to the right about the vertical axis, and the field of view changes from that indicated by dashed line in Fig.3 and Fig.4 to that indicated by alternate double-dot and dash line in Fig.3 and Fig.4, so that the viewing direction changes to the right.

[0013] However, in the remote-controlled mirror apparatus for vehicles of the prior art described above, the mirror housing 102 that houses the power unit 103 is located along with the power unit 103 and the stay 100 on the fixed side, while the mirror body 101 is located along with the mirror holder 104 on the tilting side that tilts with respect to the fixed side, as shown in Fig.1. As a result, when the mirror body 101 is tilted with respect to the mirror housing 102, edge of the mirror body 101 may come inside the opening edge of the mirror housing 102. For example, when the mirror body 101 is tilted downward as indicated by alternate dot and dash line in

Fig.1, lower edge of the mirror body 101 comes inside the lower opening edge of the mirror housing 102. When the mirror body 101 is tilted upward as indicated by alternate double-dot and dash line in Fig.1, upper edge of the mirror body 101 comes inside the upper opening edge of the mirror housing 102. In case the edge of the mirror body 101 comes inside the opening edge of the mirror housing 102, the opening edge of the mirror housing 102 may be reflected on the mirror body 101 and make an obstacle to the view. Obstruction to the view when adjusting the angle of the mirror body 101 becomes conspicuous particularly in the case of the mirror body 101 having a small radius of curvature.

SUMMARY OF THE INVENTION

[0014] An object of the present invention is to provide a remote-controlled mirror apparatus for vehicles that is capable of securing a wide field of view without the possibility of causing an obstacle to the field of view when adjusting the angle of the mirror body.

[0015] According to the present invention, in order to achieve the object described above, a power unit is attached to one end of a stay as an angle adjusting mechanism, a mirror holder having a configuration of housing is attached to the power unit to be capable of tilting, a mirror body is held on the mirror holder, the power unit is housed in a chamber defined by the mirror body and the mirror holder, and the angle of said mirror body, together with the mirror holder, is adjusted with respect to the stay and power unit by means of the power unit.

[0016] Thus in the remote-controlled mirror apparatus for vehicles of the present invention, the mirror housing of the prior art, that houses the power unit, located on the fixed side together with the power unit and the stay is eliminated and, instead, the mirror holder having a configuration of housing that houses the power unit is installed together with the mirror body on the tilting side. Consequently, when the mirror body is tilted with respect to the power unit and the stay, the mirror holder is also tilted together with the mirror body with respect to the power unit and the stay, and therefore such a problem does not occur as the edge of the mirror body comes inside the opening edge of the mirror housing on the fixed side as in the case of the prior art. As a result, it becomes possible to secure a wide field of view without the possibility of causing an obstacle to the field of view when adjusting the angle of the mirror body.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] Fig.1 is a partially cutaway view showing the remote-controlled mirror apparatus for vehicles of the prior art.

[0018] Fig.2 is a side view showing the field of view in an example of using the remote-controlled mirror apparatus for vehicles of the prior art shown in Fig.1 as a rear under mirror for a vehicle such as one-box car or recreational vehicle.

[0019] Fig.3 is a plan view showing the field of view.

[0020] Fig.4 is a plan view showing the field of view.

[0021] Fig.5 is a partially cutaway view showing one embodiment of the remote-controlled mirror apparatus for vehicles of the present invention.

[0022] Fig.6 is a partially cutaway view showing a state in which the mirror body and the other components are tilted downward.

[0023] Fig.7 is a partially cutaway view showing a state in which the mirror body and the other components are tilted upward.

[0024] Fig.8 is a partially cutaway view showing the power unit, the mirror holder base and other components.

[0025] Fig.9 is an exploded perspective view showing the mirror body.

[0026] Fig.10 is an exploded perspective view showing a part of the power unit and the clutch mechanism.

[0027] Fig.11 is an exploded perspective view showing a key portion of the power unit.

[0028] Fig.12 is an exploded perspective view showing the mirror holder base.

[0029] Fig.13 is an exploded perspective view showing the mirror holder.

[0030] Fig.14 is an exploded perspective view showing the stay, part of the pivot mechanism and the waterproof boot.

[0031] Fig.15 is a schematic front view showing the layout of motors, advance-retract rods and drive force transmission mechanism of the power unit.

[0032] Fig.16 is an exploded sectional view showing the notch type clutch mechanism.

[0033] Fig.17 is a partially cutaway view showing the friction type clutch mechanism.

[0034] Fig.18 is a view in the direction of XVIII in Fig. 12.

[0035] Fig. 19 is a partially cutaway view showing the elastic fitting of the guiding projection and the guiding recess.

[0036] Fig.20 is a view in the direction of XX in Fig.11.

[0037] Fig.21 is a sectional view showing the waterproof boot.

[0038] Fig.22 is a partial perspective view showing the through hole and the engagement lips of the mirror holder.

[0039] Fig.23A is a plan view of the separate piece, Fig.23B is a view showing the section along line B-B in Fig.23A, and Fig.23C is a view showing the section along line C-C in Fig.23A.

[0040] Fig.24 is a partially cutaway view corresponding to the section along line B-B in Fig.23A, showing the state of the spherical portion of the advance-retract rod being fitted in the spherical recess of the mirror holder base via the separate piece.

[0041] Fig.25 is a partially cutaway view corresponding to the section along line C-C in Fig.23A, showing the state of the spherical portion of the advance-retract rod being fitted in the spherical recess of the mirror holder base via the separate piece.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0042] An embodiment of the remote-controlled mirror apparatus for vehicles according to the present invention will be described below with reference to Fig.5 through Fig.25. This is an example of application to an electrically powered and remote-controlled rear under mirror apparatus for automobiles, being mounted on the rear top of a vehicle body C such as one-box car or recreational vehicle. In the drawings, same reference numerals as those in Fig.1 through Fig.4 denote identical parts. By assembling components shown in the exploded perspective views of Fig.9 through Fig.14 along the center axis O-O, the remote-controlled mirror apparatus for vehicles according to this embodiment of the present invention is constructed.

[0043] In the drawings, reference numeral 1 denotes a stay made of a hollow tube (pipe). One end of the stay 1 is attached to a vehicle body (not shown). Mounted on the other end of the stay 1 is a mirror body 2 via a mirror holder 3 and power unit 4 (and a clutch mechanism 5 and a mirror holder base 6) to serve as an angle adjusting mechanism, mounted to be capable of adjusting the angle.

[0044] The mirror body 2 described above has a convex reflecting surface (mirror surface) of a small radius of curvature formed thereon, as shown in Fig.5 through Fig.7 and Fig.9. The mirror holder 3 described above has such a configuration of housing with a front face 30 opening and a rear portion closed as shown in Fig.5 through Fig.7 and Fig.13. In the front opening 30 of the mirror holder 3, a hook 31 and a plurality of ribs 32 (omitted in Fig.13) are installed integrally with each other. Fastened by bonding (and/or other fastening means) via tape 20 between the hook 31 and the ribs 32 is the circumference of the mirror body 2. As a result, the mirror body 2 is held by the mirror holder 3 of the housing configuration.

[0045] The power unit 4 is disposed in a chamber 21 defined by the mirror body 2 and the mirror holder 3. The power unit 4 comprises two separate parts of housing 400 and 401 that are held together by screws 402, as shown in Fig.8, Fig.10, Fig.11 and Fig.15. The housing parts 400 and 401 contain two motors 41, 42, two advance-retract rods 410, 420, two sets of drive force transmission mechanisms (comprising first (worm) gears 411, 421, second gears (each comprising a helical gear of a worm wheel and a spur gear of an idle gear combined on the same shaft) 412, 422, third gears (each comprising an external-teeth gear and an internal-teeth gear integrated) 413, 423), two cross-shaped springs 414, 424 and two packings 415, 425 incorporated therein.

[0046] The two advance-retract rods 410, 420 are located on two oblique axes S1-S1, S2-S2 that are counterparts of mutually perpendicular vertical axis V-V and horizontal axis H-H rotated around the intersect thereof (center P of a pivot mechanism 63 to be described later and is the center of tilting movement of tilting members such as the mirror body 2 and the mirror holder 3) by 45 degrees, being located in parallel to the horizontal axis H-H and above the horizontal axis H-H, respectively. The vertical axis V-V, the horizontal axis H-H and the two oblique axes S1-S1, S2-S2 intersect at right angles with the center axis O-O located on one end of the stay 1 at the intersect P.

[0047] The two motors 41, 42 are disposed in V-shaped configuration that is symmetrical with respect to the vertical axis V-V as shown in Fig.15. The two sets of drive force transmission mechanisms 411, 421, 412, 422, 413, 423, the two cross-shaped springs 414, 424 and the two packings 415, 425 are disposed substantially in the moving direction of the two advance-retract rods 410, 420.

[0048] Since the two advance-retract rods 410, 420 are located on the two oblique axes S1-S1, S2-S2 that are counterparts of the mutually perpendicular vertical axis V-V and horizontal axis H-H rotated around the intersect P, O-O by 45 degrees, being disposed in parallel to the horizontal axis H-H and above the horizontal axis H-H, respectively, thus the distances between the intersect P, O-O and the centers O1, O2 of the advance-retract rods 410, 420 can be increased to square root of 2 (approximately 1.4) times that of a case in which the two advance-retract rods are located on the vertical axis V-V and the horizontal axis H-H, given the same size of the housing 400, 401 of the power unit 4, thus increasing the holding force of the two advance-retract rods 410, 420.

[0049] Also because the two advance-retract rods 410, 420 are arranged symmetrically with respect to the vertical axis V-V, balance between the right and left portions is maintained. Further since the moving portions of the mirror body 2 and the mirror holder 3 are held by 3-point support involving the pivot mechanism 63 to be described later, the reflecting surface of the mirror body 2 can be prevented from being dislocated by impact or the like.

[0050] In the remote-controlled mirror apparatus for vehicles of this type, the center of mass of the tilting member constituted from the mirror body 2 and the mirror holder 3 and other components is preferably located at the center P of tilting movement of the tilting member for the convenience of the angle adjustment. However, when the center of mass of the tilting member and the center P of tilting movement deviate from each other, a force proportional to the amount of deviation acts on the tilting member to cause the tilting member to tilt. This tilting movement of the tilting member is prevented by the main holding effect of the pivot mechanism 63 and the subsidiary holding effect of the two advance-retract rods 410, 420 of the power unit 4. In this embodiment, since the two advance-retract rods 410, 420 are arranged symmetrically with respect to the vertical axis V-V, the subsidiary holding effects of the two advance-retract rods 410, 420 on the right and left are well balanced, so that the reflecting surface of the mirror body 2 can be surely prevented from being dislocated.

[0051] The power unit 4 has the cavity (cavity of a shaft 50 to be described later) that communicates with the cavity of the stay 1, as shown in Fig.5 through Fig. 8. The cable harness 43 connected to the two motors 41, 40 is led out of the housing 400, 401 of the power unit 4 in the chamber 21 that is defined by the mirror body 2 and the mirror holder 3, passed through the cavity (cavity of the shaft 50 to be described later) of the power unit 4 and the cavity of the stay 1 as shown in Fig.5 through Fig.8, and is electrically connected to a power source (not shown).

[0052] Since the cable harness 43 is passed through the cavity of the power unit 4 and the cavity of the stay 1 in the chamber 21 as described above, the cable harness 43 does not run outside the chamber 21 unlike such a case as the cable harness is drawn out of the mirror holder 3 (mirror housing) for connection, thus resulting in better appearance. Also because the assembly work is easier for passing the cable harness 43 through the cavity of the power unit 4 and the cavity of the stay 1 in the chamber 21 and the cable harness 43 is not led outside the chamber 21, sealing performance is improved.

[0053] Moreover, in the case of the remote-controlled mirror apparatus for vehicles according to the present invention wherein the mirror body 2 and the mirror holder 3 that house the power unit 4 tilt with respect to the power unit 4 and the stay 1, since the cable harness 43 is wired in the chamber 21 defined by the mirror body 2 and the mirror holder 3, tilting motion of the mirror body 2 and the mirror holder 3 can be done smoothly. This effect is particularly remarkable when the cable harness 43 passes through the center P of tilting movement of the mirror body 2 and the mirror holder 3.

[0054] The power unit 4 is attached to one end of the stay 1 to be rotatable around the center axis O-O on the one end of the stay 1 via the clutch mechanism 5 as shown in Fig.8 and Fig.10. The clutch mechanism 5 has the shaft 50 that is fixed on the stay 1 side and a bracket 51 fixed on the power unit 4 side, as shown in Fig.8, Fig. 10 and Fig.16.

[0055] The shaft 50 is separated from the stay 1 as shown in Fig.8, and comprises a hollow cylindrical tube that is smaller than the stay 1, with a disk 500 being attached integrally in an intermediate portion thereof. The disk 500 has small round recesses 501 arranged one on another on one side of the disk (opposite side of the stay 1) along the circumference thereof. One end of the shaft 50 is inserted into one end of the stay 1 and fastened by, for example, three screws 502 as a tightening fixture. The other end of the shaft 50 and the disk 500 are housed in the housing 400, 401 of the power unit 4, while the other end of the shaft 50 further penetrates through the housing 400, 401 of the power unit 4. Besides, center axis of the shaft 50 and the center axis O-O on the other end of the stay 1 correspond with each other, and the cable harness 43 passes through the shaft 50 and the stay 1.

[0056] The above mentioned bracket 51 has a shape of triangular plate as shown in Fig.10, and has a round through hole 510 at the center thereof. The bracket 51 is fitted to the other end of the shaft 50 via the through hole 510 to be rotatable about the center axis O-O (in the direction of arc arrow in Fig.10) and movable in the direction of the center axis O-O (in the direction of straight arrow in Fig.10), and is fastened on the housing 401 of the power unit 4 by means of screws 511. The bracket 51 has, for example, three small balls (steel balls) 512 embedded at equal intervals on one side (surface that opposes the disk 500 of the shaft 50) thereof, corresponding to the group of recesses 501 of the shaft 50.

[0057] Also as shown in Fig.8 and Fig.10, a bushing nut 52 is fastened on the other end of the shaft 50. Installed between the bushing nut 52 and the bracket 51 are a compressive coil spring 53 and a washer 54. Elastic force of the spring 53 presses the bracket 51 against the disk 500 of the shaft 50, thereby fitting the balls 512 into the recesses 501. As a result, the power unit 4 is mounted on the other end of the stay 1 via the clutch mechanism 5 to be rotatable about the center axis O-O.

[0058] Since the power unit 4 is mounted on the other end of the stay 1 via the clutch mechanism 5 to be rotatable about the center axis 0-0 on the other end of the stay 1, the mirror body 2 and the other components can be rotated about the center axis O-O on the other end of the stay 1 with respect to the stay 1 via the power unit 4 and the clutch mechanism 5, thereby providing such effects as increasing the scope of use. In other words, angle of the mirror body 2 is adjusted through remote control thereby changing the viewing direction, and the mirror body 2 can also be rotated about the center axis O-O on the other end of the stay 1. Consequently, the field in which objects can be viewed and perceived can be changed, making it possible to view over a wider range.

[0059] Specifically, the mirror body 2, the mirror holder 3, the power unit 4 and the other components are rotated about the center axis O-O on the other end of the stay 1 with respect to the stay 1 against the elastic force of the spring 53. This causes the balls 512 on the bracket 51 side to get out of the recesses 501 on the shaft 50 side. Accordingly, the bracket 51 slides in the direction of the center axis O-O of the stay 1 against the elastic force of the spring 53. When the balls 512 have got out of the recesses 501, the mirror body 2 and the other components rotate about the center axis O-O on the other end of the stay 1 with respect to the stay 1.

[0060] When rotation of the mirror body 2 and the other components is stopped, the elastic force of the spring

53 causes the bracket 51 to slide in the direction of the center axis O-O of the stay 1, thus making the balls 512 fitted in the recesses 501 again, so that the power unit 4 and the stay 1 side are held together.

[0061] In the case of the clutch mechanism 5 of the notch type, the holding force is large and such an effect is provided as click feeling can be obtained in the operation.

[0062] Fig.17 is a partially cutaway view showing a clutch mechanism of friction type. In the drawings, same reference numerals as those in Fig.1 through Fig.16 denote identical parts.

[0063] The clutch mechanism of friction type has such a configuration as one end of a shaft 55 of hollow tube shape is inserted in the other end of the stay 1 and is fastened by screws or the like. The other end of the shaft 55 penetrates through the housing of the power unit 4. Fastened integrally on the other end of the shaft 55 are two friction plates 56 (fixed to be incapable of rotating with respect to the shaft 55). Held by pressure between the two friction plates 56 is the housing of the power unit 4 to be rotatable about the center axis O-O of the stay 1. Assembled on the other end of the shaft 55 is a tightening fixture 57 such as nut so that the two friction plates 56 press and hold the housing of the power unit 4.

[0064] The clutch mechanism of friction type is capable of achieving an effect similar to that of the clutch mechanism 5 of notch type and, in addition, has an effect of rotating the mirror body 2 and the other components in a stepless way.

[0065] The shaft 50 on the mirror body 2 side and the stay 1 are divided as shown in Fig.8, Fig.10 and Fig.14 and are fastened together by screws 502 as a tightening fixture, and therefore there is such effects as the mirror body 2 side (mirror holder 3, power unit 4, etc.) and the stay 1 side are shared, freely selected and replaced. When the mirror body 2 is broken, for example, only the mirror body 2 may be replaced without need to replace the stay 1 side. Also it is easy to manufacture products by forming only the stay 1 in a desired shape, thus improving the productivity and serviceability.

[0066] The mirror holder 3 that holds the mirror body 2 is attached to the power unit 4 that is installed on the stay 1 as described above, to be capable of adjusting the angle by means of the pivot mechanism 63, as shown in Fig.8, Fig.10 and Fig.14. Fastened with screw 60 on the rear inner surface of the mirror holder 3 is the mirror holder base 6. A spherical portion 61 is provided integrally at the center of the mirror holder base 6. Provided at the center on the back of the spherical portion 61 and the mirror holder 3 are round through holes 62 and 33, that have inner diameters greater than the outer diameters of the stay 1 and the shaft 50, respectively. Inserted in the through hole 33 of the mirror holder 3 and in the through hole 62 of the mirror holder base 6 are the other end of the stay 1 and one end of the shaft 50, respectively.

[0067] Provided integrally at the center of the housing 401 of the power unit 4 is a spherical recess 44. The spherical recess 44 of the power unit 4 has the spherical portion 61 of the mirror holder base 6 attached thereto, in such a way as the angle can be adjusted by means of a spherical convex washer 45, a compressive coil spring 46 and a plain washer 47. The plain washer 47 is pressed against the other end face of the stay 1 by the elastic force of the spring 46 that is interposed between the spherical convex washer 45 and the plain washer 47 thereby to receive the resisting force, while the spherical convex washer 45 presses the spherical portion 61 of the mirror holder base 6 against the spherical recess 44 of the power unit 4. As a result, the spherical portion 61 of the mirror holder base 6 is pressed and held between the spherical convex washer 45 and the spherical recess 44 of the power unit 4 in such a way as the angle can be adjusted, and the mirror holder 3 is mounted on the power unit 4 to be capable of adjusting the angle. Further, one end of the shaft 50 is inserted through the through hole 440 of the spherical recess 4, the through hole 450 of the spherical convex washer 45, the compressive coil spring 46 and the through hole 470 of the plain washer 47.

[0068] The spherical recess 44 of the power unit 4, the spherical portion 61 of the mirror holder base 6, the spherical convex washer 45, the spring 46 and the plain washer 47 constitute the pivot mechanism 63. Center (centers of the spherical recess 44, the spherical portion 61 and the spherical convex washer 45) P of the pivot mechanism 63 is located near the through hole 33 of the mirror holder 3 through which the other end of the stay 1 is inserted.

[0069] By locating the center P of the pivot mechanism 63 near the through hole 33 of the mirror holder 3 through which the other end of the stay 1 is inserted as described above, movement of the edge of the through hole 33 of the mirror holder 3 decreases when the mirror body 2, the mirror holder 3, etc. are tilted, thus making it possible to decrease the diameter of the through hole 33, and decrease the size of a waterproof boot 7 to be described later, thereby obtain the well-designed waterproof boot 7. Also because movement of the waterproof boot 7 can be made smaller, such effects are obtained as less resistance against the movement of the waterproof boot 7 and better operability of the power unit 4.

[0070] The above mentioned mirror holder base 6 has two spherical recesses 64 to which the spherical portions of the two advance-retract rods 410, 420 of the power unit 4 are fitted rotatably as shown in Fig.18 and Fig.19. Two elastic projections 65 having cylindrical configuration (round pin) and forked cross section are provided on each of the two oblique axes (axes connecting the center P of the pivot mechanism 63 and the centers of the two spherical recesses 64 (or spherical portions of the two advance-retract rods 410, 420)) S1-S1, S2-S2 of the mirror holder base 6.

[0071] Also provided on the two oblique axes S1-S1, S2-S2 of the housing 401 of the power unit 4 are four guiding recesses 403 having cylindrical concave shape corresponding to the four elastic guiding projections 65, as shown in Fig.20.

[0072] The elastic guiding projection 65 of the mirror holder base 6 and the guiding recess 403 of the power unit 4 are elastically fitted to each other. As the advance-retract rods 410, 420 of the power unit 4 are moved forward or backward by the elastic guiding projection 65 of the mirror holder base 6 and the guiding recess 403 of the power unit 4 which are elastically fitted to each other, tilting motion of the tilting member comprising the mirror holder base 6, the mirror body 2, etc. is guided (positioned).

[0073] Since the guiding projection 65 is made in forked cross section and has elasticity in the direction that crosses the two oblique axes S1-S1, S2-S2, elastic fitting of the guiding projection 65 having the forked cross section and the guiding recess 403 brings the outer surface of the guiding projection 65 and the inner surface of the guiding recess 403 into contact with each other while pressing, thus preventing play of the guiding projection 65 from occurring in the direction that crosses the two oblique axes S1-S1, S2-S2, thereby making it possible to guide the tilting movement of the tilting members without play.

[0074] In the drawings, reference numeral 7 denotes the waterproof boot. The waterproof boot 7 has a configuration of bellows having annular projections 72 and annular recesses 73 arranged alternately, while the diameter increases gradually from one end to the other in a conical trapezoidal shape. When the waterproof boot 7 is fastened on the stay 1 and on the circumference 36 of the through hole 33 of the mirror holder 3, part of an opening 74 between adjacent annular projections 72 faces downward so that water does not build up on a part of the annular recess 73 that faces upward.

[0075] One end of the waterproof boot 7 is fastened on one end of the stay 1 on the fixed side thereof (may also be fastened via a fastening ring (not shown)) as shown in Fig.8, Fig.14 and Fig.21. The other end of the waterproof boot 7 is held and fastened (or fastened by elastic holding) by a plurality of engaging lips 34 on the circumference 36 of the through hole 33 of the mirror holder 3 on the movable side thereof, to be interposed between the stay 1 and the mirror holder 3, thereby providing waterproof therebetween.

[0076] A through hole 70 on one end of the waterproof boot 7 has inner diameter a little smaller than or nearly equal to the outer diameter of the stay 1. Thus one end of the waterproof boot 7 is fastened on the stay 1 (may also be fastened via a fastening ring).

[0077] An engagement projection 71 is provided to protrude from the inner circumference of the through hole on the other end of the waterproof boot 7, integrally therewith. The engagement projection 71 is held (or fastened by elastic holding) between the circumference 36 of the through hole 33 of the mirror holder 3 and the plurality of engaging lips 34.

[0078] The engaging lips 34 are arranged to oppose the circumference 36 of the through hole 33 with a clearance (clearance for inserting the engagement projection 71 of the waterproof boot 7 by pressure) being kept therebetween. Reference numeral 35 denotes a through hole for releasing a die to form the engaging lips 34.

[0079] Since a part of the opening 74 between the adjacent annular projections 72 faces downward so that water does not build up on a part of the annular recess 73 facing upward when both ends of the waterproof boot 7 are fastened on the stay 1 and on the circumference 36 of the through hole 33 of the mirror holder 3, water or rain falling on the waterproof boot 7 is discharged through the opening 74 that faces downward between the annular projections 73 to the outside, and therefore does not build up on the part of the annular recess 73 facing upward. Since water can be surely prevented from building up on the waterproof boot 7 as described above, such problems caused by water buildup on the waterproof boot 7 can be prevented as the water staying on the waterproof boot 7 freezes and hinders smooth tilting motion of the tilting member comprising the mirror body 2 and the mirror holder 3, or operation of the power unit 4 is affected in the case of the remote-controlled mirror apparatus for vehicles of the invention where the tilting member is tilted by the power unit 4.

[0080] As shown in Fig.24 and Fig.25, the mirror holder base 6 has two cylindrical portions 642, 642 each of which has two spherical recesses 64, 64 provided thereon. Fitted rotatably to the two spherical recesses 64, 64 are the spherical portions 416, 426 of the two advance-retract rods 410, 420 of the power unit 4 via a separate piece 8 to be described later. The two spherical recesses 64, 64 are formed by undercut and have slits 641 provided in the radial direction, with two engaging steps 640, 640 provided on the edge of the slit 641.

[0081] In Fig. 23 through Fig.25, reference numeral 8 denotes a separate piece that makes it easy to press the spherical portions 416, 426 of the two advance-retract rods 410, 420 into the spherical recesses 64, 64 and makes it difficult for the spherical portions 416, 426 of the two advance-retract rods 410, 420 to come off the spherical recesses 64, 64. The separate piece 8 is made of, for example, an elastic material such as a synthetic resin and is formed in a substantially ring shape, comprising two elastic engagement hooks 80, 80 that make elastic engagement with the two engaging steps 640, 640 of the mirror holder base 6 and a ring-shaped retainer portion 81 that prevents the spherical recesses 64, 64 (cylindrical portions 642, 642) to which the spherical portions 416, 426 of the two advance-retract rods 410, 420 are fitted from expanding outward.

[0082] The spherical portions 416, 426 of the two advance-retract rods 410, 420 are pressed to fit into the spherical recesses 64, 64, the elastic engagement hooks 80, 80 of the separate piece 8 are put into elastic engagement with the two engaging steps 640, 640 of the mirror holder base 6, and the retainer portion 81 of the separate piece 8 is pressed into the cylindrical portion 642 of the mirror holder base 6. Thus the separate piece 8 makes it easy to press the spherical portions 416, 426 of the two advance-retract rods 410, 420 into the spherical recesses 64, 64 and makes it difficult for the spherical portions 416, 426 of the two advance-retract rods 410, 420 to come off the spherical recesses 64, 64.

[0083] Since the mirror holder base 6 (mirror holder 3) is provided with the separate piece 8 that makes it easy to press the spherical portions 416, 426 of the two advance-retract rods 410, 420 into the spherical recesses 64, 64 and makes it difficult for the spherical portions 416, 426 of the two advance-retract rods 410, 420 to come off the spherical recesses 64, 64 as described above, such a configuration is made by means of the separate piece 8 that makes it easy to press the spherical portions 416, 426 of the two advance-retract rods 410, 420 into the spherical recesses 64, 64 and makes it difficult for the spherical portions 416, 426 of the two advance-retract rods 410, 420 to come off the spherical recesses 64, 64. As a result, since the force required for the spherical portions 416, 426 of the two advance-retract rods 410, 420 to come off the spherical recesses 64, 64 can be made greater, retaining force of the advance-retract rods 410, 420, namely the retaining force of the tilting member (mirror surface) comprising the mirror body 2, the mirror holder 3 and the mirror holder base 6 is increased thereby improving the performance of the power unit 4.

[0084] The remote-controlled mirror apparatus for vehicles according to this embodiment of the present invention having the configuration described above operates as described below.

[0085] When the first motor 41 of the power unit 4 is actuated, drive force of the first motor 41 is transmitted via the drive force transmission mechanisms 411, 412, 413 to the first advance-retract rod 410 to cause the first advance-retract rod 410 to advance or retract. Accordingly, the mirror body 2 tilts about the first oblique axis S1-S1 (axis connecting the center P of the pivot mechanism 63 and the center of the spherical portion of the second advance-retract rod 420) via the mirror holder 3 and the mirror holder base 6. When the second motor 42 of the power unit 4 is actuated, drive force of the second motor 42 is transmitted via the drive force transmission mechanisms 421, 422, 423 to the second advance-retract rod 420 to cause the second advance-retract rod 420 to advance or retract, so that the mirror body 2 tilts about the second oblique axis S2-S2 (axis connecting the center P of the pivot mechanism 63 and the center of the spherical portion of the first advance-retract rod 410) via the mirror holder base 6 and the mirror holder 3.

[0086] As the angle of the mirror body 2 is adjusted, viewing direction can be changed to the left and right or back and forth, thus making it possible to widen the field of view in the area downward at the back of a vehicle C such as one-box car or recreational vehicle as shown in Fig.2 through Fig.4.

[0087] As described above, the remote-controlled mirror apparatus for vehicles according to this embodiment of the present invention tilts the mirror body 2 with respect to the power unit 4 and the stay 1 together with the mirror holder 3 having the configuration of housing and the mirror holder base 6, by actuating the power unit 4. Thus in the remote-controlled mirror apparatus for vehicles according to this embodiment of the present invention, the mirror housing 102, that contains the power unit 103, of the prior art located on the fixed side together with the power unit 103 and the stay 100, is eliminated and, instead, the mirror holder 3 having a configuration of housing that contains the power unit 4 is installed together with the mirror body 2 on the tilting side. As a consequence, when the mirror body 2 is tilted with respect to the power unit 4 and the stay 1, the mirror holder 3 is also tilted along with the mirror body 2 with respect to the power unit 4 and the stay 1, and therefore such a problem does not occur as the edge of the mirror body 101 comes inside the opening edge of the mirror housing 102 on the fixed side as in the case of the prior art. As a result, it is made possible to secure a wide field of view without the possibility of causing an obstacle to the field of view when adjusting the angle of the mirror body 2.

[0088] Also in this embodiment, periphery of the mirror body 2 is fixed on the front opening 30 of the mirror holder 3, with the waterproof boot 7 being interposed between the stay 1 and the mirror holder 3, while the chamber 21 defined by the mirror body 2 and the mirror holder 3 is closed almost airtight and the power unit 4 is housed in the closed chamber 21. Consequently, noise of the power unit 4 is reduced, and waterproof performance and dust-proof performance for the power unit 4 are improved.

[0089] While the embodiment described above is a rear under mirror for automobile used in the vehicle C such as one-box car or recreational vehicle, the remote-controlled mirror apparatus for vehicles of the present invention can be applied to vehicles other than one-box car and recreational vehicle, and to mirror apparatuses other than the rear under mirror.

Claims

1. A remote-controlled mirror apparatus for vehicles that allows, when attached to a vehicle, to view and perceive in a predetermined field around a desired direction by means of reflection of a mirror body, with a direction of view being adjustable by changing angle of said mirror body through remote control, said apparatus comprising:

   a stay one end of which is attached to a vehicle body;
   a power unit attached to the other end of said

stay as an angle adjusting mechanism;
a mirror holder having a configuration of housing attached to said power unit to be capable of tilting; and
said mirror body being held on said mirror holder to define, together with said mirror holder, a chamber wherein said power unit is housed, with said mirror body and said mirror holder being tilted thereby to adjust the angle thereof with respect to said stay and said power unit by means of said power unit.

2. A remote-controlled mirror apparatus for vehicles according to claim 1, wherein:

said stay is a hollow tube;
said power unit has a cavity that communicates with a cavity of said stay; and
a cable harness that electrically connects said power unit and a power source is passed through the cavity of the power unit and the cavity of the stay in said chamber.

3. A remote-controlled mirror apparatus for vehicles according to claim 1, wherein:
said mirror holder has a through hole for passing the other end of said stay, while center of tilting movement of said mirror body and said mirror holder is located near said through hole.

4. A remote-controlled mirror apparatus for vehicles according to claim 1, wherein:

said power unit is provided with two advance-retract rods that advance or retract to tilt said mirror body and said mirror holder thereby adjusting the angle of said mirror body; and
said two advance-retract rods are disposed, symmetrically with respect to a vertical axis, on two oblique axes that are counterparts of mutually perpendicular vertical axis and horizontal axis rotated about the intersect thereof.

5. A remote-controlled mirror apparatus for vehicles according to claim 4, wherein:

said power unit is provided with;
said two advance-retract rods disposed on said two oblique axes that are rotated by 45 degrees around the intersect, in parallel to the horizontal axis and above the horizontal axis, respectively;
two motors disposed in V-shaped configuration symmetrically with respect to said vertical axis; and
two sets of drive force transmission mechanisms interposed between said two advance-retract rods and said two motors.

6. A remote-controlled mirror apparatus for vehicles according to claim 1, wherein:
said power unit is attached to the one end of said stay to be rotatable about the center axis on the other end of said stay via a clutch mechanism.

7. A remote-controlled mirror apparatus for vehicles according to claim 6, wherein:
said clutch mechanism is a notch type clutch mechanism.

8. A remote-controlled mirror apparatus for vehicles according to claim 6, wherein:
said clutch mechanism is a friction type clutch mechanism.

9. A remote-controlled mirror apparatus for vehicles according to claim 1, wherein:

said power unit is provided with two advance-retract rods that advance or retract to tilt said mirror holder and said mirror body thereby to adjust the angle of said mirror body;
a guiding recess and a guiding projection are provided between said power unit and said mirror holder in the directions of two axes connecting center of tilting movement of said mirror holder and the mirror body and the two advance-retract rods, for guiding the tilting movement of said mirror holder and said mirror body; and
said guiding projection has a cross section of forked configuration and elasticity in the direction of crossing said axis direction, and makes elastic fitting of the guiding projection having the forked cross sectional configuration and the guiding recess, thereby to prevent play from occurring in the direction that crosses said axis direction thus making it possible to guide the tilting motion of said mirror holder and said the mirror body without play.

10. A remote-controlled mirror apparatus for vehicles according to claim 1, wherein:

said mirror holder has a through hole for inserting the other end of said stay;
a waterproof boot is interposed between circumference of the through hole of said mirror holder and said stay; and
said waterproof boot has a configuration of bellows with annular projections and annular recesses arranged alternately, with a part of opening between the annular projections that are adjacent to each other being disposed to face downward so that water does not build up on a part of the annular recess facing upward.

11. A remote-controlled mirror apparatus for vehicles according to claim 1, wherein:

said mirror body, said mirror holder, said power unit and said stay are separate components that are held together by tightening fixture or the like.

12. A remote-controlled mirror apparatus for vehicles, wherein

a power unit is provided with two advance-retract rods that advance or retract to tilt a mirror holder and a mirror body thereby to adjust angle of said mirror body;
said mirror holder has two spherical recesses wherein spherical portions of said two advance-retract rods are fitted, respectively; and
a separate piece is provided that makes it easy to press the spherical portions of said advance-retract rods into said spherical recesses and makes it difficult for the spherical portions of said advance-retract rods to come off the spherical recesses.

13. A remote-controlled mirror apparatus for vehicles according to claim 12, wherein:

the separate piece comprises;
an elastic engagement hook that makes elastic engagement with said mirror holder; and
a retainer portion for preventing said spherical recess wherein spherical portion of said advance-retract rod is fitted from expanding.

FIG. 1 PRIOR ART

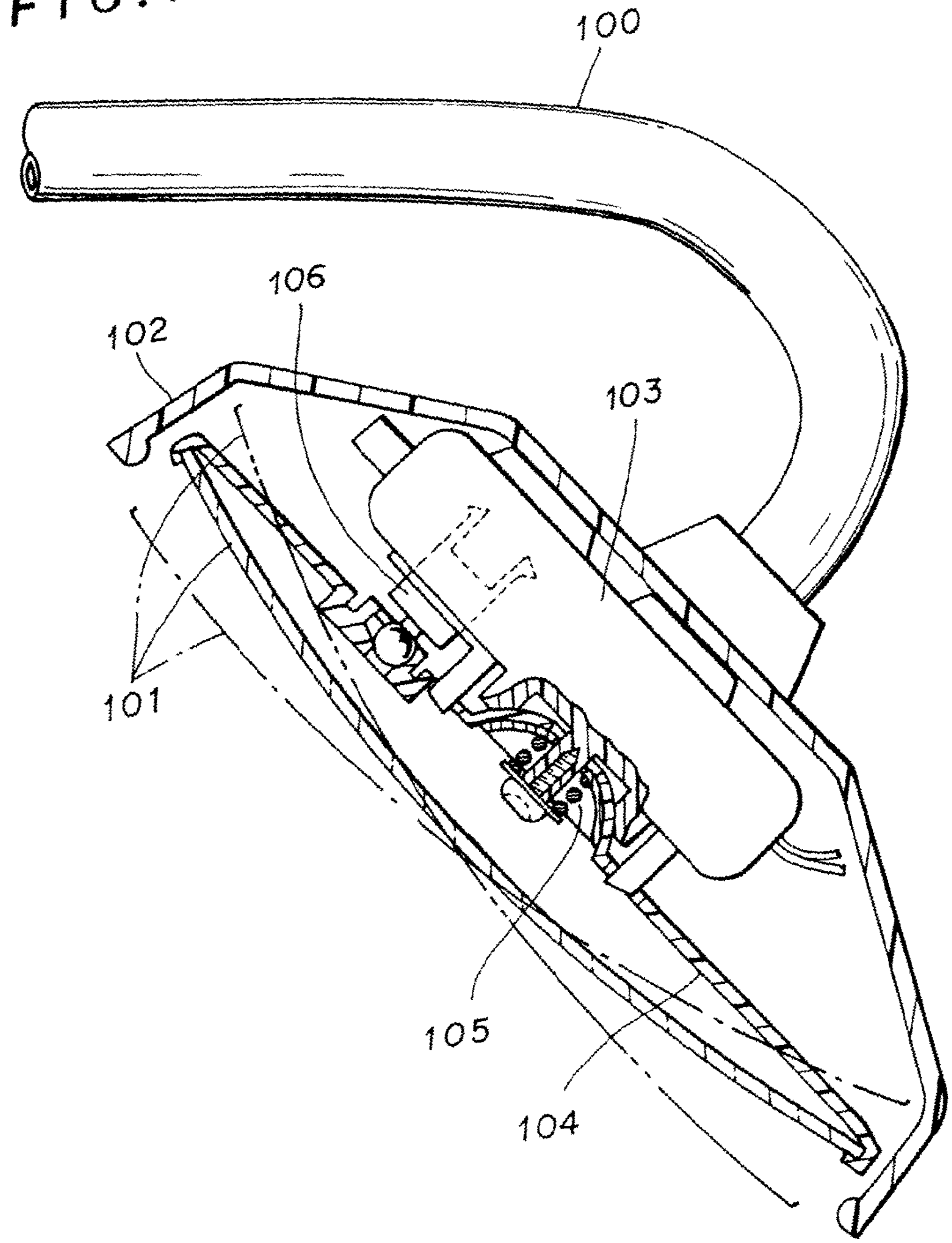


FIG.2 PRIOR ART

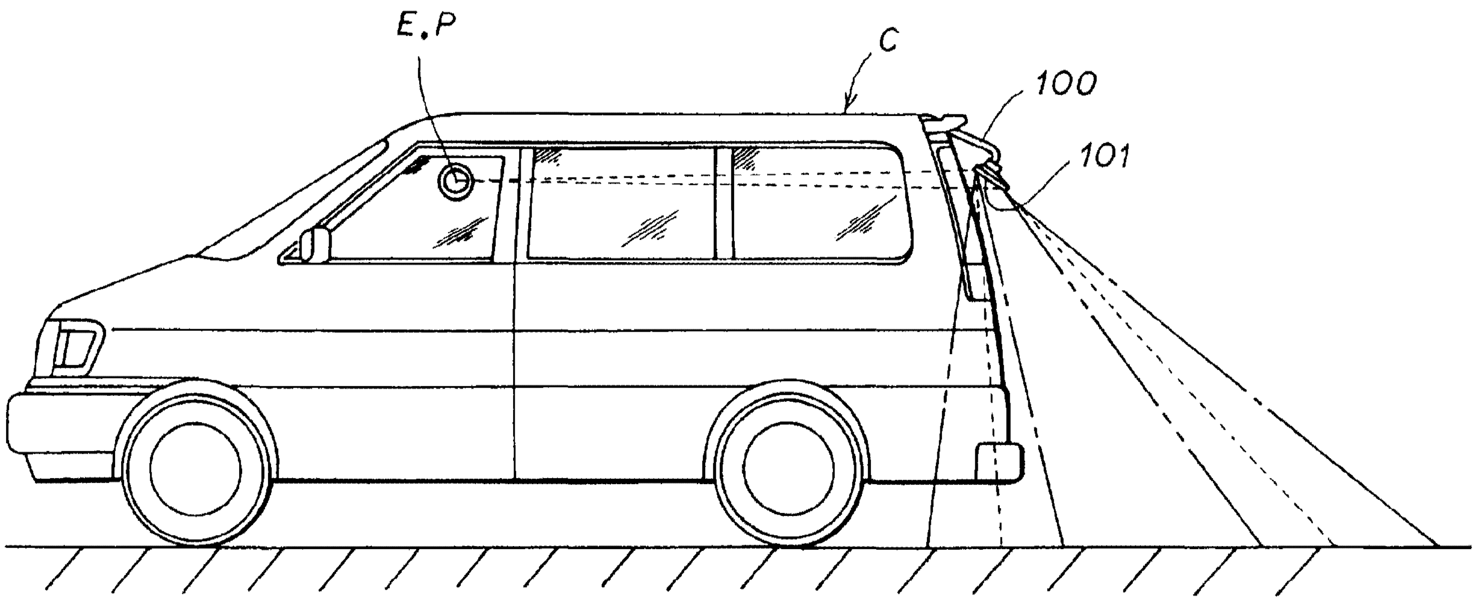


FIG.3 PRIOR ART

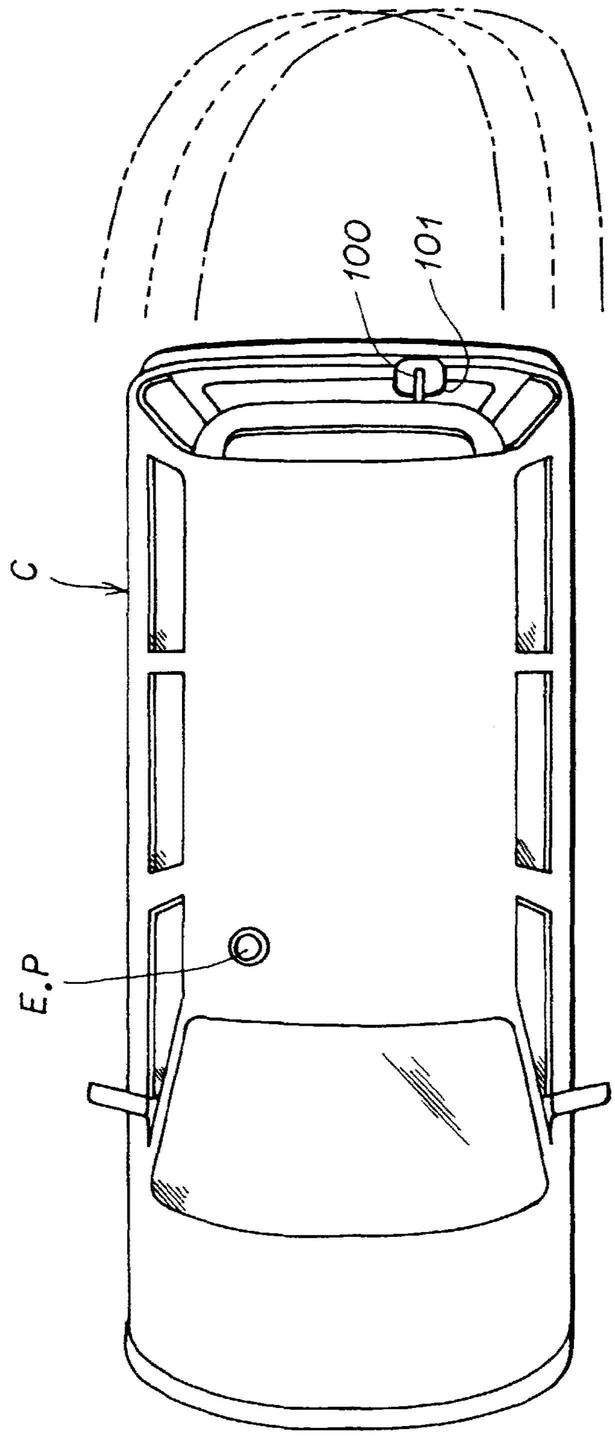


FIG.4 PRIOR ART

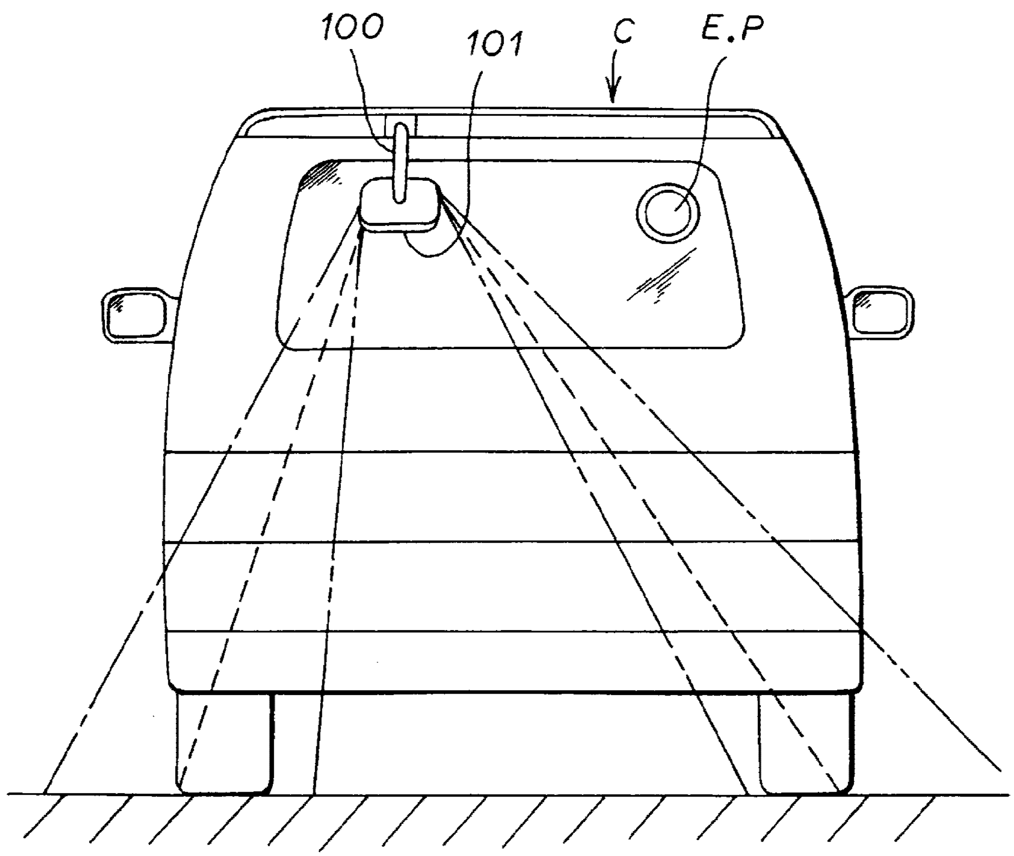


FIG.5

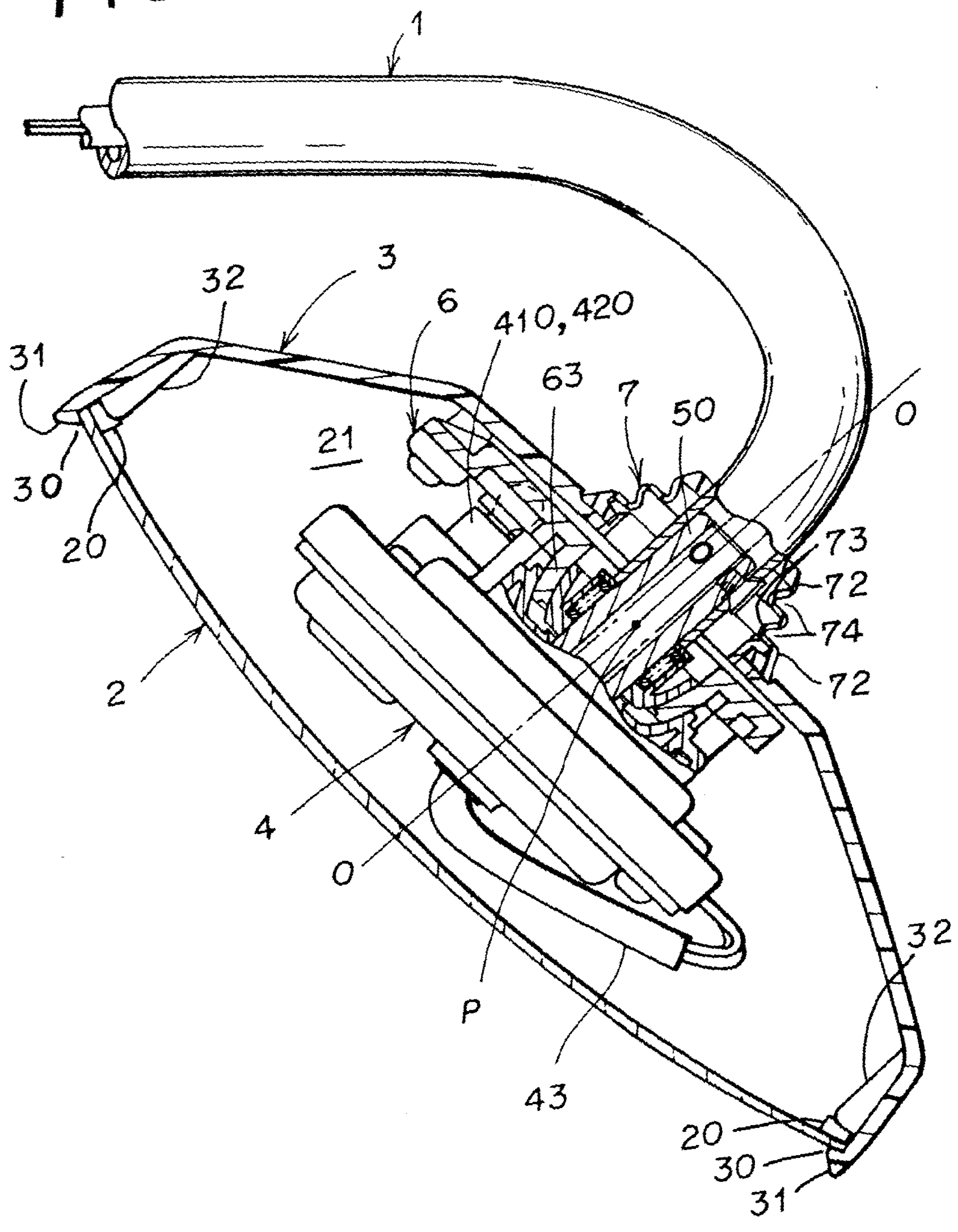


FIG. 6

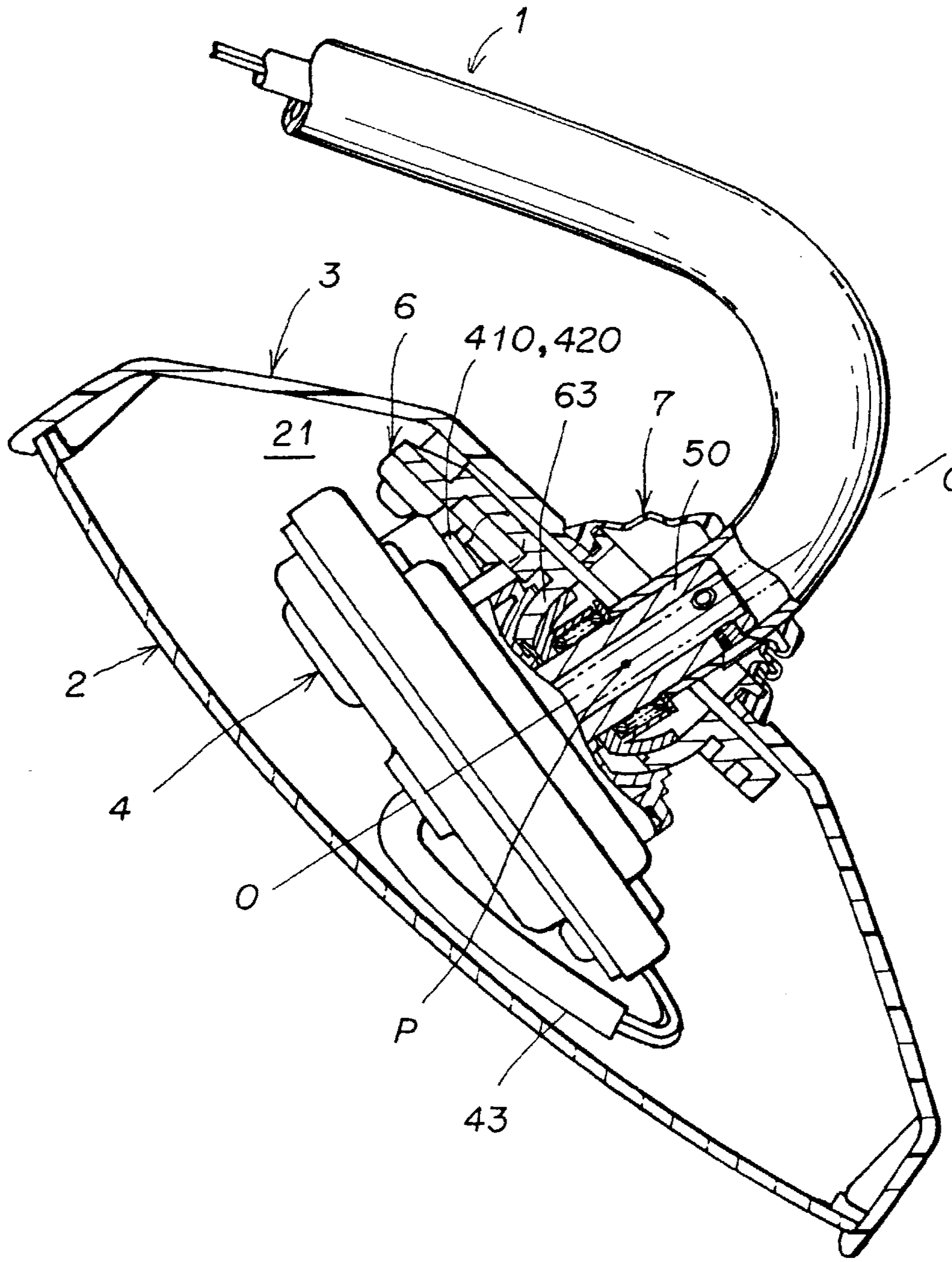


FIG. 7

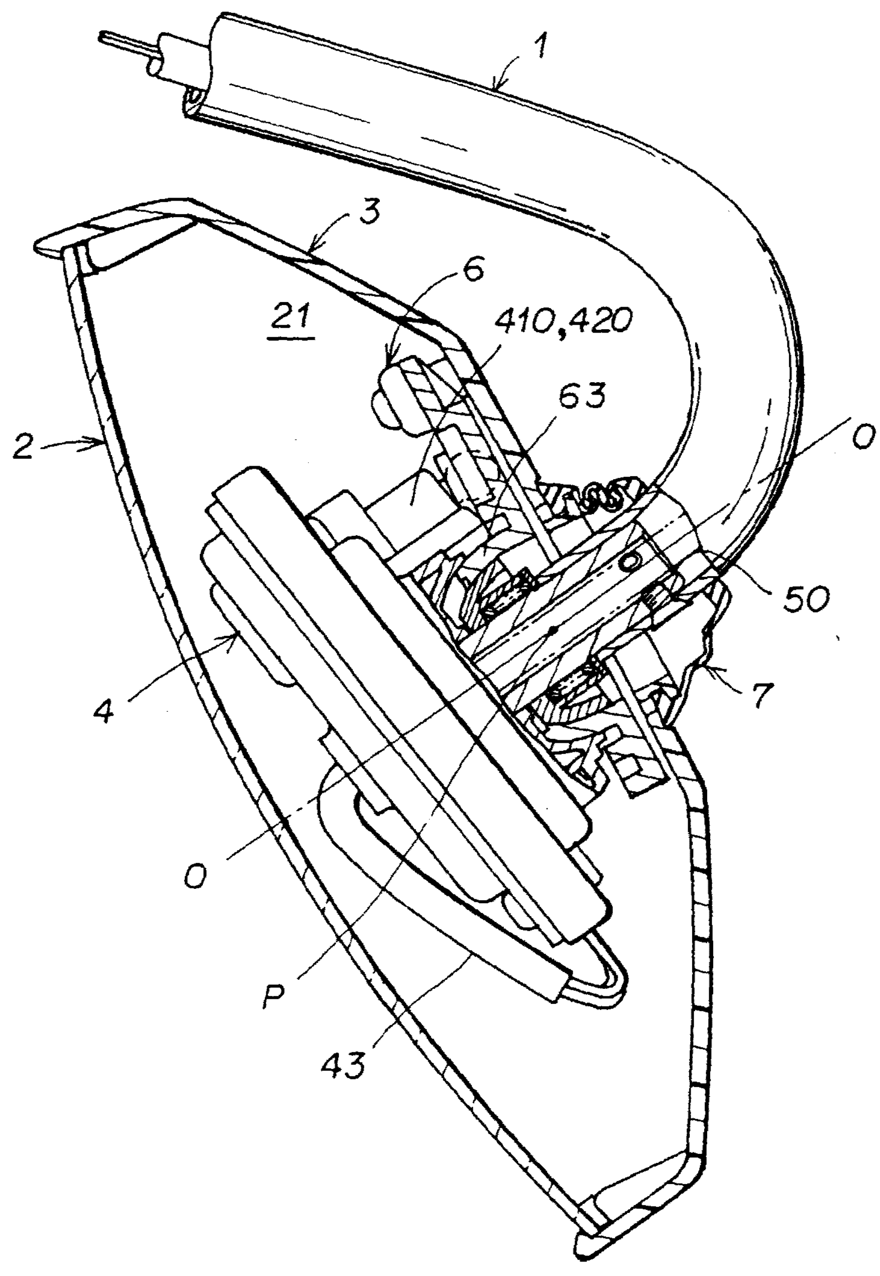


FIG. 8

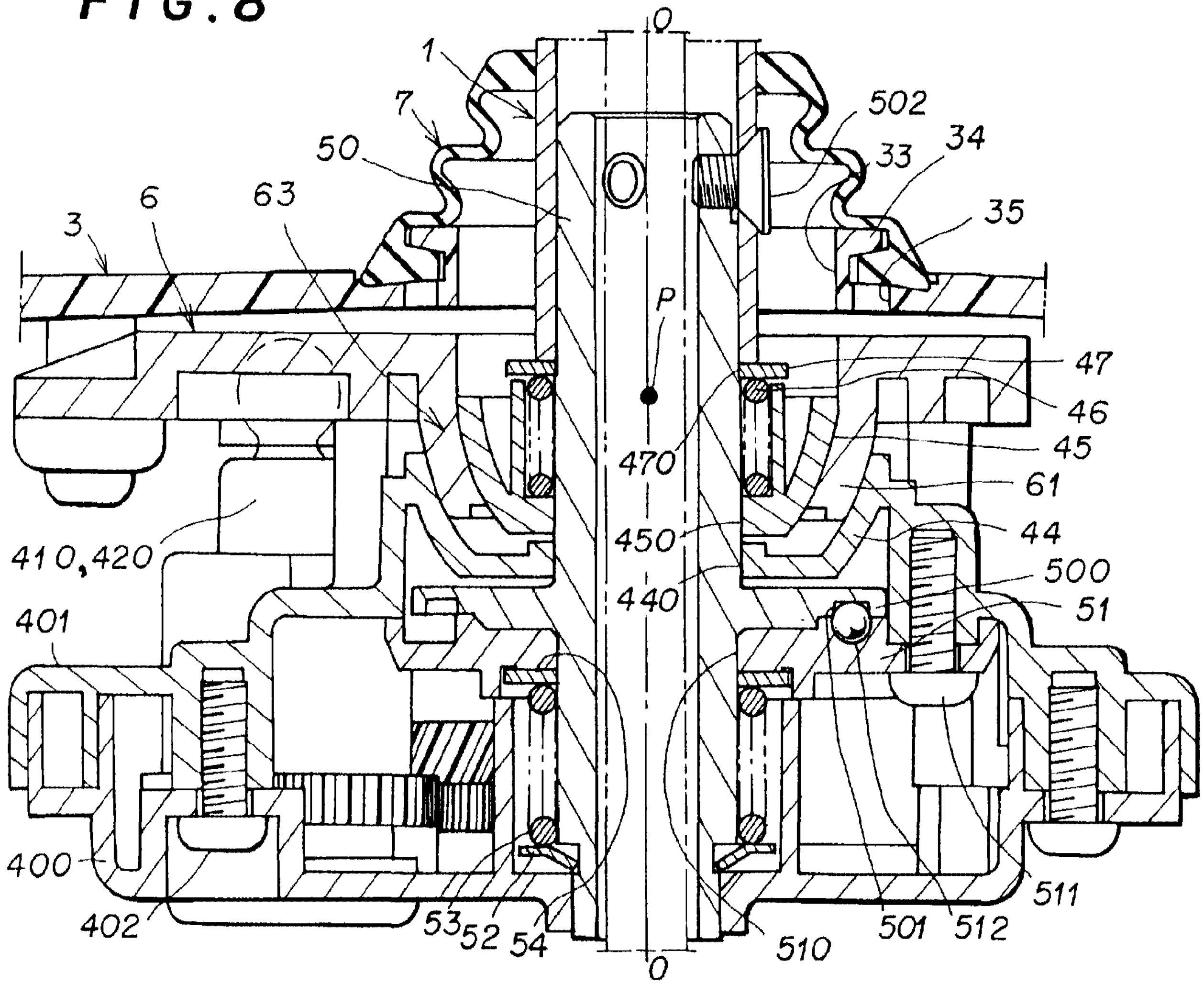

0
1
7
50
502
33
34
35
3
6
63
P
47
46
470
45
61
410,420
450
44
440
500
51
401
400
402
53
52
54
510
501
512
511
0

FIG.9

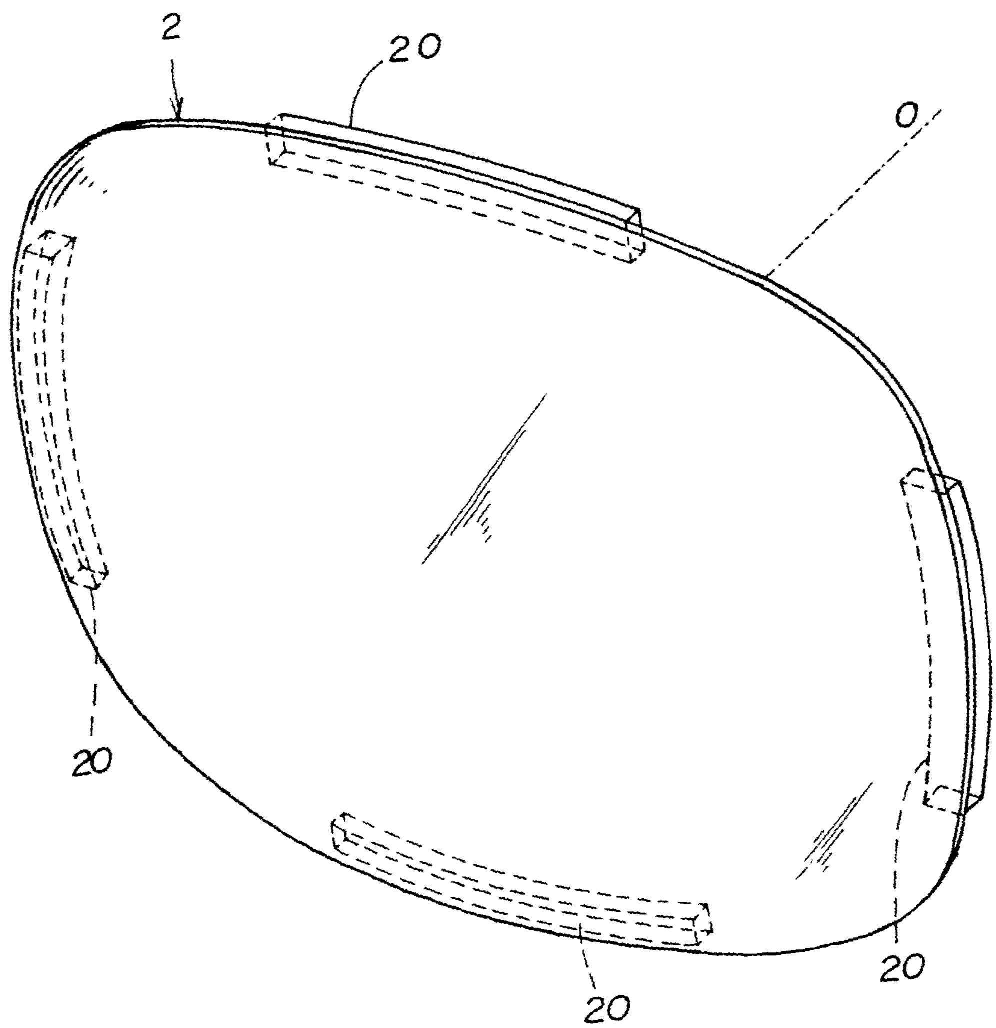


FIG.10

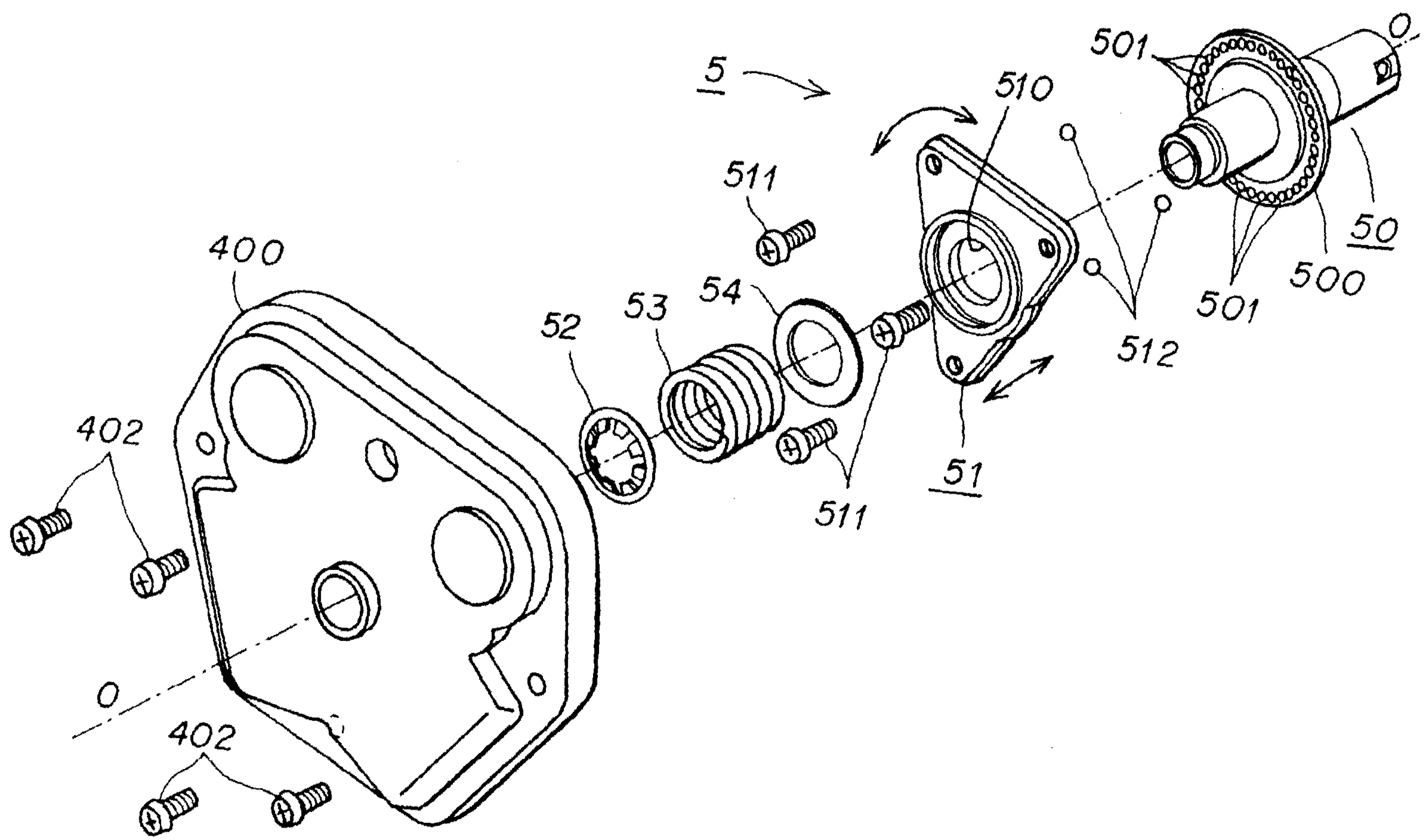


FIG. 11

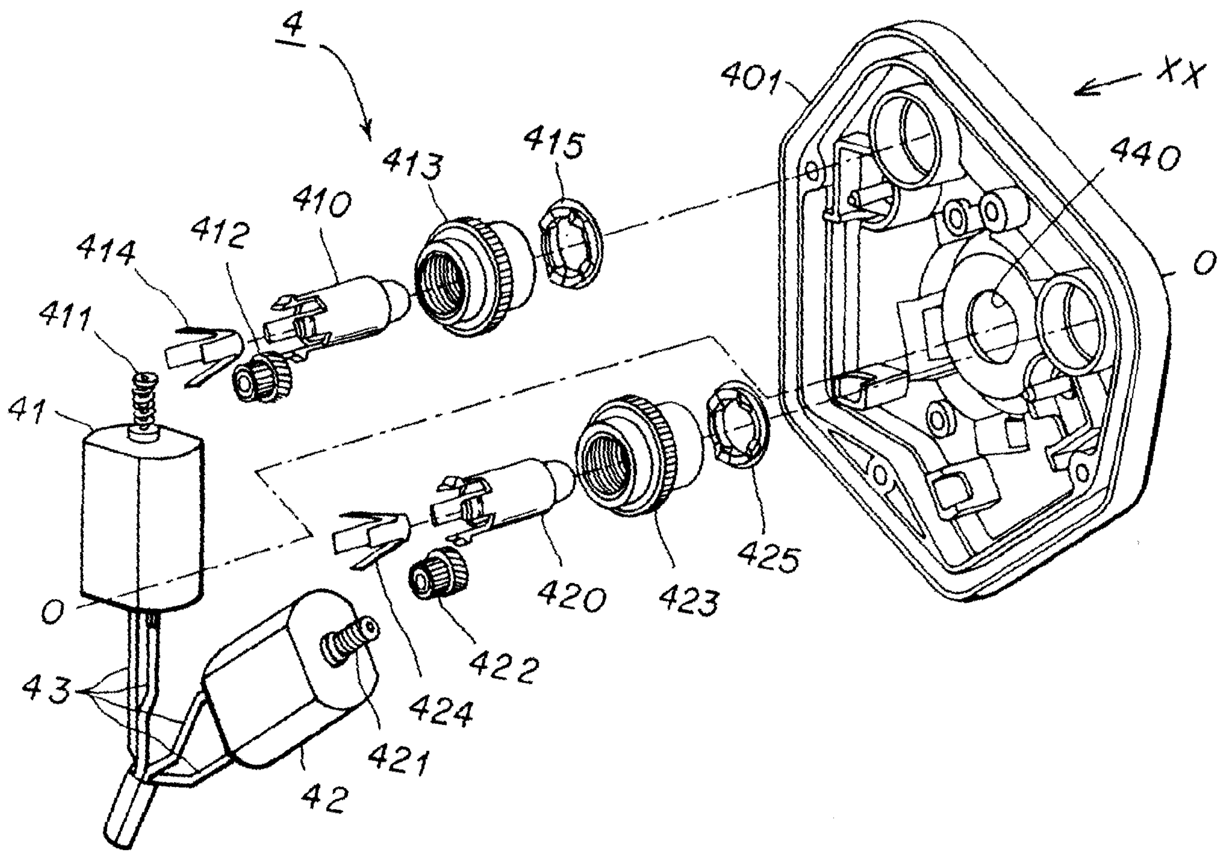

4
401
XX
415
413
440
410
412
414
411
O
41
420
423
425
O
422
43
424
421
42

FIG. 12

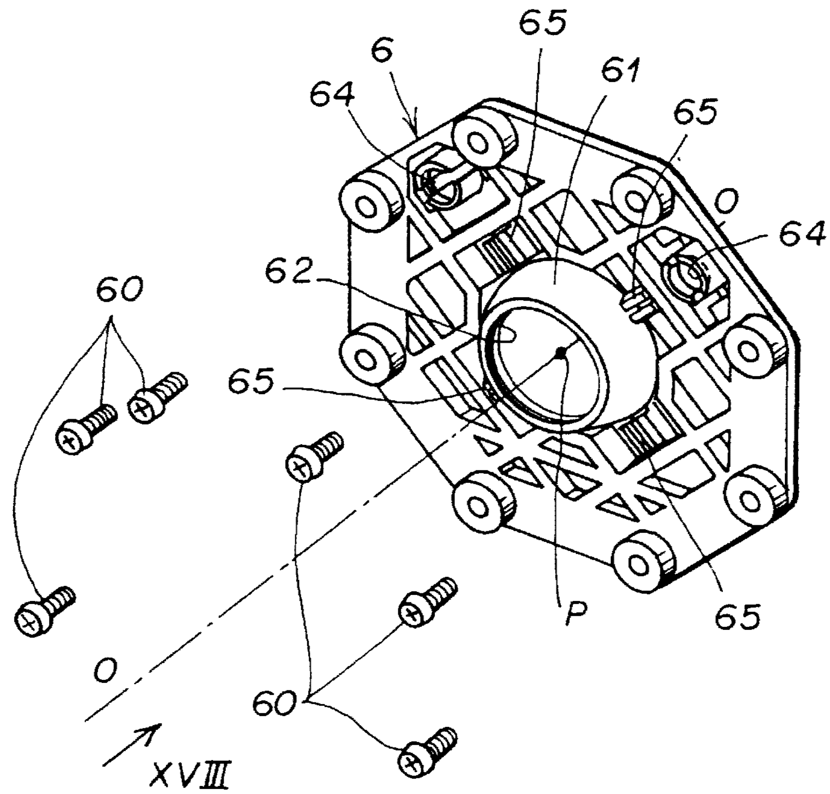


FIG.13

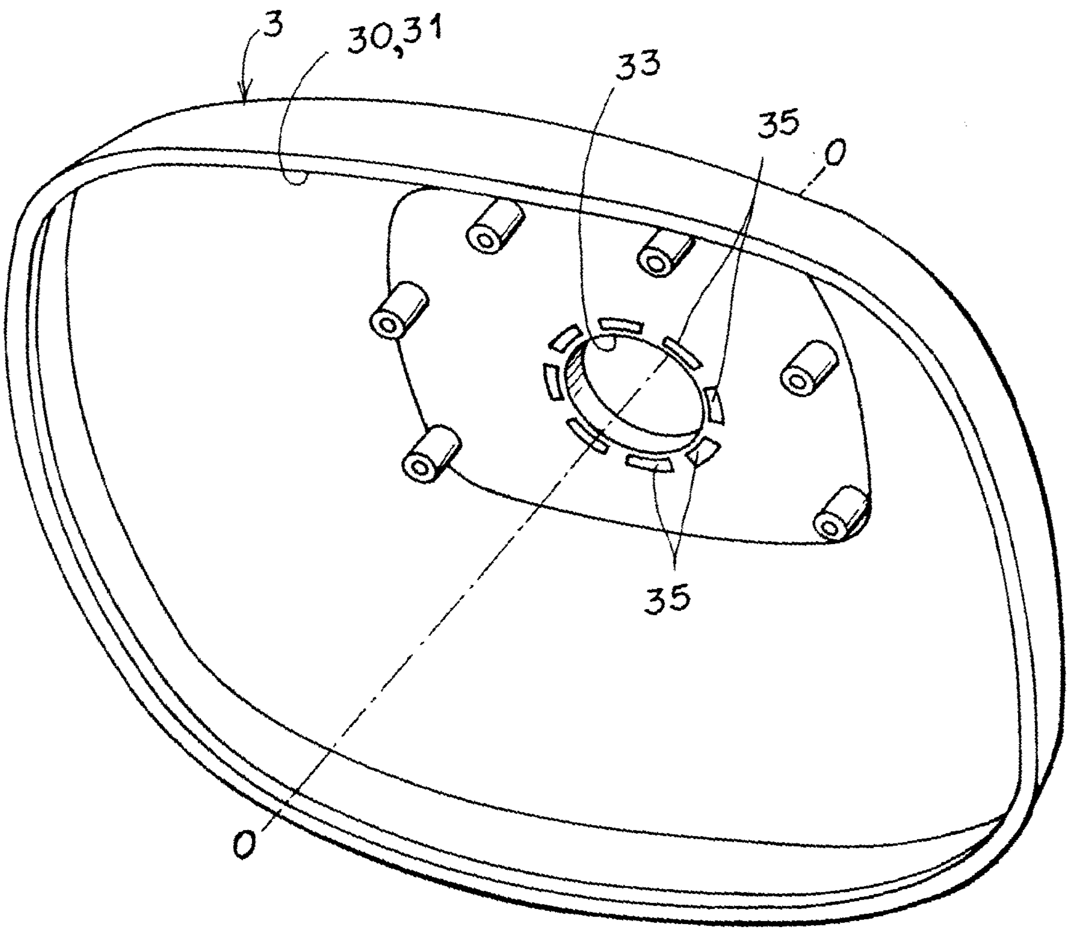


FIG.14

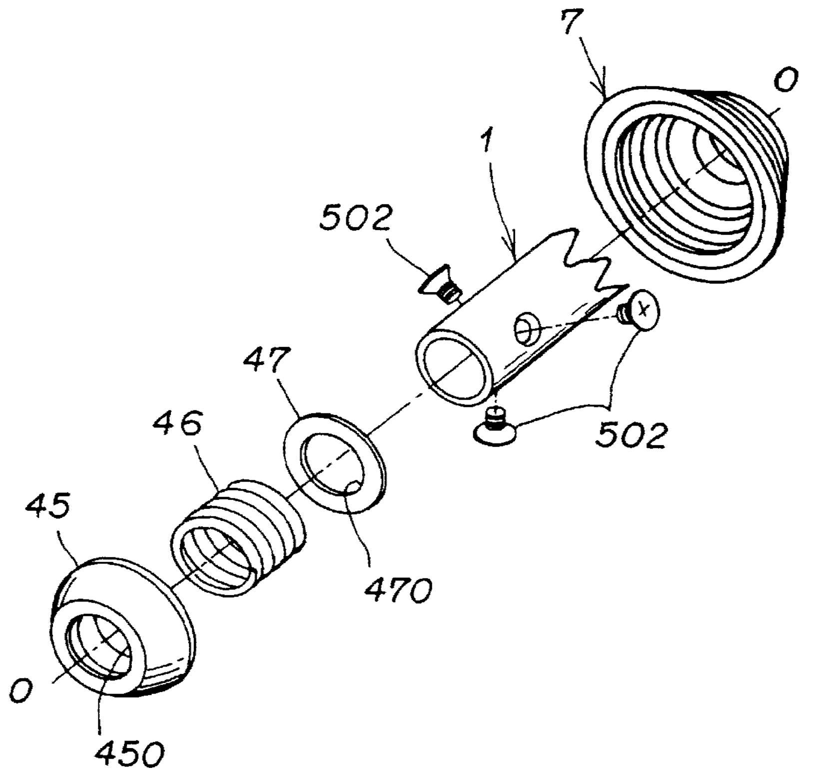


FIG. 15

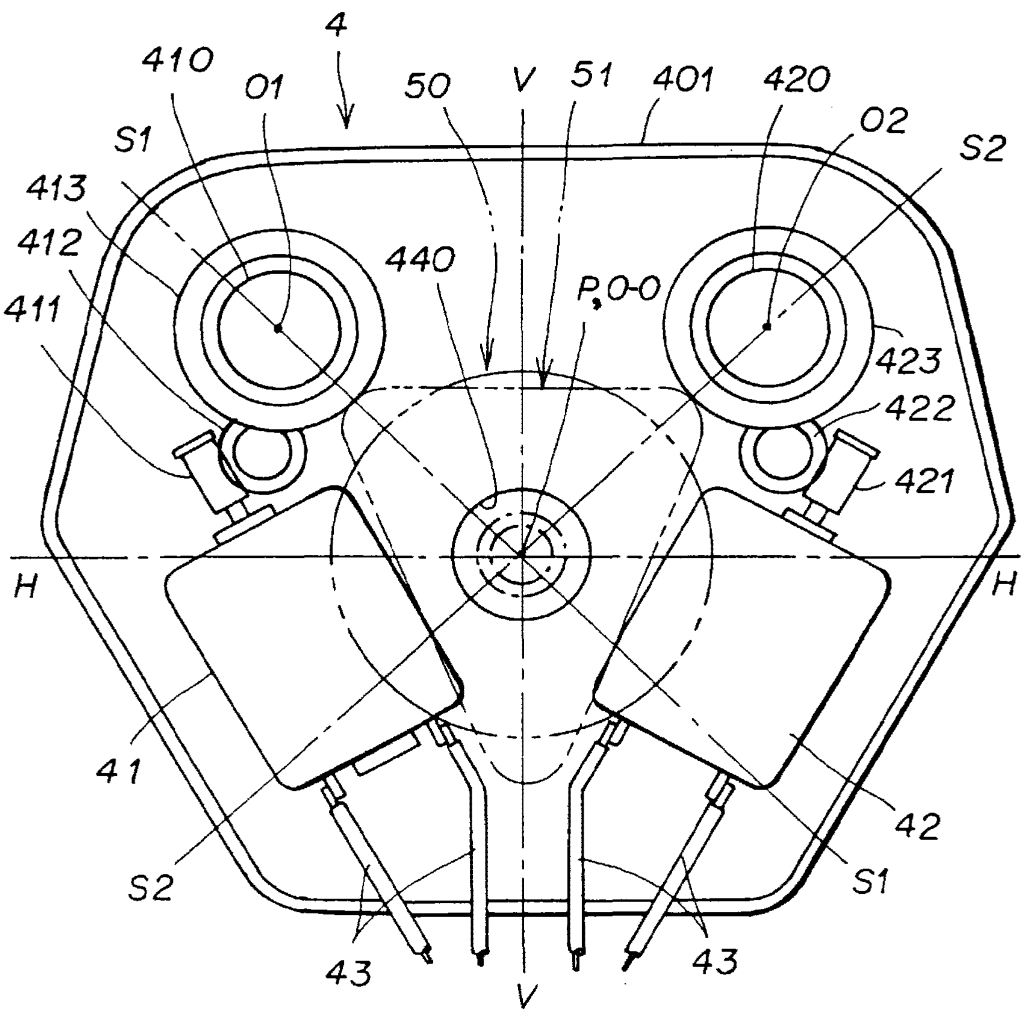

4
410
O1
50
V
51
401
420
O2
S2
S1
413
412
440
P,0-0
411
423
422
421
H
H
41
42
S2
S1
43
43
V

FIG.16

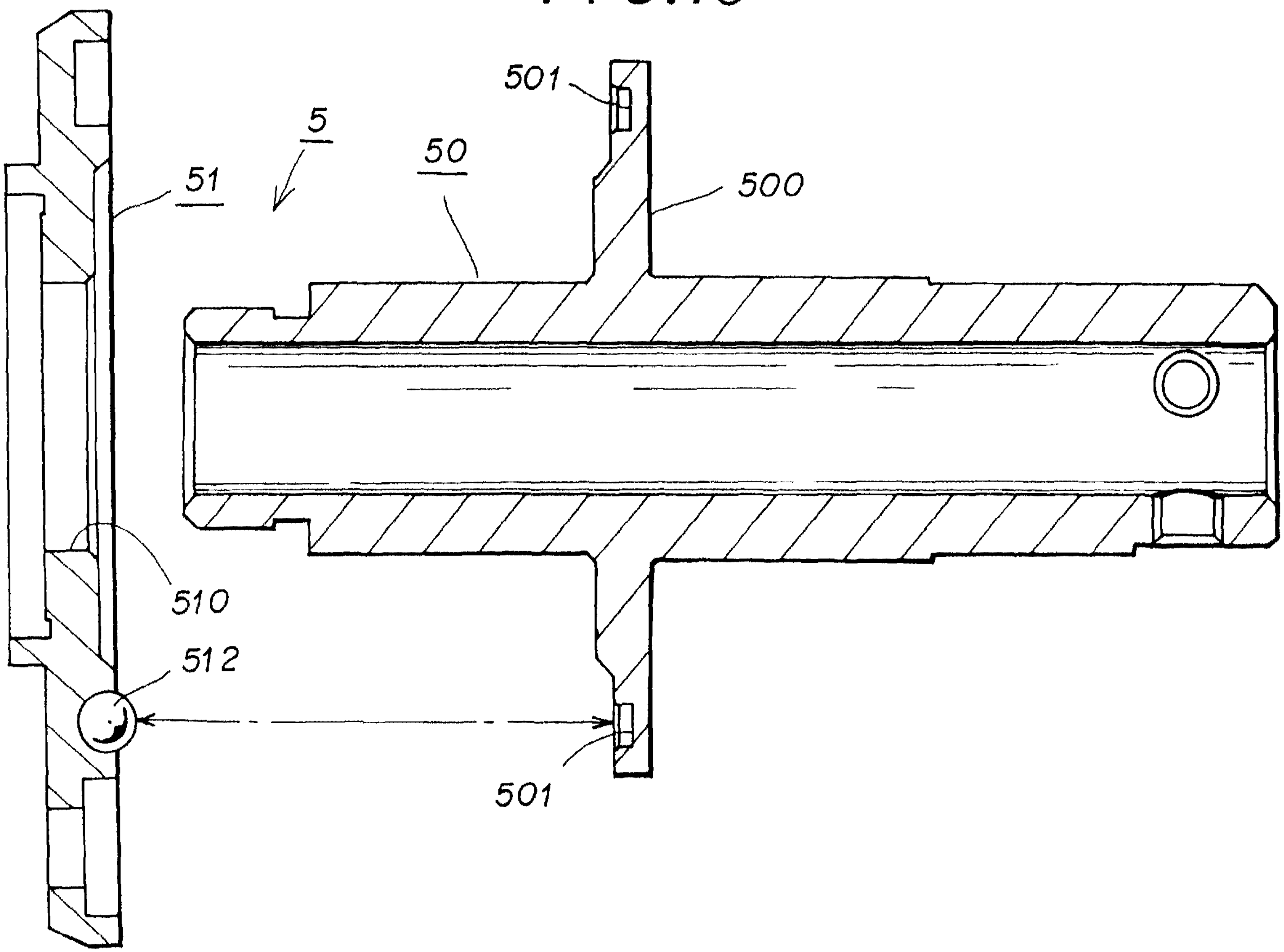


FIG. 17

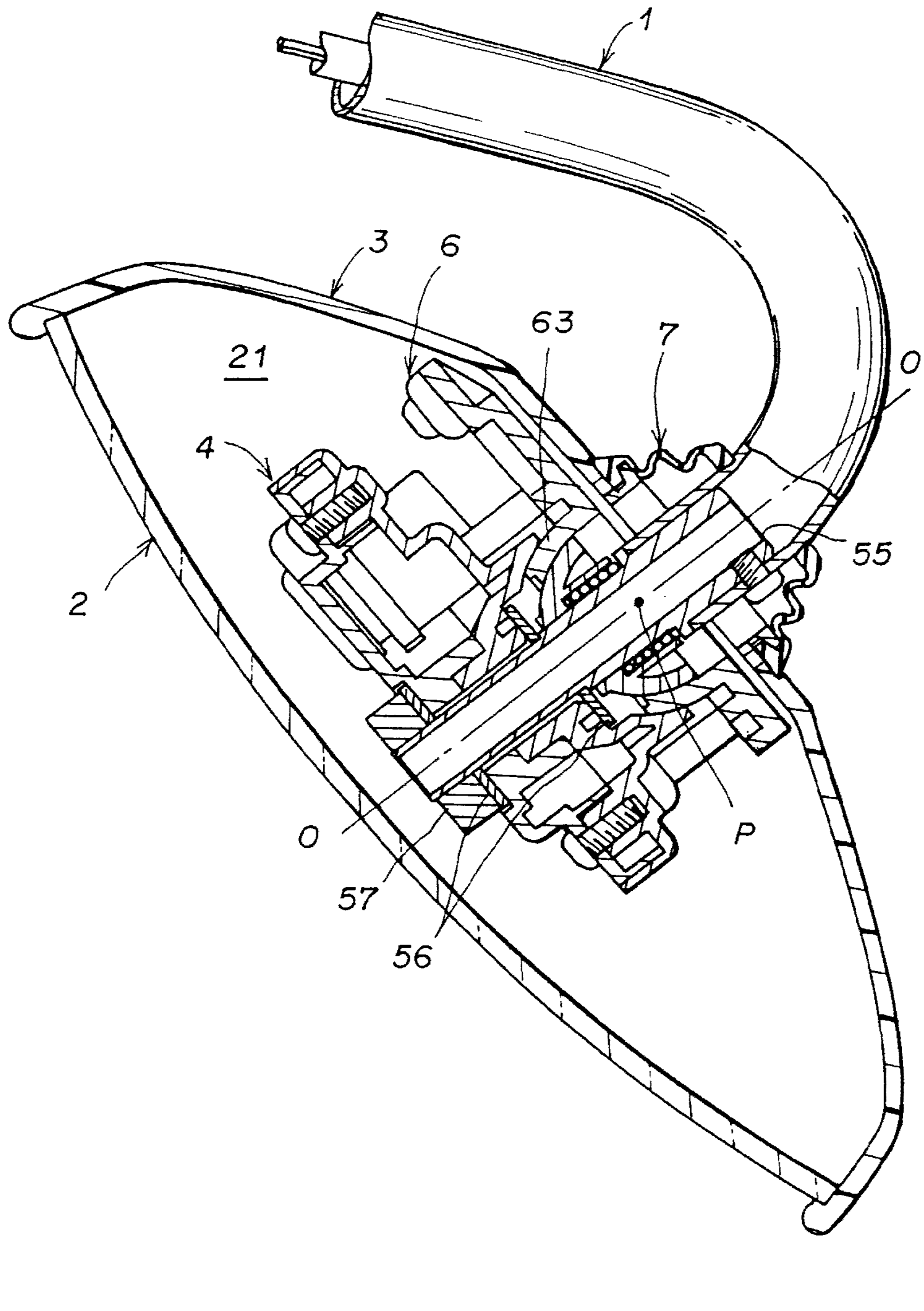


FIG.18

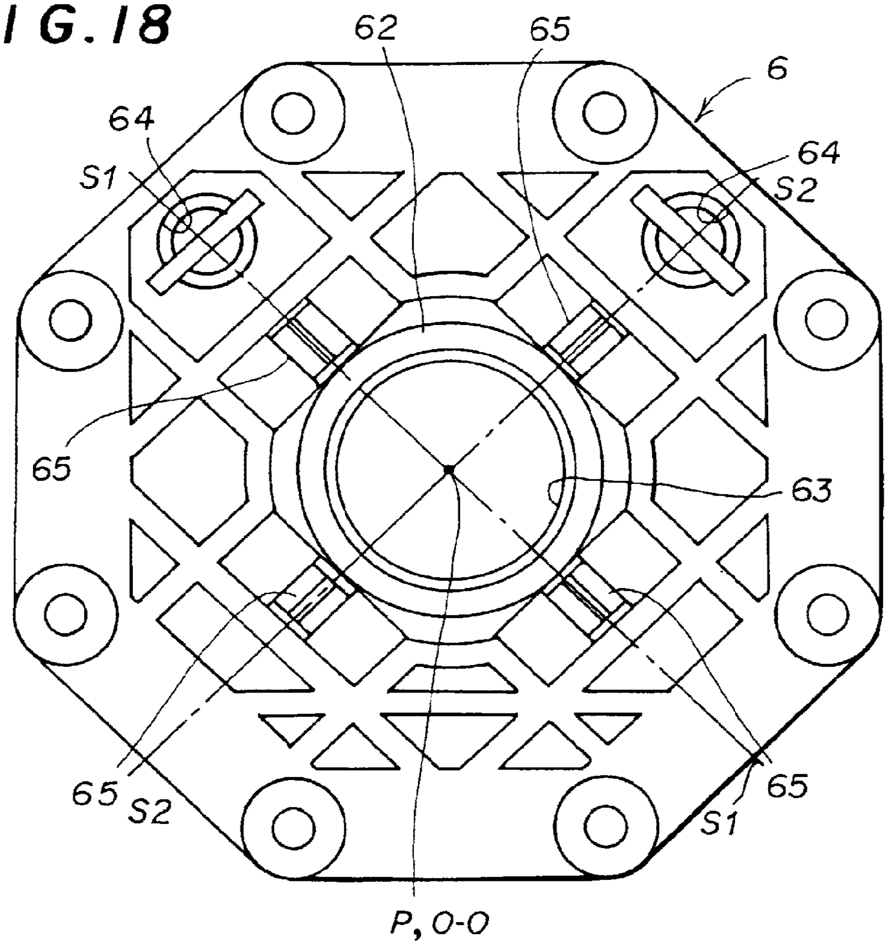


FIG.19

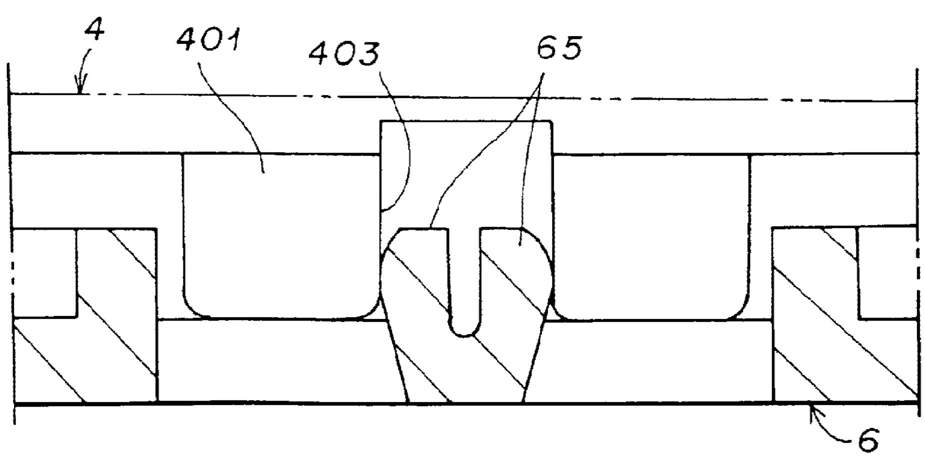


FIG. 20

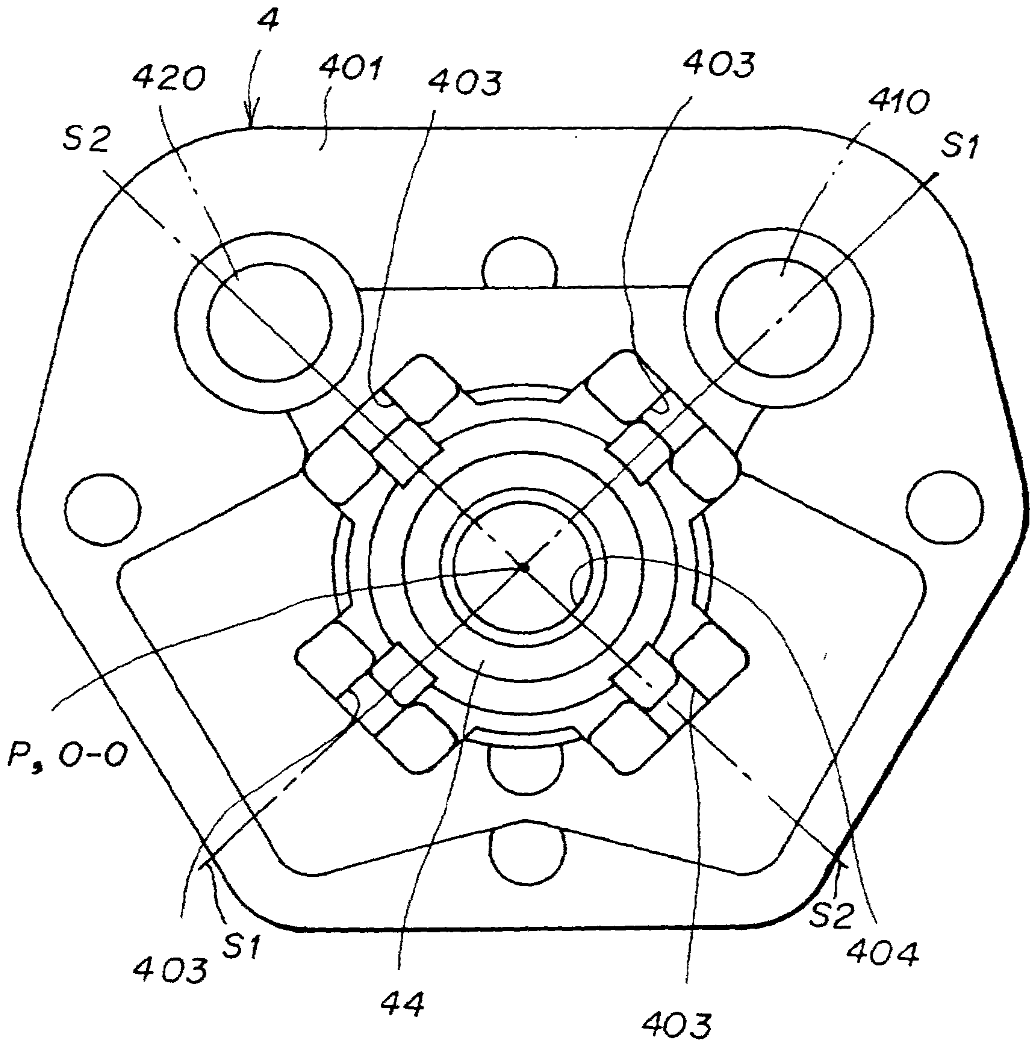


FIG. 21

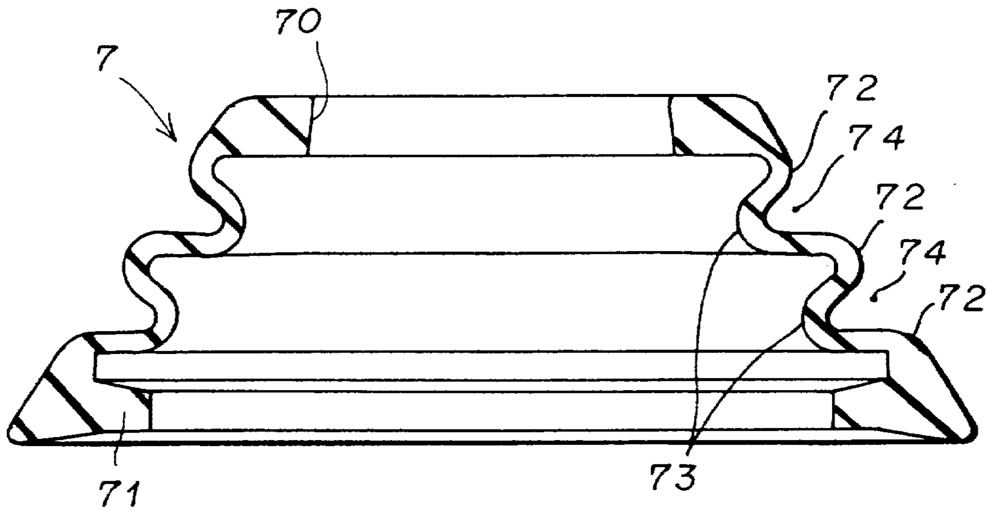


FIG. 22

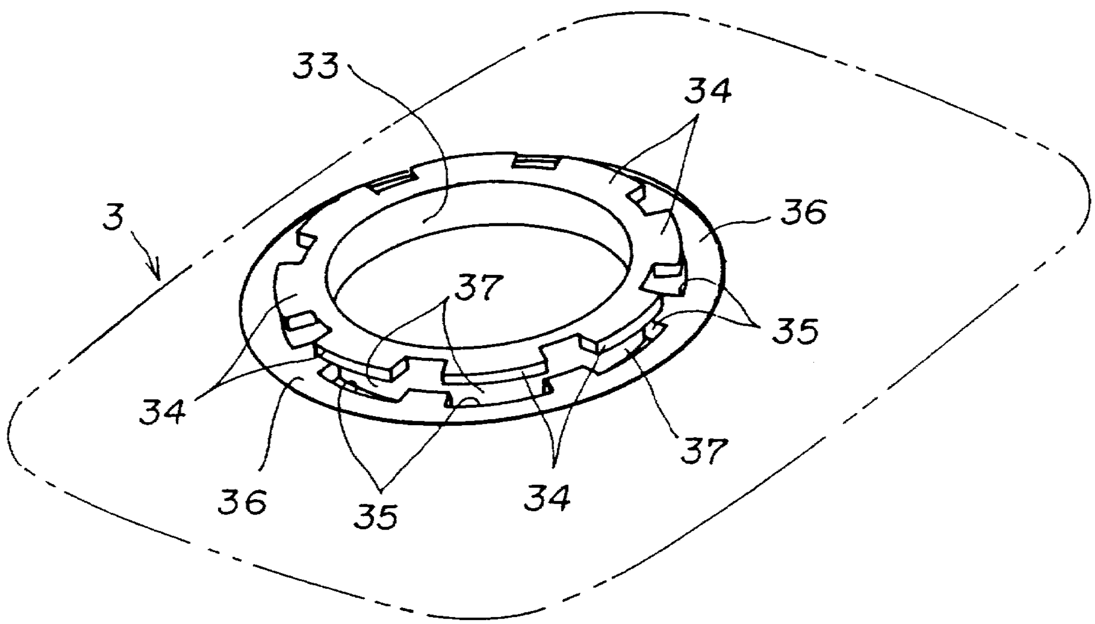


FIG. 23B

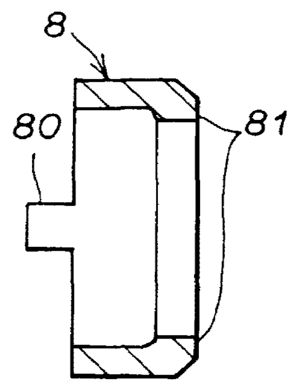


FIG. 23A

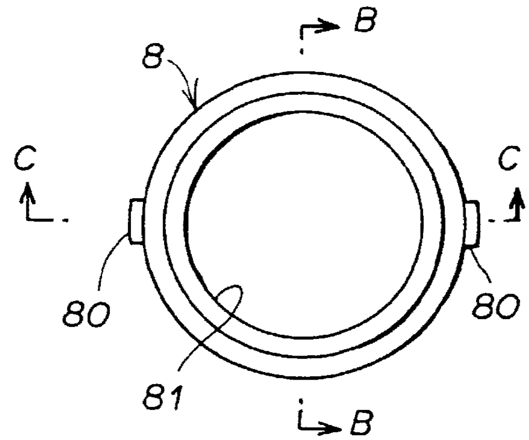


FIG. 23C

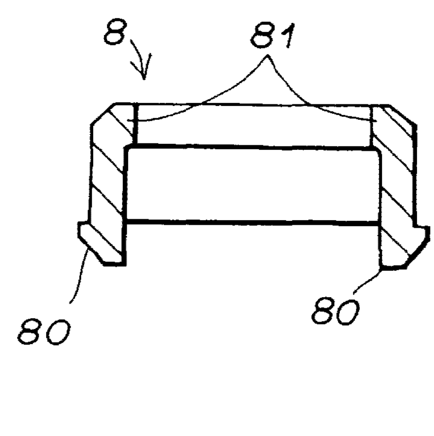


FIG. 24

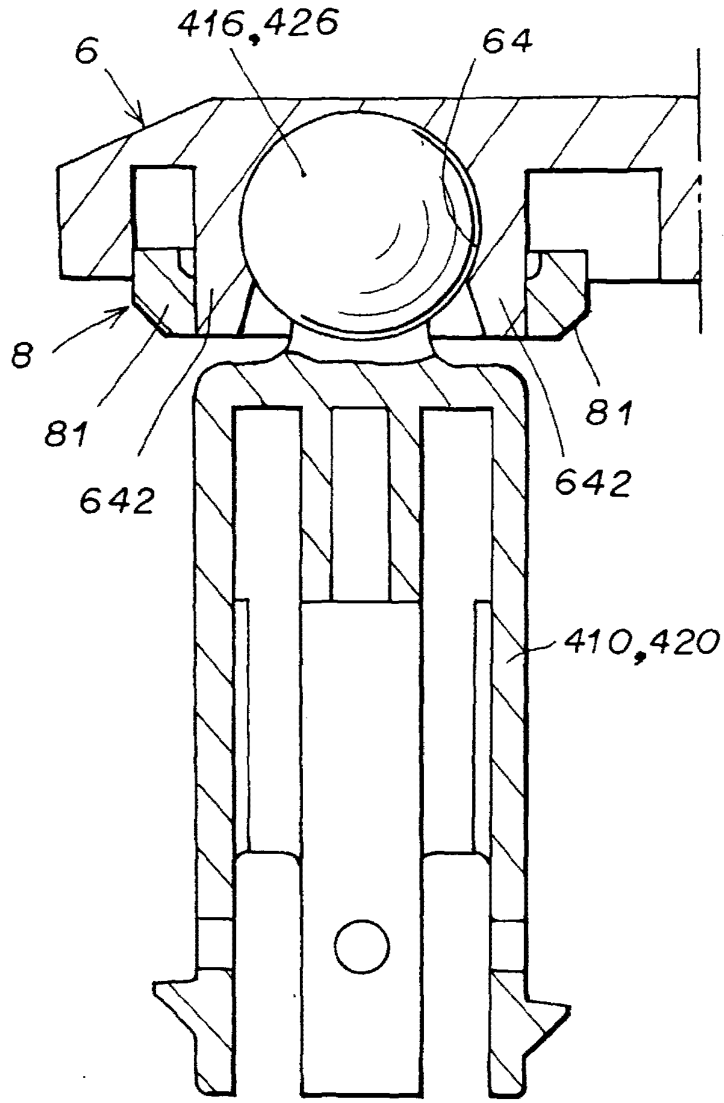
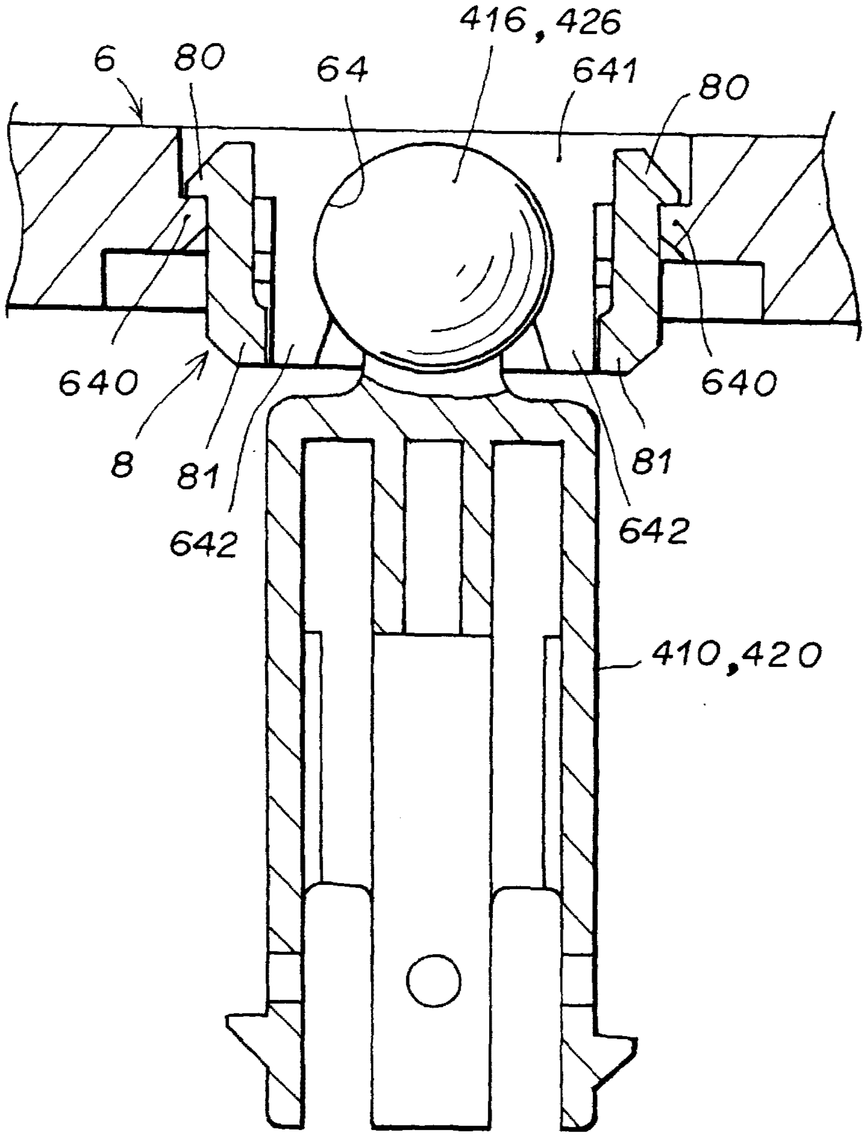


FIG. 25



(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 188 616 A2

(12) EUROPÄISCHE PATENTANMELDUNG

(43) Veröffentlichungstag: **20.03.2002 Patentblatt 2002/12**

(51) Int Cl.7: **B60R 1/06**

(21) Anmeldenummer: **01120426.0**

(22) Anmeldetag: **27.08.2001**

(84) Benannte Vertragsstaaten:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE TR
Benannte Erstreckungsstaaten:
AL LT LV MK RO SI

(30) Priorität: **01.09.2000 DE 20015092 U**

(71) Anmelder: **MEKRA Lang GmbH & Co. KG**
90765 Fürth (DE)

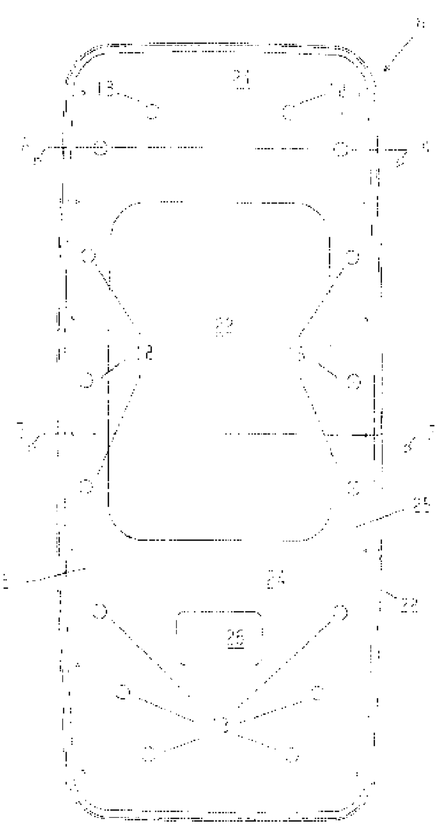
(72) Erfinder:
- **Lang, Heinrich**
91465 Ergersheim (DE)
- **Seiboth, Wolfgang**
91438 Bad Windsheim (DE)

(74) Vertreter: **Winter, Brandl, Fürniss, Hübner, Röss, Kaiser, Polte Partnerschaft**
Patent- und Rechtsanwaltskanzlei
Alois-Steinecker-Strasse 22
85354 Freising (DE)

(54) **Spiegelelement sowie Rückblickspiegel mit einem solchen Spiegelelement**

(57) Es wird ein Spiegelelement insbesondere für Außenrückblickspiegel von Kraftfahrzeugen bereitgestellt, das eine Spiegeltragplatte (6) und ein auf der Spiegeltragplatte (6) befestigte Spiegelscheibe (4) umfaßt. Dadurch, daß die Spiegeltragplatte (6) wenigstens eine freibleibende Ausnehmung (22) bzw. einen Durchbruch aufweist, kann die Spiegelscheibe (4) nicht vollflächig auf der Spiegeltragplatte (6) aufliegen und die Spiegelscheibe (4) wird dadurch hinsichtlich Vibrationen zum Teil von der Spiegeltragplatte (6) entkoppelt. Durch die Ausnehmungen (22) wird auch erreicht, daß die Spiegeltragplatte (6) leichter und folglich auch das Gesamtsystem leichter wird.

FIG. 3



EP 1 188 616 A2

Printed by Jouve, 75001 PARIS (FR)

Beschreibung

[0001] Die Erfindung betrifft ein Spiegelelement mit Spiegelscheibe und Spiegeltragplatte, insbesondere für Außenrückblickspiegel von Kraftfahrzeugen, sowie einen Rückblickspiegel mit einem solchen Spiegelelement.

[0002] Aus der EP-0 659 609 B1 ist ein Rückblickspiegel bekannt, der ein in einem Gehäuse lösbar befestigtes Spiegelelement bestehend aus Spiegelscheibe und Spiegeltragplatte umfaßt. Hierbei ist die Spiegelscheibe vollflächig auf die Spiegeltragplatte aufgeklebt.

[0003] Bei Einsatz von solchen Spiegelelementen in Außenspiegeln von Lastkraftwagen treten häufig starke Vibrationen auf, die im Extremfall zu Ablösungen der Spiegelscheibe von der Tragplatte führen könnten bzw. zu einer Beeinträchtigung der Optik durch die Vibrationen.

[0004] Es ist daher Aufgabe der vorliegenden Erfindung, ein Spiegelelement insbesondere für Außenrückblickspiegel von Nutzfahrzeugen bereitzustellen, das weniger vibrationsanfällig ist.

[0005] Die Lösung dieser Aufgabe erfolgt durch die Merkmale des Anspruchs 1 bzw. durch die Rückblickspiegel gemäß den Ansprüchen 9 und 10.

[0006] Dadurch, daß die Spiegeltragplatte wenigstens eine freibleibende Ausnehmung bzw. einen Durchbruch aufweist, kann die Spiegelscheibe nicht vollflächig auf der Spiegeltragplatte aufliegen, und die Spiegelscheibe wird daher hinsichtlich Vibrationen zum Teil von der Spiegeltragplatte entkoppelt. Durch die Ausnehmungen wird auch erreicht, daß die Spiegeltragplatte leichter und folglich auch das Gesamtsystem leichter wird.

[0007] Gemäß einer vorteilhaften Ausgestaltung der Erfindung liegt die Spiegelscheibe auf Noppen auf, so daß die Spiegelscheibe nur noch punktuell auf der Spiegeltragplatte, nämlich auf den Noppen aufliegt und folglich eine noch größere Entkoppelung stattfindet. In dem durch die Noppen definierten Abstand zwischen Spiegeltragplatte und Spiegelscheibe ist eine Klebschicht eingebracht, die die Verbindung zwischen Spiegelscheibe und Spiegeltragplatte gewährleistet. Durch die Elastizität und Plastizität der Klebschicht werden kaum Vibrationen auf die Spiegelscheibe übertragen.

[0008] Gemäß einer weiteren vorteilhaften Ausgestaltung der Erfindung sind die Ausnehmungen bzw. Durchbrüche so in die Spiegeltragplatte eingebracht, daß ein umlaufender Randbereich in der Spiegeltragplatte verbleibt, wodurch sich eine erhöhte Stabilität ergibt.

[0009] Gemäß einer weiteren vorteilhaften Ausgestaltung der Erfindung ist eine Mehrzahl von freibleibenden Ausnehmungen vorgesehen, die über die Spiegeltragplatte verteilt sind. Durch die Mehrzahl der Ausnehmungen kann die Eigenfrequenz der Spiegeltragplatte bzw. des Gesamtsystems beeinflußt werden, wodurch ebenfalls die Gesamtanfälligkeit gegen Vibrationen verringert werden kann.

[0010] Gemäß einer weiteren vorteilhaften Ausgestaltung der Erfindung umfassen die Ausnehmungen eine Fläche von 10% bis 70% und vorzugsweise von 15% bis 50% der Fläche der Spiegelscheibe. Hierdurch wird eine ausreichende Stabilität gewährleistet und dennoch der positive Effekt hinsichtlich der besseren Vibrationsverhaltens erreicht.

[0011] Gemäß einer weiteren vorteilhaften Ausgestaltung der Erfindung sind die Ausnehmungen unterschiedlich groß, wodurch ebenfalls gezielt das Vibrationsverhalten beeinflußt werden kann.

[0012] Gemäß einer weiteren vorteilhaften Ausgestaltung der Erfindung sind mittig, kreissektorförmige Ausnehmungen bzw. Durchbrüche vorgesehen. Zwischen den Ausnehmungen sind Speichen angeordnet, die zu einer zentralen Nabe zusammenlaufen. Bei der zentralen Nabe erfolgt der Anguß der Spiegeltragplatte. Diese Ausführungsform verbessert das Fließverhalten des fließfähigen Kunststoffs bei der Herstellung der Spiegeltragplatte im Spritzgußverfahren.

[0013] Bei dem Rückblickspiegel gemäß Anspruch 9 ist das Spiegelelement an dem Gehäuse befestigt, und das Gehäuse ist verstellbar an einem Halter angelagert.

[0014] Bei dem Rückblickspiegel gemäß Anspruch 10 ist das Spiegelelement an einer Halteplatte befestigt, die mit einem Verstellmechanismus verbunden ist.

[0015] Weitere Einzelheiten, Merkmale und Vorteile der Erfindung ergeben sich aus der nachfolgenden Beschreibung bevorzugter Ausführungsformen anhand der Zeichnungen.

[0016] Es zeigt:

Fig. 1 eine erste Ausführungsform eines Rückblickspiegels gemäß der Erfindung, bei der das Spiegelelement mittels Rastelementen am Gehäuserand eines Rückspiegelgehäuses befestigt ist,

Fig. 2 eine zweite Ausführungsform eines Rückblickspiegels gemäß der Erfindung, bei der das Spiegelelement mittels Rastelementen an der Innenseite der Gehäuserückwand eines Rückblickspiegels befestigt ist,

Fig. 3 eine Aufsicht auf eine Spiegeltragplatte einer ersten Ausführungsform eines Spiegelelements gemäß der Erfindung mit einer zentralen Ausnehmung,

Fig. 4 eine Schnittdarstellung durch die Ausführungsform nach Fig. 3 entlang der Linie A-A,

Fig. 5 eine Schnittdarstellung durch durch die Ausführungsform nach Fig. 3 entlang der Linie B-B,

Fig. 6 eine Aufsicht auf eine Spiegeltragplatte gemäße einer zweiten Ausführungsform der Erfindung, und

Fig. 7 eine Aufsichte auf eine Spiegeltragplatte gemäß einer dritten Ausführungsform.

[0017] Fig. 1 zeigt eine erste Ausführungsform der Erfindung, bei dem ein erfindungsgemäßes Spiegelelement 2 mit Spiegelscheibe 4 und Spiegeltragplatte 6 am Rand 8 eines Rückblickspiegelgehäuses 10 mittels Rastelementen 12 befestigt ist. Die Rastelemente 12 sind dabei einstückig im Randbereich 14 an die Spiegeltragplatte 6 angeformt. Die Spiegeltragplatte 6 weist im Randbereich 14 in Verlängerung der Rastelemente 12 noch eine umlaufende Nut 16 auf, die den Rand 8 des Spiegelgehäuses 10 übergreift. Hierdurch wird das Innere des Spiegelgehäuses 10 gegen äußere Umwelteinflüsse abgedichtet. Allerdings wird durch diese Befestigung auch eine enge Koppelung zwischen dem Spiegelgehäuse 10 und dem Spiegelelement 2 hergestellt, so dass bei Verwendung von herkömmlichen Spiegelelementen Vibrationen vom Fahrzeug über das Spiegelgehäuse 10 auf das Spiegelelement 2 übertragen werden.

[0018] An die Spiegeltragplatte 6 sind einstückig Noppen 18 angeformt, auf denen die Spiegelscheibe 4 aufliegt. In dem durch die Noppen 18 zwischen Spiegelscheibe 4 und Spiegeltragplatte 6 definierten Zwischenraum befindet sich eine Klebstoffschicht 20 mittels der die Spiegelscheibe 4 auf der Spiegeltragplatte 6 befestigt ist.

[0019] Fig. 2 zeigt eine zweite Ausführungsform der Erfindung, bei der das Spiegelelement 2 mittels den Rastelementen 12 an einer Halteeinrichtung 21 auf der Innenrückseite des Spiegelgehäuses 10 befestigt ist.

[0020] Verschiedene Varianten von Spiegelelementen 2, die in der Ausführungsformen nach Fig. 1 und 2 eingesetzt werden können werden nachfolgend anhand der Figuren 3 bis 7 beschrieben.

[0021] Die Figuren 3 bis 5 zeigen eine erste Ausführungsform eines Spiegelelements gemäß der vorliegenden Erfindung. Fig. 3 zeigt eine Aufsicht auf die Spiegeltragplatte 6. Die Spiegeltragplatte 6 weist eine zentrale, freibleibende Ausnehmung 22 auf, so dass die Spiegelscheibe 4 - in Fig. 3 nicht dargestellt - nur in den verbleibenden Kontaktbereichen 24 auf der Spiegeltragplatte 6 aufliegen kann. Die Kontaktbereiche 24 umfassen einen geschlossenen umlaufenden Randbereich 25, d.h. die Ausnehmung 22 liegt im Inneren der Spiegeltragplatte 6. In den Kontaktbereichen 24 sind die Noppen 16 angeordnet, auf denen die Spiegelscheibe 4 aufliegt. Durch eine Öffnung 26 werden elektrische Anschlüsse für eine Spiegelheizung durch die Spiegeltragplatte 6 hindurchgeführt.

[0022] Die Figuren 4 und 5 zeigen jeweils Schnittdarstellungen der ersten Ausführungsform des Spiegelelements 2 und zwar Fig. 4 entlang der Linie A-A und Fig. entlang der Linie B-B. Die Schnittdarstellungen der Figuren 4 und 5 zeigen jeweils das Spiegelelement 2, während Fig. 3 nur die Spiegeltragplatte 6 zeigt. Die Spiegeltragplatte 6 weiste an ihrer Außenkante einen umlaufenden Rand 28 auf, so dass die Spiegelscheibe 6 in einer Vertiefung in der Spiegeltragplatte 6 liegt.

[0023] Fig. 6 zeigt eine Spiegeltragplatte 6 einer zweiten Ausführungsform des Spiegelelements 2 gemäß der vorliegenden Erfindung, bei der insgesamt vier kreisförmige, freibleibende Ausnehmungen 30 wie die Eckpunkte eines Quadrats auf der Spiegeltragplatte 6 angeordnet sind. Zusätzlich ist wieder die Öffnung 26 für die elektrischen Anschlüsse vorgesehen. Der übrige Aufbau des Spiegelelements 2 entspricht den vorhergehend beschriebenen Ausführungsformen.

[0024] Fig. 7 zeigt die Spiegeltragplatte 6 einer dritten Ausführungsform der Erfindung, bei der vier kreissektorförmige Ausnehmungen 34 vorgesehen sind. Die vier kreissektorförmigen Ausnehmungen 34 sind zentral über der Öffnung 26 so angeordnet, daß sich eine in etwa kreisförmige Öffnung mit vier Sektoren ergibt, die durch kreuzförmig verlaufende Stege 36 mit einer zentralen Nabe 38 voneinander abgetrennt werden. An der Nabe 38 erfolgt bei der Herstellung der Spiegeltragplatte 6 der Anguß.

Bezugszeichenliste:

[0025]

2	Spiegelelement
4	Spiegelscheibe
6	Spiegeltragplatte
8	Rand des Spiegelgehäuses
10	Spiegelgehäuse
12	Rastelement
14	Randbereich von 8
16	umlaufende Nut
18	Noppen
20	Klebstoffschicht
21	Halteeinrichtung
22	Ausnehmung
24	Kontaktbereiche
25	geschlossener umlaufender Randbereich
26	Öffnung für elektrische Anschlüsse
28	umlaufender Rand
30	kreisförmige Ausnehmung
34	kreissektorförmige Ausnehmungen
36	Stege
38	Nabe

Patentansprüche

1. Spiegelelement, insbesondere für Außenrückblickspiegel von Kraftfahrzeugen, mit einer Spiegeltragplatte (6), die Halteelemente (12) zur Befestigung der Spiegeltragplatte (6) an einem Rückblickspiegelkörper (10) umfaßt, und mit einer auf der Spiegeltragplatte (6) befestigten Spiegelscheibe (4), **dadurch gekennzeichnet,**
   dass die Spiegeltragplatte (6) wenigstens eine frei-

bleibende Ausnehmung (22; 30; 34) aufweist und die Spiegelscheibe (4) nur in Kontaktbereichen (18; 24) auf der Spiegeltragplatte (6) aufliegt.

2. Spiegelelement nach Anspruch 1, **dadurch gekennzeichnet, dass** in den Kontaktbereichen (24) der Spiegeltragplatte (6) Noppen (18) angebracht sind, auf denen die Spiegelscheibe (4) aufliegt.

3. <Spiegelelment nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** Spiegelscheibe (4) und Spiegeltragplatte (6) mittels einer Klebstoffschicht (20) miteinander verklebt sind.

4. Spiegelelement nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Spiegeltragplatte (6) einen geschlossenen umlaufenden Randbereich (25) aufweist.

5. Spiegelelement nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** eine Mehrzahl von freibleibenden Ausnehmungen (30; 34) über die Fläche der Spiegeltragplatte (6) verteilt sind.

6. Spiegelelement nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Ausnehmungen (22; 30; 34) eine Fläche von 10% bis 70% und vorzugsweise 15% bis 50% der Fläche der Spiegelscheibe (6) überdecken.

7. Spiegelelement nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Ausnehmungen unterschiedliche Größen aufweisen.

8. Spiegelelement nach einem der vorhergehenden Ansprüche 5 bis 7, **dadurch gekennzeichnet, dass** die Ausnehmungen (34) kreissecktorförmig sind und dass zwischen den kreissektorförmigen Ausnehmungen (34) Stege (36) verbleiben, die auf eine gemeinsame Nabe (38) zulaufen.

9. Rückblickspiegel für Kraftfahrzeuge mit einem Haltearm, mit einem an dem Haltearm verstellbaren Gehäuse (10) und mit einem gegenüber dem Gehäuse (10) unverstellbaren aber auswechselbaren Spiegelelement (2) nach einem der vorhergehenden Ansprüche.

10. Rückblickspiegel für Kraftfahrzeuge mit einem Haltearm, einer in einem Gehäuse (10) angeordneten Halteplatte, an der das Gehäuse (10) gehalten ist und die mittels einer Haltevorrichtung am Haltearm befestigt ist, und mit einem an der Halteplatte lösbar befestigten Spiegelelement (2) nach einem der vorhergehenden Ansprüche 1 bis 8.

FIG. 1

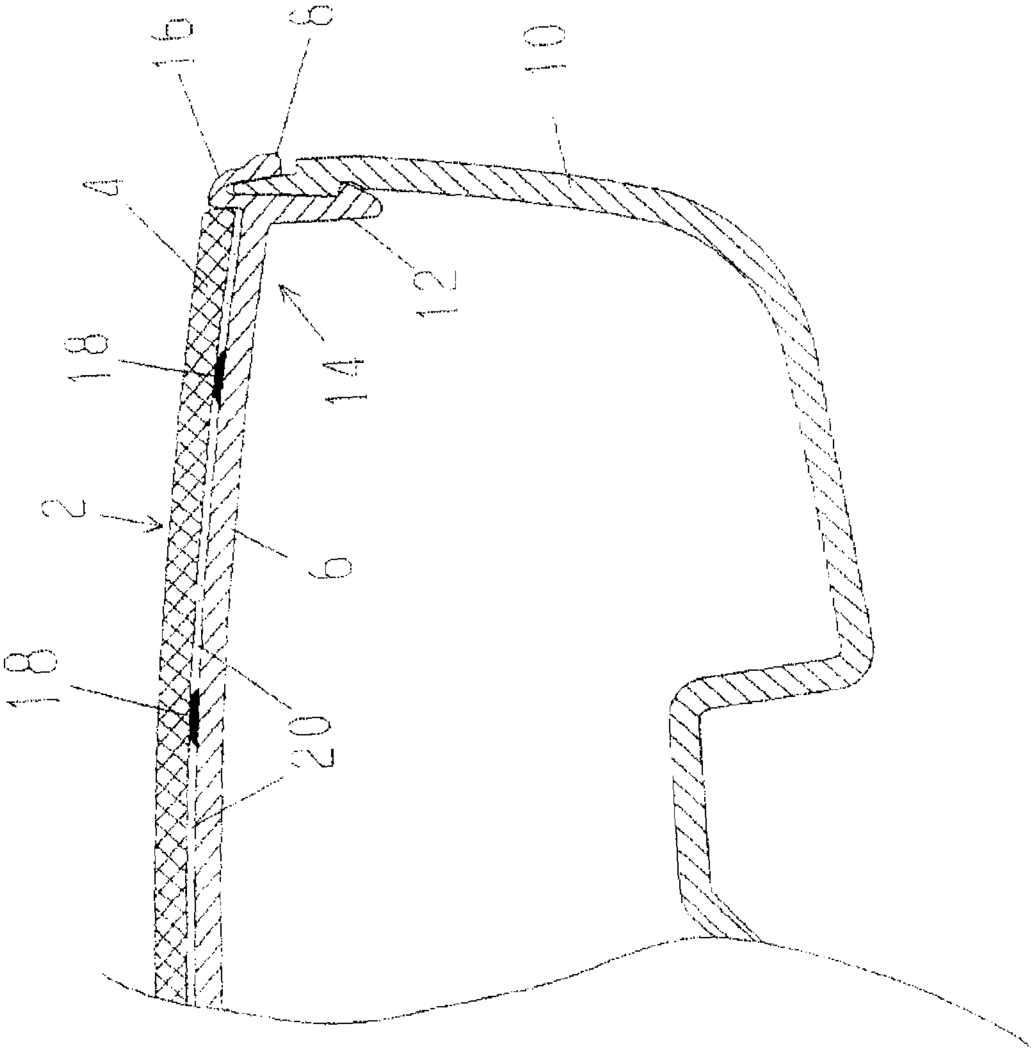


FIG. 2

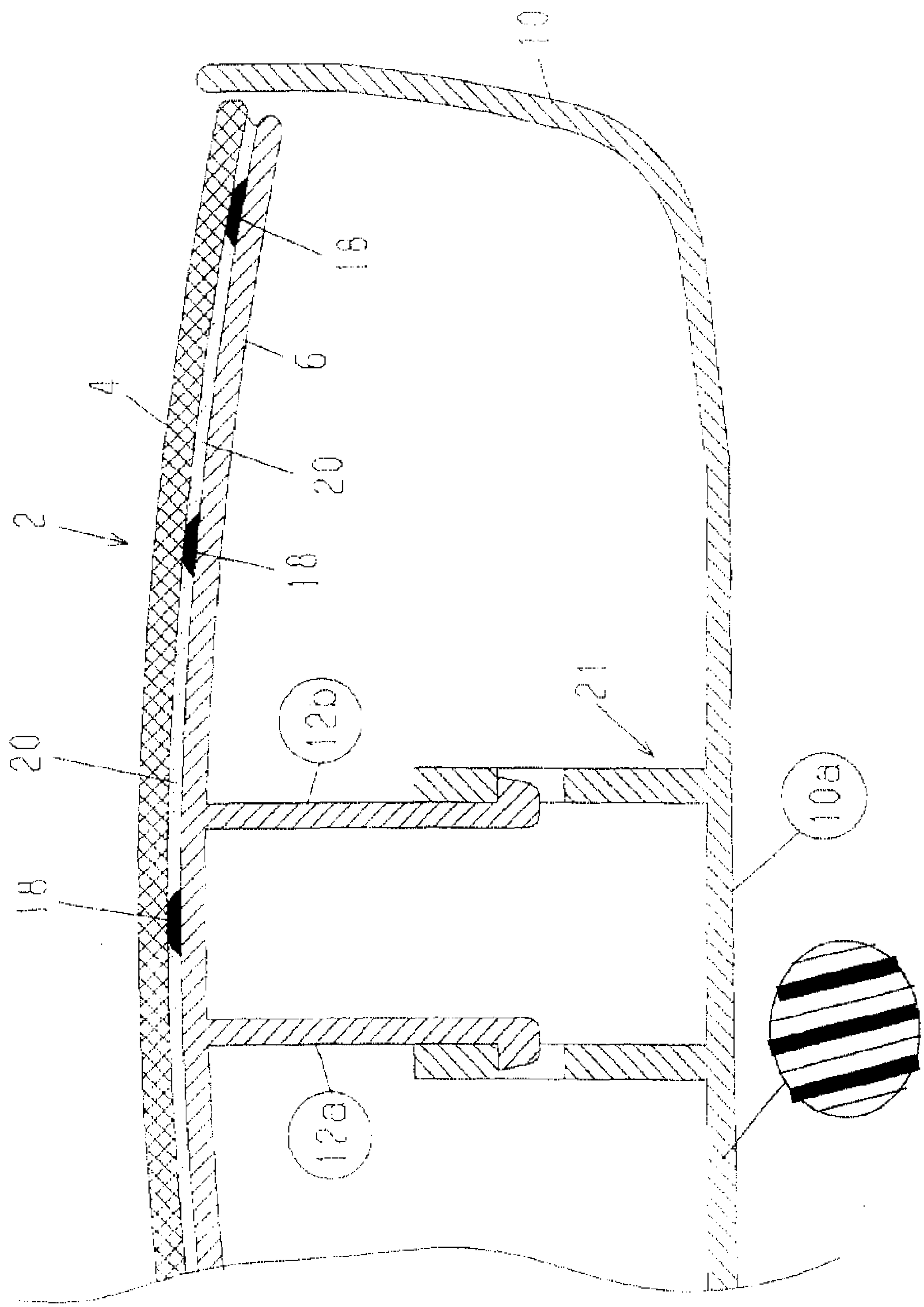


FIG. 3

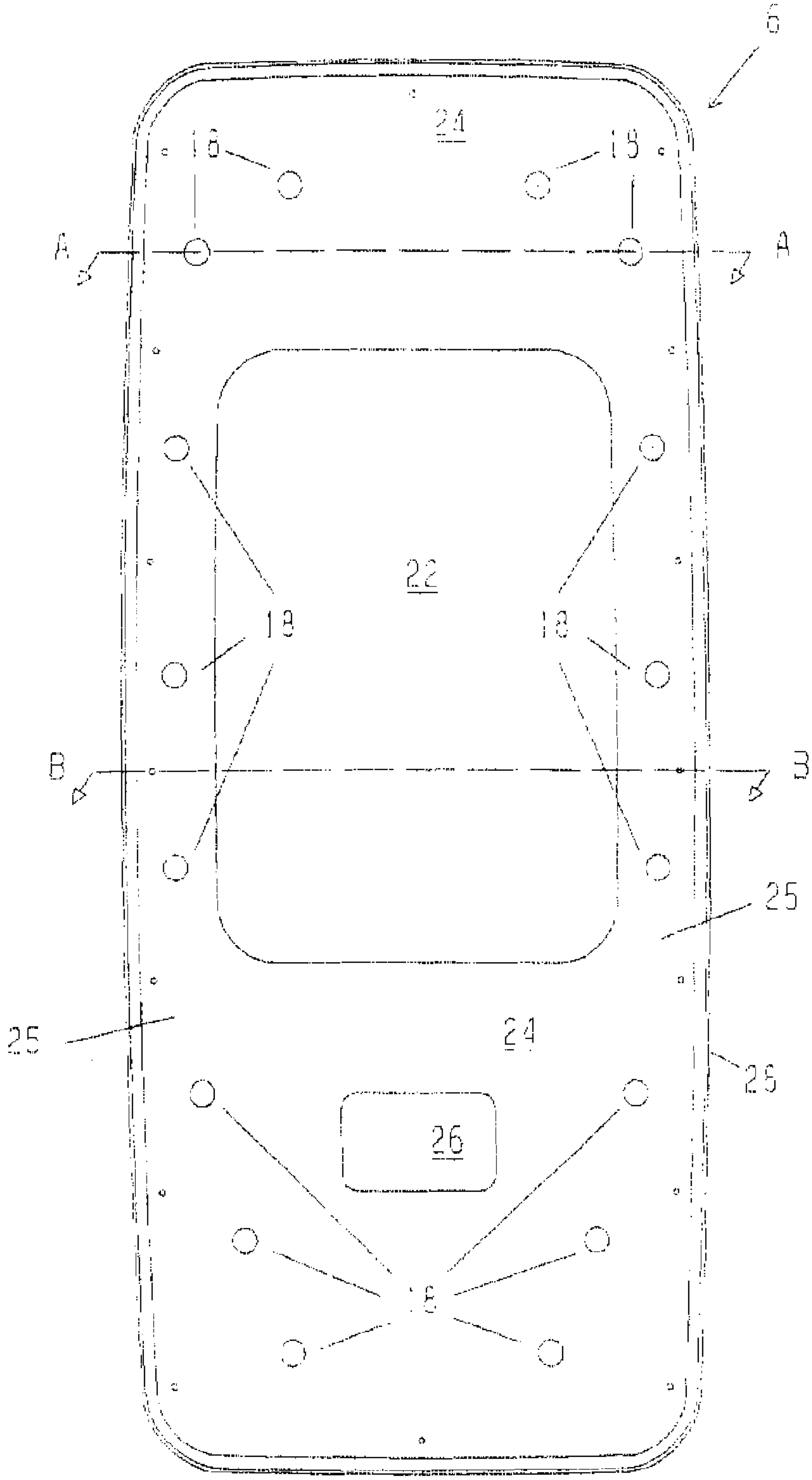


FIG. 4

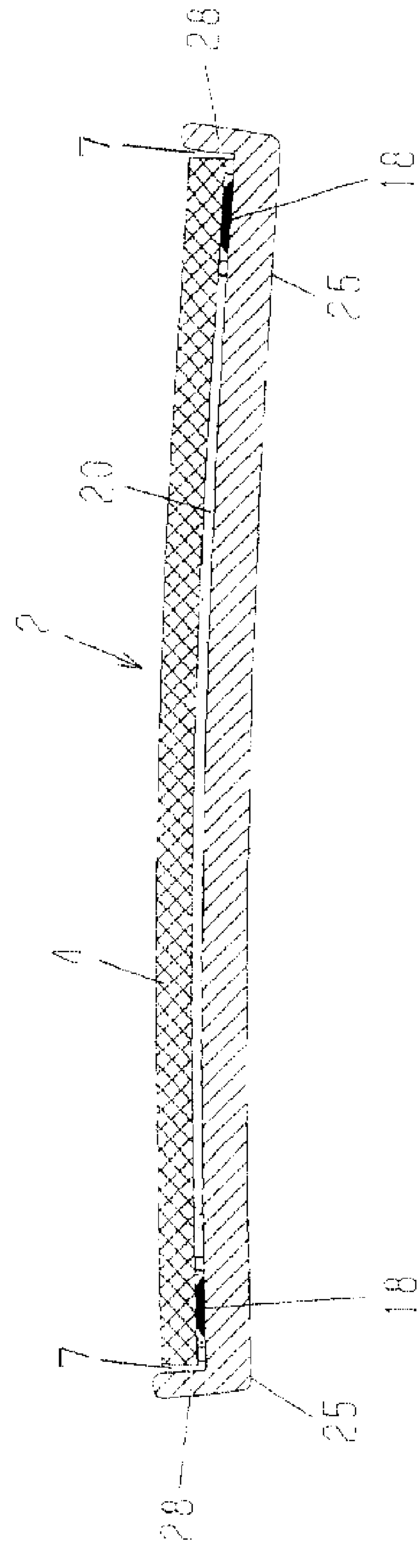


FIG. 5

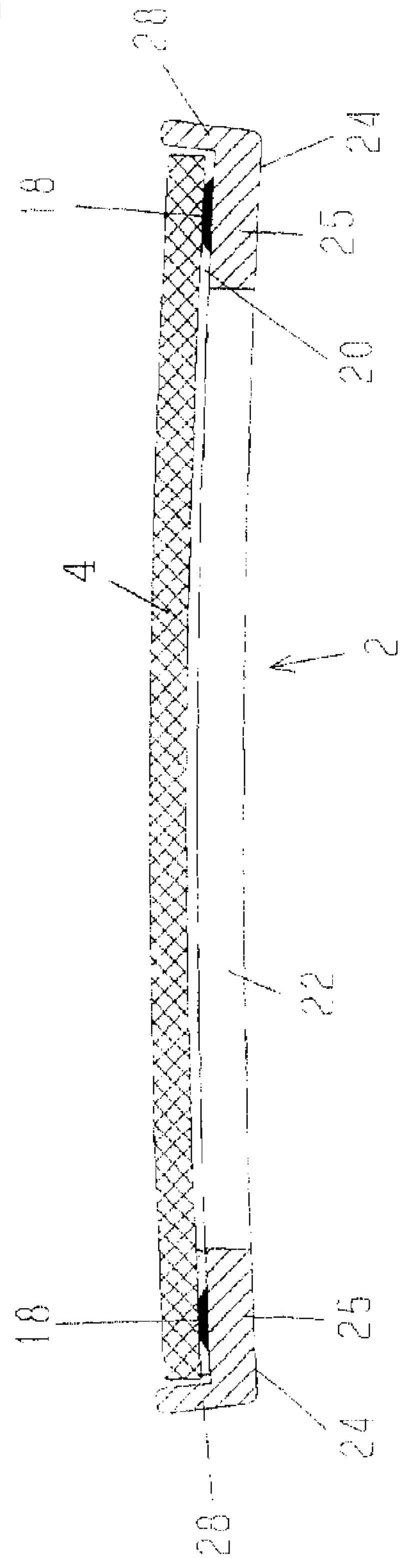


FIG. 6

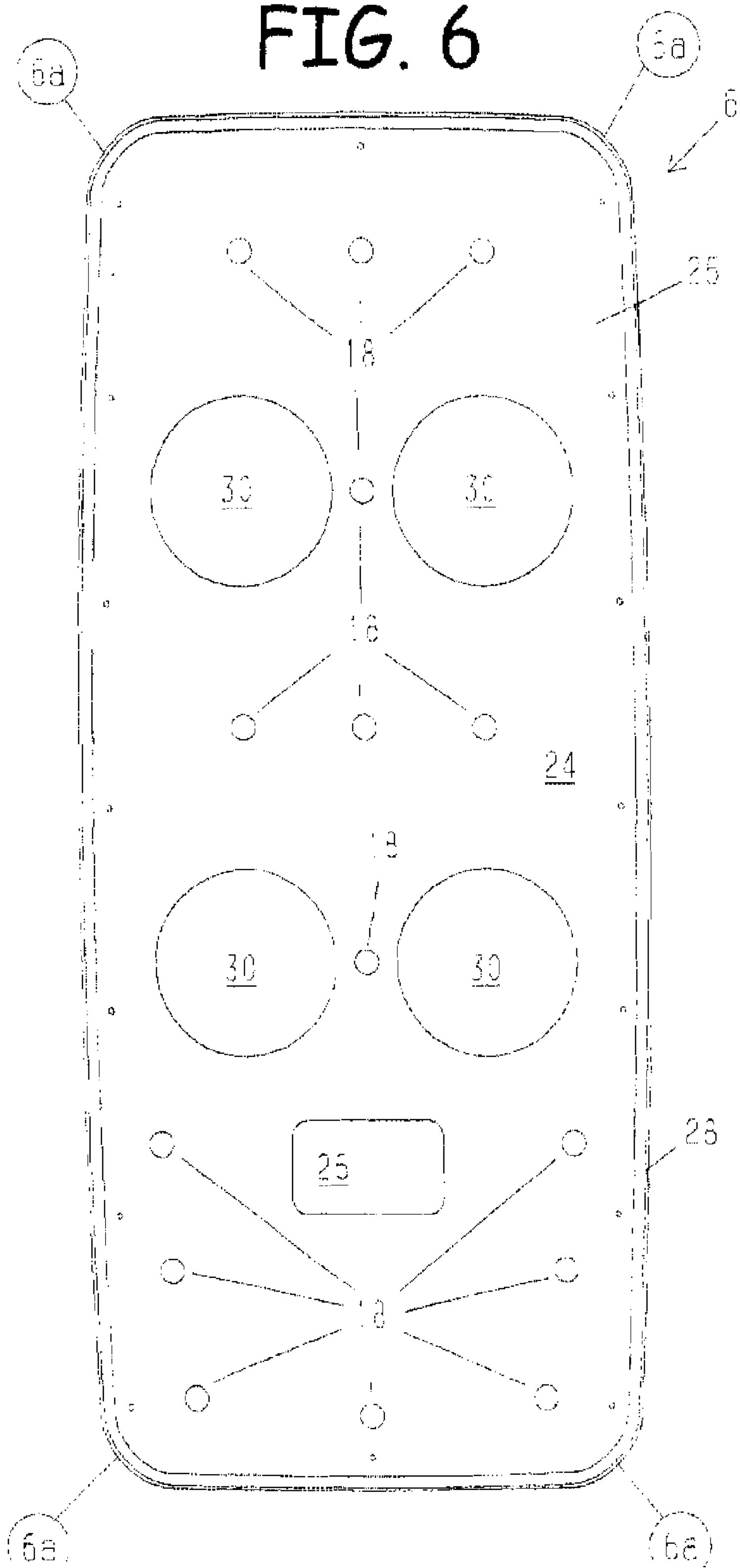
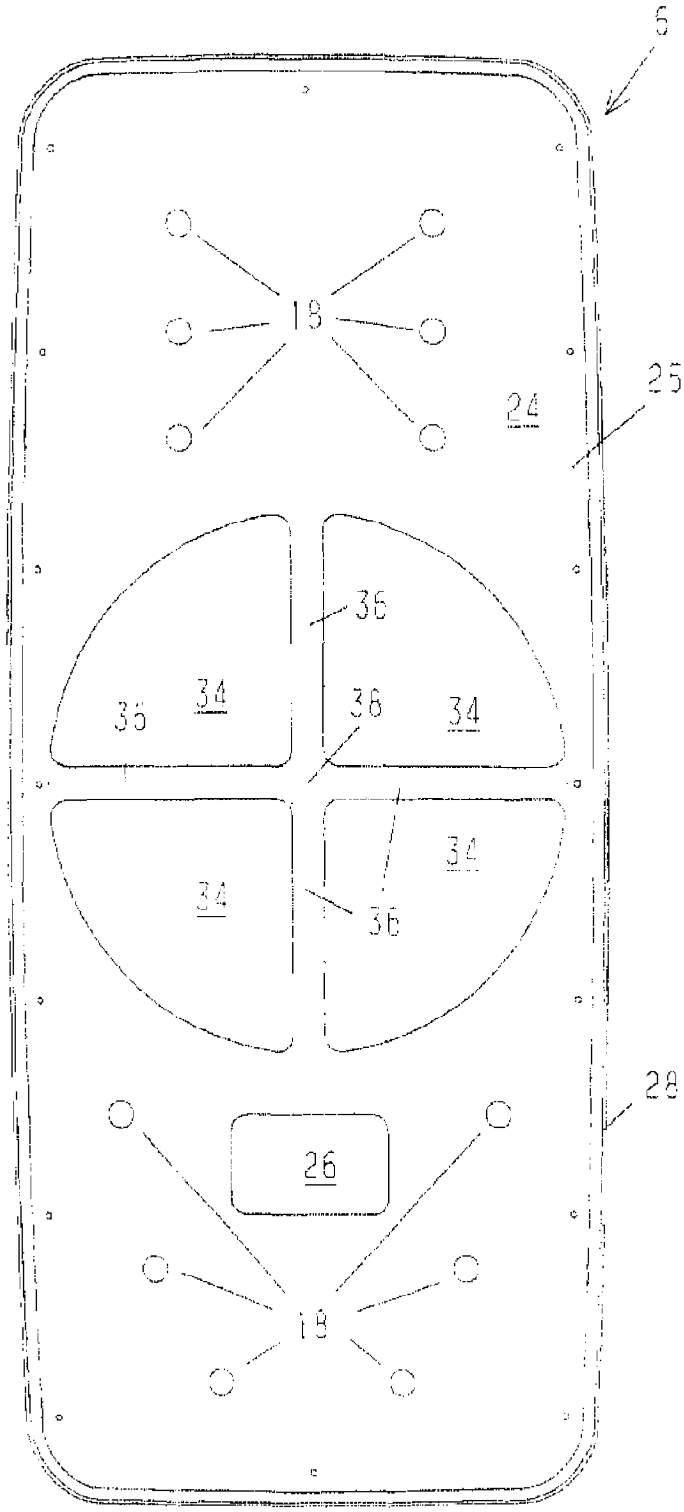


FIG. 7



Notice

ABSTRACT EP1188616

A mirror element is provided, in particular for exterior rearview mirrors of motor vehicles, which comprises a mirror support plate (6) and a mirror disk (4) fastened on the mirror support plate (6). The fact that the mirror support plate (6) has at least one remaining free recess (22) or an opening, the mirror plate (4) can not rest on the mirror support plate (6) over the entire surface and the mirror pane (4) is characterized in part Mirror support plate (6) decoupled. By the recesses (22) is also achieved that the mirror support plate (6) lighter and consequently the overall system is easier. <IMAGE>

Notice

DESCRIPTION EP1188616

[0001]
The invention relates to a mirror element with mirror plate and mirror support plate, in particular for exterior rearview mirror of motor vehicles, as well as a rearview mirror with such a mirror element.

[0002]

From EP-0 659 609 B1, a rearview mirror is known which comprises a mirror element detachably mounted in a housing, comprising a mirror disk and mirror support plate. Here, the mirror plate is glued over the entire surface of the mirror support plate.

[0003]
When using such mirror elements in the exterior mirrors of trucks often occur strong vibrations, which could lead to detachment of the mirror plate from the support plate in extreme cases, or to a deterioration of the optics by the vibrations.

[0004]
It is therefore an object of the present invention to provide a mirror element, in particular for exterior rearview mirrors of commercial vehicles, which is less prone to vibration.

[0005]

The solution of this object is achieved by the features of claim 1 and by the rearview mirror according to claims 9 and 10.

[0006]

Due to the fact that the mirror support plate has at least one remaining recess or breakthrough, the mirror plate can not rest on the mirror support plate over the entire surface, and the mirror disk is therefore partially decoupled from the mirror support plate with respect to vibrations.

By the recesses is also achieved that the mirror support plate lighter and consequently the overall system is easier.

[0007]

According to an advantageous embodiment of the invention, the mirror disk rests on nubs, so that the mirror disk rests only selectively on the mirror support plate, namely on the knobs and thus takes place an even greater decoupling.

In the distance defined by the nubs between the mirror support plate and the mirror plate, an adhesive layer is introduced, which ensures the connection between the mirror plate and mirror support plate.

Due to the elasticity and plasticity of the adhesive layer, vibrations are hardly transmitted to the mirror pane.

[0008]

According to a further advantageous embodiment of the invention, the recesses or Breakthroughs introduced into the mirror support plate so that a peripheral edge region remains in the mirror support plate, resulting in increased stability.

[0009]

According to a further advantageous embodiment of the invention, a plurality of free-lying recesses are provided, which are distributed over the mirror support plate. By the plurality of recesses, the natural frequency of the mirror support plate or the entire system can be influenced, which also the overall susceptibility to vibration can be reduced.

[0010]

According to a further advantageous embodiment of the invention, the recesses comprise an area of 10% to 70% and preferably of 15% to 50% of the surface of the mirror pane. This ensures sufficient stability and yet achieves the positive effect in terms of better vibration behavior.

[0011]
According to a further advantageous embodiment of the invention, the recesses are of different sizes, which also targeted the vibration behavior can be influenced.

[0012]

According to a further advantageous embodiment of the invention are centered, circular sector-shaped recesses or

Breakthroughs provided. Spokes are arranged between the recesses, which converge to form a central hub. At the central hub, the gate of the mirror support plate is made. This embodiment improves the flowability of the flowable plastic in the manufacture of the mirror support plate by injection molding.

[0013]
In the rearview mirror according to claim 9, the mirror element is fixed to the housing, and the housing is adjustably attached to a holder.

[0014]

In the rearview mirror according to claim 10, the mirror element is fixed to a holding plate which is connected to an adjusting mechanism.

[0015]
Further details, features and advantages of the invention will become apparent from the following description of preferred embodiments with reference to the drawings.

[0016]
1 shows a first embodiment of a rearview mirror according to the invention, in which the mirror element is fastened to the housing edge of a rearview mirror housing by means of latching elements, FIG. 2 shows a second embodiment of a rearview mirror according to the invention, in which the mirror element is fastened to the inside of the mirror by means of latching elements 3 is a plan view of a mirror support plate of a first embodiment of a mirror element according to the invention with a central recess, FIG. 4 is a sectional view through the embodiment of FIG. 3 along the line AA, Fig. 5 is a sectional view through 6 shows a plan view of a mirror support plate according to a second embodiment of the invention, and FIG. 7 is a plan view of a mirror support plate according to a third embodiment.

[0017]

Fig. 1 shows a first embodiment of the invention, in which a mirror element according to the invention 2 with mirror plate 4 and mirror support plate 6 is fixed to the edge 8 of a rearview mirror housing 10 by means of locking elements 12.

The locking elements 12 are integrally formed in the edge region 14 to the mirror support plate 6.

The mirror support plate 6 has in the edge region 14 in extension of the locking elements 12 is still a circumferential groove 16 which engages over the edge 8 of the mirror housing 10.

As a result, the interior of the mirror housing 10 is sealed against external environmental influences.

However, this attachment also produces a close coupling between the mirror housing 10 and the mirror element 2, so that vibrations are transmitted from the vehicle via the mirror housing 10 to the mirror element 2 when conventional mirror elements are used.

[0018]

On the mirror support plate 6 are integrally formed nubs 18, on which the mirror plate 4 rests. In the space defined by the nubs 18 between the mirror plate 4 and mirror support plate 6 is an adhesive layer 20 by means of which the mirror plate 4 is mounted on the mirror support plate 6.

[0019]

Fig. 2 shows a second embodiment of the invention, in which the mirror element 2 is fixed by means of the locking elements 12 to a holding device 21 on the inner rear side of the mirror housing 10.

[0020]

Various variants of mirror elements 2 which can be used in the embodiments according to FIGS. 1 and 2 are described below with reference to FIGS. 3 to 7.

[0021]

Figures 3 to 5 show a first embodiment of a mirror element according to the present invention.

3 shows a plan view of the mirror support plate 6.

The mirror support plate 6 has a central, remaining free recess 22, so that the mirror plate 4 - not shown in Fig. 3 - can rest only in the remaining contact areas 24 on the mirror support plate 6. The contact regions 24 comprise a closed peripheral edge region 25, i. the recess 22 lies in the interior of the mirror support plate. 6 In the contact areas 24, the knobs 16 are arranged, on which the mirror plate 4 rests. Through an opening 26 electrical connections for mirror heating are passed through the mirror support plate 6.

[0022]

FIGS. 4 and 5 respectively show sectional views of the first embodiment of the mirror element 2, specifically FIG. 4 along the line A-A and FIG. 1 along the line B-B. The sectional views of Figures 4 and 5 respectively show the mirror element 2, while Fig. 3 shows only the mirror support plate 6. The mirror support plate 6 has on its outer edge a peripheral edge 28, so that the mirror plate 6 is located in a recess in the mirror support plate 6.

[0023]

Fig. 6 shows a mirror support plate 6 of a second embodiment of the mirror element 2 according to the present invention, in which a total of four circular, remaining free recesses 30 as the vertices of a square on the mirror support plate 6 are arranged. In addition, the opening 26 is provided for the electrical connections again. The remaining structure of the mirror element 2 corresponds to the previously described embodiments.

[0024]

Fig. 7 shows the mirror support plate 6 of a third embodiment of the invention, in which four circular sector-shaped recesses 34 are provided. The four circular sector-shaped recesses 34 are arranged centrally above the opening 26 so that an approximately circular opening with four sectors results, which are separated by cross-shaped webs 36 with a central hub 38 from each other. At the hub 38 takes place in the production of the mirror support plate 6 of the sprue.

LIST OF REFERENCE NUMBERS

[0025]

2 : Mirror element 4: mirror plate 6: mirror support plate 8: edge of the mirror housing 10: mirror housing 12: latching element 14: edge region of 6 16: encircling groove 18: nubs 20: adhesive layer 21: holding device 22: recess 24: contact regions 25: closed circumferential edge region 26: Opening for electrical connections 28: peripheral edge 30: circular recess 34: circular sector-shaped recesses 36: webs 38: hub

Notice

CLAIMS EP1188616

1.
Mirror element, in particular for exterior rearview mirrors of motor vehicles, having a mirror support plate (6), the holding elements (12) for fixing the mirror support plate (6) on a rearview mirror body (10), and with a on the mirror support plate (6) fixed mirror glass (4), characterized in that the mirror support plate (6) has at least one remaining recess (22; 30; 34) and the mirror pane (4) rests only in contact areas (18; 24) on the mirror support plate (6).

2.
Mirror element according to claim 1, characterized in that in the contact regions (24) of the mirror support plate (6) nubs (18) are mounted, on which the mirror disc (4) rests.

3.
<Spiegelelment according to claim 1 or 2, characterized in that the mirror pane (4) and mirror support plate (6) by means of an adhesive layer (20) are glued together.

4.
Mirror element according to one of the preceding claims, characterized in that the mirror support plate (6) has a closed peripheral edge region (25).

5.
Mirror element according to one of the preceding claims, characterized in that a plurality of

remaining free recesses (30; 34) over the surface of the mirror support plate (6) are distributed.

6.
Mirror element according to one of the preceding claims, characterized in that the recesses (22; 30; 34) cover an area of 10% to 70% and preferably 15% to 50% of the surface of the mirror pane (6).

7.
Mirror element according to one of the preceding claims, characterized in that the recesses have different sizes.

8.
Mirror element according to one of the preceding claims 5 to 7, characterized in that the recesses (34) are kreissecktorförmig and that between the circular sector-shaped recesses (34) webs (36) remain running towards a common hub (38).

9.
Rearview mirror for motor vehicles with a holding arm, with an adjustable housing on the arm (10) and with respect to the housing (10) immovable but interchangeable mirror element (2) according to one of the preceding claims.

10.
Rearview mirror for motor vehicles with a holding arm, a housing (10) arranged holding plate on which the housing (10) is held and which is fixed by means of a holding device on the holding arm, and with a releasably secured to the retaining plate mirror element (2) after a of the preceding claims 1 to 8.

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 300 289 A2

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
09.04.2003 Bulletin 2003/15

(51) Int Cl.7: **B60R 1/072**, B60R 1/06

(21) Application number: **02022137.0**

(22) Date of filing: **02.10.2002**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR IE IT LI LU MC NL PT SE SK TR
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **02.10.2001 JP 2001306727**
25.04.2002 JP 2002124635

(71) Applicant: **ICHIKOH INDUSTRIES, LTD.**
Tokyo 144-0022 (JP)

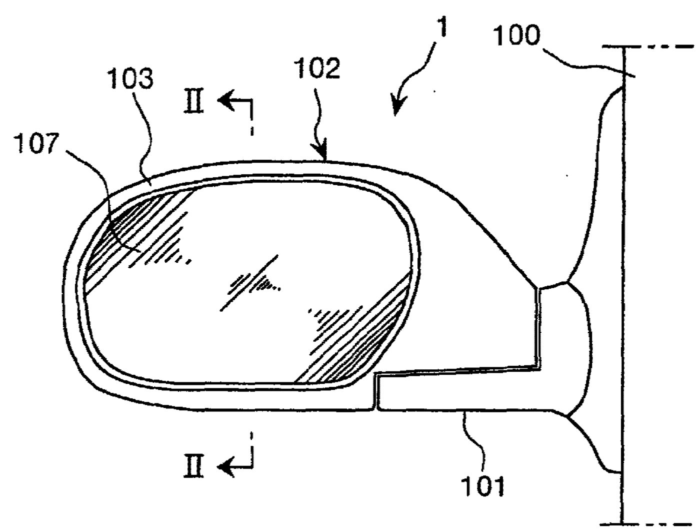
(72) Inventors:
- **Tsuyama, Osamu**
  Isehara-shi, Kanagawa-ken, 259-1192 (JP)
- **Kikuchi, Akito**
  Isehara-shi, Kanagawa-ken, 259-1192 (JP)

(74) Representative: **Grünecker, Kinkeldey,**
Stockmair & Schwanhäusser Anwaltssozietät
Maximilianstrasse 58
80538 München (DE)

(54) **Vehicle mirror device**

(57) In a vehicle mirror device a pivot portion is press-fitted to the inside hollow portion of a pivot receiver, thereby the pivot receiver wraps the pivot portion from outside. A spring member is also fitted to the outside on one end side of the pivot receiver, thereby the pivot receiver fastens the pivot portion from outside. As a result, the outer face of the pivot portion and the inner face of the hollow portion of the pivot receiver are abutted on each other securely all the time, thereby the mirror unit (1) is held always stably with respect to the holding member. As a result, the mirror face can be held reliably at a predetermined tilted position all the time.

FIG.1



EP 1 300 289 A2

Description

BACKGROUND OF THE INVENTION

1) Field of the Invention

[0001] The present invention relates to a remote control-type vehicle mirror device in which the mirror face is tilted by a remote control, or a manual type vehicle mirror device in which the mirror face is tilted manually, for example, a rear-view mirror device for automobiles.

2) Description of the Related Art

[0002] As this type of vehicle mirror devices, there are, for example, one described in publication of unexamined patent applications (Japanese Patent Application Laid-Open No. 8-104172 (see Fig. 1, Fig. 4 and Fig. 5), one described in US Patent No. 5,539, 584 (see Fig. 4 and Fig. 5), one described in US Patent No. 5,568, 326 (see Fig. 1, Fig. 2, Fig. 4, Fig. 5 and Fig. 11), and one described in US Patent No. 5,946,151 (see Fig. 4 and Fig. 5).

[0003] In this type of vehicle mirror devices, a mirror unit is generally held tiltably in the horizontal direction and the vertical direction by a power unit, being a holding member, via a pivot mechanism. The pivot mechanism comprises a spherical convex surface provided on the mirror unit side, a spherical concave surface provided on the power unit side and a spring member, which makes the spherical convex surface and the spherical concave surface abut on each other by a spring force. By driving the power unit, the mirror unit tilts in the horizontal direction about a vertical axis, which passes through the center of the spherical convex surface and the center of the spherical concave surface of the pivot mechanism, and also tilts in the vertical direction about a horizontal axis passing through the centers thereof.

[0004] In the conventional vehicle mirror device, however, the spherical convex surface and the spherical concave surface are simply made to abut on each other by a spring force. Therefore, in the conventional vehicle mirror device, if a force larger than the spring force acts on the pivot mechanism in a direction opposite to the direction of action of the spring force, the spherical convex surface and the spherical concave surface may be away from each other totally or partially. In this case, the mirror unit is held unstably with respect to the power unit, and hence it becomes difficult to hold the mirror face at a predetermined tilted position.

SUMMARY OF THE INVENTION

[0005] It is an object of the present invention to provide a vehicle mirror device, in which the mirror unit is always held stably with respect to a holding member (power unit), and the mirror face can be held always at a predetermined tilted position.

[0006] To achieve the object, according to one aspect of this invention, a pivot receiver is provided in the mirror unit or the holding member, and a pivot portion is provided in the other thereof. A hollow portion is provided inside of the pivot receiver, and an opening communicating with the hollow portion is provided at one end of this pivot receiver. The pivot portion is press-fitted tiltably to the hollow portion from the opening of the pivot receiver, and a spring member is fitted to the outside on the one end side of the pivot receiver, to thereby fasten the pivot receiver onto the pivot portion.

[0007] According to the aspect, the pivot portion is press-fitted to the inside hollow portion of the pivot receiver, thereby the pivot receiver wraps the pivot portion from outside, and the spring member is fitted to the outside on the one end side of the pivot receiver, thereby the pivot receiver fastens the pivot portion from outside. Hence, in this invention, the outer face of the pivot portion and the inner face of the hollow portion of the pivot receiver abut on each other securely all the time, thereby the mirror unit is held always stably with respect to the holding member. As a result, the mirror face can be held reliably at a predetermined tilted position all the time.

[0008] These and other objects, features and advantages of the present invention are specifically set forth in or will become apparent from the following detailed descriptions of the invention when read in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWING

[0009]

Fig. 1 is an elevational view in a used state which shows an embodiment of a vehicle mirror device according to the present invention;
Fig. 2 is a sectional view along the line II-II in Fig. 1;
Fig. 3 is an exploded perspective view of a mirror holder base, a power unit and a pivot mechanism, which shows the main part;
Fig. 4 is a sectional view of the mirror holder base, a power unit and the pivot mechanism, which shows a state where an advancing or retreating rod for driving in the horizontal direction is located at a medium position;
Fig. 5 is a sectional view of the mirror holder base, the power unit and the pivot mechanism, which shows a state where the advancing or retreating rod for driving in the horizontal direction is located at the most advanced position;
Fig. 6 is a sectional view of the mirror holder base, the power unit and the pivot mechanism, which shows a state where the advancing or retreating rod for driving in the horizontal direction is located at the most retreated position;
Fig. 7 is a sectional view which shows a state before the pivot portion is press-fitted to the pivot receiver;

Fig. 8 is a sectional view which shows a state where the pivot portion is press-fitted to the pivot receiver;
Fig. 9A is a partial plan view which shows a state before a spring member is temporarily held by a temporary holder of the pivot receiver;
Fig. 9B is a sectional view along the line B-B in Fig. 9A;
Fig. 9C is a sectional view along the line C-C in Fig. 9A;
Fig. 10A is a partial plan view which shows a state where the spring member is temporarily held by the temporary holder of the pivot receiver;
Fig. 10B is a sectional view along the line B-B in Fig. 10A;
Fig. 10C is a sectional view along the line C-C in Fig. 10A;
Fig. 11A is a partial plan view which shows a state where the spring member is fitted to a fitting section of the pivot receiver;
Fig. 11B is a sectional view along the line B-B in Fig. 11A; and
Fig. 11C is a sectional view along the line C-C in Fig. 11A.

DETAILED DESCRIPTIONS

[0010] One embodiment of the vehicle mirror device according to this invention will be explained, with reference to the accompanying drawings. The vehicle mirror device in this embodiment is a rear-view mirror device for automobiles, which shows an example where it is used for a remote-control type vehicle mirror device, however, this invention is by no means limited by this embodiment. In Fig. 3 to Fig. 6, reference numeral "F" denotes a traveling direction of a vehicle, and shows the front as seen from a driver side. Reference numeral "B" denotes a direction opposite to the traveling direction of the vehicle, and shows the rear side as seen from the driver side. Reference numeral "U" denotes the upper side as seen from the driver side. Reference numeral "D" denotes the lower side as seen from the driver side. Reference numeral "L" denotes the left side when a driver looks forward. Reference numeral "R" denotes the right side when the driver looks forward.

[0011] The construction of the vehicle mirror device according to this embodiment will be explained.

[0012] In these figures, reference numeral 1 denotes a vehicle mirror device according to this embodiment, a so-called door mirror device. This door mirror device 1 comprises a base 101 fixed to a door 100 of a vehicle, and a mirror assembly 102 equipped tiltably to the base 101, substantially about the vertical axis thereof. The door mirror device 1 in this embodiment is a left door mirror device equipped on the left side door 100 of a vehicle, and the construction of a right side door mirror device is substantially symmetric to the configuration of the left side door mirror device.

[0013] As shown in Fig. 2, the mirror assembly 102 comprises a mirror housing 103, a unit bracket 105 fitted to the mirror housing 103 by a screw 104 or the like, a power unit 3 as a holding member fitted to the unit bracket 105 by a screw 106 or the like, and a mirror unit 2 tiltably fitted to the power unit 3 by a pivot mechanism (a so-called center pivot) 5.

[0014] Thus, the door mirror device 1 in this embodiment is constructed such that the mirror unit 2 is tiltably held by the power unit 3 as the holding member, via the pivot mechanism 5.

[0015] The mirror unit 2 comprises, as shown in Fig. 2, a mirror body 107 having a mirror face (reflecting surface), a mirror holder 108 which holds the mirror body 107, and a mirror holder base 21 attached to the central portion of the mirror holder 108. In this example, the mirror holder 108 and the mirror holder base 21 are respectively a separate structure, and the mirror holder base 21 is attached to the central portion of the mirror holder 108, to thereby form an integral structure. In this invention, however, the mirror holder 108 and the mirror holder base 21 may be formed as an integral structure.

[0016] The mirror holder base 21 is, as shown in Fig. 2 to Fig. 6, respectively provided with horizontal pivot receivers 23 and 25, vertical pivot receiver 24, a pivot receiver 22 of the pivot mechanism 5, and left and right guiding shafts 26b. The pivot receiver 22 is provided substantially at the center of the mirror holder base 21. The horizontal pivot receivers 23 and 25 are provided at the left and right opposite ends of the mirror holder base 21, putting the pivot receiver 22 therebetween. The vertical pivot receiver 24 is provided at the lower end of the mirror holder base 21. The left and right guiding shafts 26b are provided at the left and right opposite ends of the mirror holder base 21, putting the pivot receiver 22 therebetween. The left and right guiding shafts 26b are spanned horizontally in openings 26 provided between the pivot receiver 22 and the horizontal pivot receivers 23 and 25. The mirror holder base 21 in this example can be shared by the left and right door mirror devices. In other words, the horizontal pivot receiver 23 provided on the left side of the pivot receiver 22 is formed so as to be combined with the power unit 3 in the left door mirror device 1. The horizontal pivot receiver 25 provided on the right side of the pivot receiver 22 is formed so as to be combined with the power unit in the right door mirror device.

[0017] The power unit 3 comprises, as shown in Fig. 2 to Fig. 6, a casing 31 constituted by combining a pair of split cases 31a and 31b, a drive motor (not shown) for tilting horizontally and a drive motor (not shown) for tilting vertically, respectively built in the casing 31, an advancing or retreating rod 34 for tilting horizontally, which advances or retreats from the casing 31 by the drive motor for tilting horizontally, and an advancing or retreating rod 35 for tilting vertically, which advances or retreats from the casing 31 by the drive motor for tilting vertically. Substantially spherical pivots 34b and 35b are formed at the end of the advancing or retreating rods 34 and 35. The drive motor is electrically connected to a power source (not shown) and a remote control switch (not shown), via a connector (not shown) and a harness (not shown).

[0018] A pivot portion 37 in the pivot mechanism 5 and left and right guiding sections 38 having a U-shape groove, respectively, are provided in the casing 31 (split case 31a). The pivot portion 37 is provided corresponding to the pivot receiver 22, substantially at the center of the casing 31 (a place slightly to the right upward from the center). The left and right guiding sections 38 are provided corresponding to the guiding shafts 26b and the openings 26 at the left and right opposite ends of the casing 31, putting the pivot portion 37 therebetween. The advancing or retreating rod 34 for tilting horizontally is provided corresponding to the horizontal pivot receiver 23, on the outer side of the guiding section 38 at the left end of the casing 31. The advancing or retreating rod 35 for tilting vertically is provided corresponding to the vertical pivot receiver 24 at the lower end of the casing 31.

[0019] The pivot mechanism 5 comprises the pivot receiver 22, the pivot portion 37 and a spring member 4.

[0020] The pivot portion 37 is press-fitted to the pivot receiver 22, and the spring member 4 is fitted to the pivot receiver 22 from outside. The pivots 34b and 35b of the advancing or retreating rods 34 and 35 are respectively press-fitted to the pivot receivers 23 and 24. The guiding sections 38 are fitted to the guiding shafts 26b. Thereby, the mirror holder base 21, that is, the mirror unit 2 is held by the power unit 3 as the holding member via the pivot mechanism 5, so as to be able to tilt horizontally and vertically.

[0021] The one end of the pivot portion 37 in the pivot mechanism 5 is formed, as shown in Fig. 3, Fig. 7 and Fig. 8, so as to protrude integrally substantially at the center of the casing 31 (split case 31a) of the power unit 3, via a shank 36. The external form of this pivot portion 37 is substantially spherical. A chamfered portion 37b is provided at the other end of the pivot portion 37, in a direction substantially orthogonal to the axial direction of the shank 36. By this chamfered portion 37b, the external shape of the pivot portion 37 becomes spherical, with the other end notched by about one fourth. A substantially spherical small protrusion 37c is integrally formed at the center of the chamfered portion 37b. The inside of the pivot portion 37 is formed hollow. Inside of the hollow pivot portion 37 are formed a plurality of, in this example, seven ribs 37d integrally and radially from the center.

[0022] The pivot receiver 22 in the pivot mechanism 5 is, as shown in Fig. 7 to Fig. 11, integrally provided substantially at the center of the mirror holder base in the mirror unit 2. A hollow portion 22i is provided inside the pivot receiver 22. On the inner side of the hollow portion 22i of the pivot receiver 22 is provided a spherical inner face 22a, which resiliently abuts on the spherical outer face of the pivot portion 37 slidably. An opening 22j, which communicates with the hollow portion 22i, is provided at one end 22c of the pivot receiver 22. A neck portion 22f having an inner diameter (diameter) smaller than the largest outer diameter (diameter) of the pivot portion 37 is provided on the inner side of the opening 22j. As a result, the pivot portion 37 is press-fitted to the hollow portion 22i from the opening 22j.

[0023] The one end 22c of the pivot receiver is continuous from the mirror holder base 21. A fitting section 22k, to which the spring member 4 is fitted, is provided outside of the one end 22c of the pivot receiver 22. In this example, four slits 22d are provided, with substantially equal interval, at the one end 22c of the pivot receiver 22. In this example, four engaging protrusions 22g for preventing the spring member 4 from coming off are provided, with substantially equal interval, on the other end side than the fitting section 22k outside of the one end 22c of the pivot receiver 22. The four slits 22d and the four engaging protrusions 22g are provided corresponding to each other, and the four slits 22d are also used as holes for pulling out a mold for forming the four engaging protrusions 22g. On the inner side of the opening 22j of the pivot receiver 22 is formed a press-fit guiding face 22e which guides press-fit of the pivot portion 37, gradually enlarged towards the edge of the opening 22j from the neck portion 22f.

[0024] At the other end of the pivot receiver 22 is provided a flat portion 22b always with a space S between the chamfered portion 37b of the pivot portion 37 and itself, on which the small protrusion 37c of the pivot portion 37 abuts all the time. A temporary holder 22h for the spring member 4 is provided at the other end of the pivot receiver 22. This temporary holder 22h has a shelf shape (stepped shape), with the draft (pull-out angle) of the mold being substantially 0 degree. That is, the side of the temporary holder 22h is formed substantially vertical.

[0025] The spring member 4 of the pivot mechanism 5 is made of a metal, and formed of a ring-shaped wire rod having free ends 4c, which can be enlarged and deformed, designating a closed end 4b as a fulcrum. The inner diameter of the spring member 4 in a normal state shown in Fig. 3 is slightly smaller than the outer diameter of the temporary holder 22h of the pivot receiver 22, and smaller than the outer diameter of the fitting section 22k of the pivot receiver 22. The spring member 4 is temporarily held by the temporary holder 22h and pressed into the one end 22c of the pivot receiver 22 from the temporary holder 22h, to be fitted to the outside of the fitting section 22k, so that the pivot receiver 22 is fastened onto the pivot portion 37. The spring member 4 prevents the pivot receiver 22 from coming out from the pivot portion 37, and keeps the sliding torque between the pivot portion 37 and the pivot receiver 22 constant.

[0026] The vehicle mirror device in this embodiment has such a configuration, and the assembly method thereof will be explained below. In Fig. 9 to Fig. 11, drawing of the power unit 3 side is omitted.

[0027] The power unit 3 and the mirror holder base 21 are positioned at a predetermined assembly position, and as shown by the arrow of one-dot chain line in Fig. 3 and by the arrow of solid line in Fig. 7, the mirror holder base 21 is pressed to the power unit 3 and assembled by a jig (not shown). That is, the pivot portion 37 is press-fitted to the pivot receiver 22. The pivots 34b and 35b of the advancing or retreating rods 34 and 35 are also press-fitted to the pivot receivers 23 and 24. The guiding sections 38 are also fitted to the guide shafts 26b. By fitting of the guide shafts 26b and the guiding sections 38, the mirror unit 2 is prevented from rotating about the axis of the shank 36 with respect to the power unit 3.

[0028] As shown by the arrow of one-dot chain line in Fig. 3 and by the arrow of solid line in Fig. 9B and Fig. 9C, the spring member 4 is fitted into the temporary holder 22h of the pivot receiver 22 from outside by manually or by a jig (not shown), so as to be held temporarily. At this time, since the inner diameter of the spring member 4 is slightly smaller than the outer diameter of the temporary holder 22h, a slight spring force acts thereon in the state of being opened slightly, and as a result, the spring member 4 is temporarily held by the temporary holder 22h at a predetermined position, reliably in a predetermined posture.

[0029] As shown by the arrow of solid line in Fig. 10B and Fig. 10C, the spring member 4 is press-fitted to the one end 22c of the pivot receiver 22 from the temporary holder 22h, which holds the spring member 4 temporarily, by a press-fit jig (not shown) . As shown in Fig. 11A, Fig. 11B and Fig. 11C, the spring member 4 is fitted to the outside of the fitting section 22k, getting over the engaging protrusion 22g in the middle of the pivot receiver 22. At this time, since the inner diameter of the spring member 4 is smaller than the outer diameter of the fitting section 22k, the spring force of the spring member 4 acts on the fitting section 22k, and as a result, the pivot receiver 22 is reliably fastened on the pivot portion 37.

[0030] After the mirror holder base 21 has been assembled to the power unit 3, the mirror holder 108 holding the mirror body 107 is assembled to the mirror holder base 21. When the mirror holder 108 and the mirror holder base 21 are formed as an integral structure, after the integral structure is assembled to the power unit 3, the mirror body 107 is assembled to the integral structure.

[0031] In this manner, assembly of the power unit 3 and the mirror holder base 21 is performed in one direction, as shown by the arrow of one-dot chain line in Fig. 3, by the arrow of solid line in Fig. 7, by the arrow of solid line in Fig. 9B and Fig. 9C, and by arrow of solid line in Fig. 10B and Fig. 10C, and hence the assembling operation is easy and automization is also possible.

[0032] The vehicle mirror device in this embodiment has such a configuration, and the action thereof will be explained below.

[0033] By the operation of the remote control switch from a driver's seat in a vehicle, power is fed to the motor for horizontal tilting. The motor for horizontal tilting is driven, thereby the advancing or retreating rod 34 for horizontal tilting advances or retreats. Accompanying this, the mirror unit 2 tilts horizontally about the vertical axis (an axis connecting the center of the pivot mechanism 5 and the centers of the vertical pivot receiver 24 and the pivot 35b), which passes through the center of the pivot mechanism 5, with respect to the power unit 3, via the mirror holder base 21 (see Fig. 4 to Fig. 6). The motor for vertical tilting is also fed with power. The motor for vertical tilting is then driven, thereby the advancing or retreating rod 35 for vertical tilting advances or retreats. Accompanying this, the mirror unit 2 tilts vertically about the horizontal axis (an axis connecting the center of the pivot mechanism 5 and the center of the horizontal pivot receiver 23 and the pivot 34b), which passes through the center of the pivot mechanism 5, with respect to the power unit 3, via the mirror holder base 21.

[0034] Since the vehicle mirror device in this embodiment has such a configuration, the following effects can be obtained.

[0035] That is to say, in the vehicle mirror device in this embodiment, the pivot portion 37 is press-fitted to the hollow portion 22i of the pivot receiver 22, thereby the pivot receiver 22 wraps the pivot portion 37 from outside. Further, the spring member 4 is fitted to the outside of the fitting section 22k of the pivot receiver 22, thereby the pivot receiver 22 fastens the pivot portion 37 from outside. Therefore, in the vehicle mirror device in this embodiment, the spherical outer face of the pivot portion 37 resiliently abuts on the spherical inner face of the hollow portion 22i of the pivot receiver 22, reliably and tiltably at all times, and hence the mirror unit 2 is held with respect to the power unit 3 as the holding member, in a stable condition at all times. Therefore, in the vehicle mirror device in this embodiment, the mirror face of the mirror unit 2 can be reliably held at a predetermined tilted position at all times.

[0036] Particularly, in the vehicle mirror device in this embodiment, when the advancing or retreating rods 34 and 35 are located at the most advanced position or at the most retreated position, the mirror unit 2 does not float up with respect to the power unit 3, as in the conventional vehicle mirror device in which the spherical convex face is simply made to abut on the spherical concave face.

[0037] In the vehicle mirror device in this embodiment, since the spring member 4 is fitted to the outside of the one end 22c (fitting section 22k) of the pivot receiver 22 to fasten the pivot receiver 22 onto the pivot portion 37, the pivot receiver 22 can be prevented from coming out from the neck portion 22f of the pivot portion 37. Even if the fitting force of the pivot receiver 22 decreases with the lapse of time, the sliding torque between the pivot portion 37 and the pivot receiver 22 can be kept constant at all times by the spring force of the spring member 4.

[0038] In the vehicle mirror device in this embodiment, since the small protrusion 37c of the pivot portion 37 abuts on the flat portion 22b of the pivot receiver 22 at all times, there is no play between the spherical outer face of the pivot portion 37 and the spherical inner face of the hollow portion 22i of the pivot receiver 22, and hence the spherical outer face and the spherical inner face abut on each other reliably al all times.

[0039] In the vehicle mirror device in this embodiment, since there is always a space S between the flat portion 22b of the pivot receiver 22 and the chamfered portion 37b of the pivot portion 37, even if the pivot mechanism 5 (the pivot receiver 22 and the pivot portion 37) is made thin in a direction of the shank 36, the mirror unit 2 can tilt with respect to the power unit 3, using the space S.

[0040] In the vehicle mirror device in this embodiment, since the slits 22d are provided at one end 22c of the pivot receiver 22, that is, at the end on the side inserting the pivot portion 37, when the pivot portion 37 is press-fitted, the one end 22c of the pivot receiver 22 is enlarged and deformed. Therefore, the press-fit force at the time of press-fitting the pivot portion 37 to the pivot receiver 22 can be reduced.

[0041] In the vehicle mirror device in this embodiment, since the press-fit guiding face 22e is provided on the inner side of the opening 22j of the pivot receiver 22, even in an operation not visible, the pivot portion 37 can be reliably and easily press-fitted to the pivot receiver 22, by the guiding action of the press-fit guiding face 22e.

[0042] In the vehicle mirror device in this embodiment, since the temporary holder 22h is provided at the other end of the pivot receiver 22, the spring member 4 can be temporarily held by the temporary holder 22h at a predetermined position, reliably in a predetermined posture. Thereby, the spring member 4 can be reliably and simply press-fitted by a press-fit jig, from the temporary holder 22h to the fitting section 22k at a predetermined position of the pivot receiver 22, in a predetermined posture.

[0043] In the vehicle mirror device in this embodiment, since the engaging protrusion 22g is provided on the other end side than the fitting section 22k of the pivot receiver 22, the spring member 4 can be reliably fitted to the fitting section 22k at a predetermined position. When the spring member 4 is once press-fitted to the fitting section 22k, getting over the engaging protrusion 22g, the engaging protrusion 22g prevents the spring member 4 from coming off from the fitting section 22k.

[0044] In the vehicle mirror device in this embodiment, four slits 22d and four engaging protrusions 22g of the pivot receiver 22 are provided corresponding to each other, and the four slits 22d are also used as holes for pulling out a mold for forming the four engaging protrusions 22g. As a result, the structure of the pivot receiver 22 can be simplified.

[0045] In the vehicle mirror device in this embodiment, since the inside of the pivot portion 37 is formed hollow, the thickness of the pivot portion 37 can be made small, and shrinkage at the time of molding the pivot portion 37 can be prevented by the thin pivot portion 37. Further, since the seven ribs 37d are formed inside of the hollow pivot portion 37, even if the inside of the pivot portion 37 is formed hollow and the thickness of the pivot portion 37 is small, sufficient strength can be obtained.

[0046] In this embodiment, a remote-control type rear-view mirror device (door mirror device 1) for vehicles has been explained. However, this invention is also applicable to a vehicle mirror device other than the door mirror device 1. For example, this invention is applicable to a vehicle mirror device of manually tilting type, in which the mirror unit is tiltably held by a mirror housing as a holding member, via the pivot mechanism. In the vehicle mirror device of manually tilting type, the pivot receiver can be provided on the mirror housing side, being the holding member, and the pivot portion can be provided on the mirror unit side.

[0047] In the claims and the specification, "right and left" or "horizontal direction" stands for "right and left" or "horizontal direction" about a vertical axis, in the state where the vehicle mirror device is equipped on a vehicle. Further, in the claims and the specification, "up and down" or "vertical direction" stands for "up and down" or "vertical direction" about a horizontal axis, in the state where the vehicle mirror device is equipped on a vehicle.

[0048] Although the invention has been described with respect to a specific embodiment for a complete and clear disclosure, the appended claims are not to be thus limited but are to be construed as embodying all modifications and alternative constructions that may occur to one skilled in the art which fairly fall within the basic teaching herein set forth.

Claims

1. A vehicle mirror device in which a mirror unit is tiltably held by a holding member via a pivot mechanism, wherein the pivot mechanism comprises:

   a pivot receiver provided in the mirror unit or the holding member, which has a hollow portion provided inside thereof, wherein an opening communicating with the hollow portion is provided at one end thereof;
   a pivot portion provided in the other of the mirror unit and the holding member, which is tiltably press-fitted to the hollow portion from the opening of the pivot receiver; and
   a spring member fitted to the outside on the one end side of the pivot receiver, which fastens the pivot receiver onto the pivot portion.

2. The vehicle mirror device according to claim 1, wherein the external shape of the pivot portion is substantially spherical,

   a spherical inner face, which resiliently abuts on the spherical outer face of the pivot portion slidably, is provided on the inner side of the hollow portion of the pivot receiver, and

a neck portion having an inner diameter smaller than the largest outer diameter of the pivot portion is provided on the inner side of the opening of the pivot receiver.

3. The vehicle mirror device according to claim 1, wherein the one end of the pivot portion is provided in the other of the mirror unit and the holding member via a shank, and a chamfered portion is provided at the other end of the pivot portion, in a direction substantially orthogonal to the shank, and a small protrusion is provided substantially at the center of the chamfered portion, and

a flat portion is provided at the other end of the pivot receiver, always with a space between the chamfered portion and itself, against which the small protrusion abuts all the time.

4. The vehicle mirror device according to claim 1, wherein one end of the pivot receiver is provided in the mirror unit or the holding member, and a plurality of slits are provided on the one end of the pivot receiver.

5. The vehicle mirror device according to claim 1, wherein a press-fit guiding face which guides press-fit of the pivot portion is formed on the inner side of the opening of the pivot receiver, gradually enlarged towards the edge of the opening.

6. The vehicle mirror device according to claim 1, wherein a temporary holder for the spring member is provided at the other end of the pivot receiver, and by press-fitting the spring member temporarily held by the temporary holder from the temporary holder to the one end of the pivot receiver, the spring member is fitted to the outside on the one end side of the pivot receiver.

7. The vehicle mirror device according to claim 1, wherein a plurality of engaging protrusions for preventing the spring member from coming off is provided on the other end side than the fitting section, to which the spring member is fitted, outside of the one end of the pivot receiver.

8. The vehicle mirror device according to claim 1, wherein one end of the pivot receiver is provided in the mirror unit or the holding member, and slits are provided on the one end of the pivot receiver,

engaging protrusions for preventing the spring member from coming off are provided on the other end side than the fitting section, to which the spring member is fitted, outside of the one end of the pivot receiver, and

the slits and the engaging protrusions are provided corresponding to each other, and the slits are also used as holes for pulling out a mold for forming the engaging protrusions.

9. The vehicle mirror device according to claim 1, wherein the inside of the pivot portion is formed hollow, and a plurality of ribs are formed inside of the hollow pivot portion.

10. A remote-control type vehicle mirror device in which a mirror unit is held by a power unit as a holding member via a pivot mechanism, tiltably in horizontal and vertical directions, wherein the pivot mechanism comprises:

a pivot receiver provided in the mirror unit, which has a hollow portion provided inside thereof, wherein an opening communicating with the hollow portion is provided at one end thereof;

a pivot portion provided in the power unit, which is tiltably press-fitted to the hollow portion from the opening of the pivot receiver; and

a spring member fitted to the outside on the one end side of the pivot receiver, which fastens the pivot receiver onto the pivot portion.

11. The vehicle mirror device according to claim 10, wherein the external shape of the pivot portion is substantially spherical,

a spherical inner face, which resiliently abuts on the spherical outer face of the pivot portion slidably, is provided on the inner side of the hollow portion of the pivot receiver, and

a neck portion having an inner diameter smaller than the largest outer diameter of the pivot portion is provided on the inner side of the opening of the pivot receiver.

12. The vehicle mirror device according to claim 10, wherein the one end of the pivot portion is provided in the power unit via a shank, and a chamfered portion is provided at the other end of the pivot portion, in a direction substantially orthogonal to the shank, and a small protrusion is provided substantially at the center of the chamfered portion, and

a flat portion is provided at the other end of the pivot receiver, always with a space between the chamfered portion and itself, on which the small protrusion abuts all the time.

13. The vehicle mirror device according to claim 10, wherein one end of the pivot receiver is provided in the mirror unit, and slits are provided on the one end of the pivot receiver.

14. The vehicle mirror device according to claim 10,

wherein a press-fit guiding face which guides press-fit of the pivot portion is formed on the inner side of the opening of the pivot receiver, gradually enlarged towards the edge of the opening.

15. The vehicle mirror device according to claim 10, wherein a temporary holder for the spring member is provided at the other end of the pivot receiver, and by press-fitting the spring member temporarily held by the temporary holder from the temporary holder to the one end of the pivot receiver, the spring member is fitted to the outside on the one end side of the pivot receiver.

16. The vehicle mirror device according to claim 10, wherein engaging protrusions for preventing the spring member from coming off are provided on the other end side than the fitting section, to which the spring member is fitted, outside of the one end of the pivot receiver.

17. The vehicle mirror device according to claim 10, wherein one end of the pivot receiver is provided in the mirror unit, and slits are provided on the one end of the pivot receiver,

engaging protrusions for preventing the spring member from coming off are provided on the other end side than the fitting section, to which the spring member is fitted, outside of the one end of the pivot receiver, and

the slits and the engaging protrusions are provided corresponding to each other, and the slits are also used as holes for pulling out a mold for forming the engaging protrusions.

18. The vehicle mirror device according to claim 10, wherein the inside of the pivot portion is formed hollow, and ribs are formed inside of the hollow pivot portion.

FIG.1

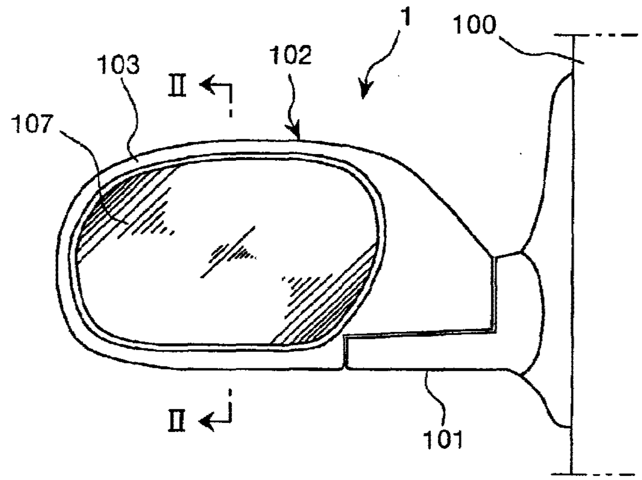

1
100
102
103
II
107
II
101

FIG.2

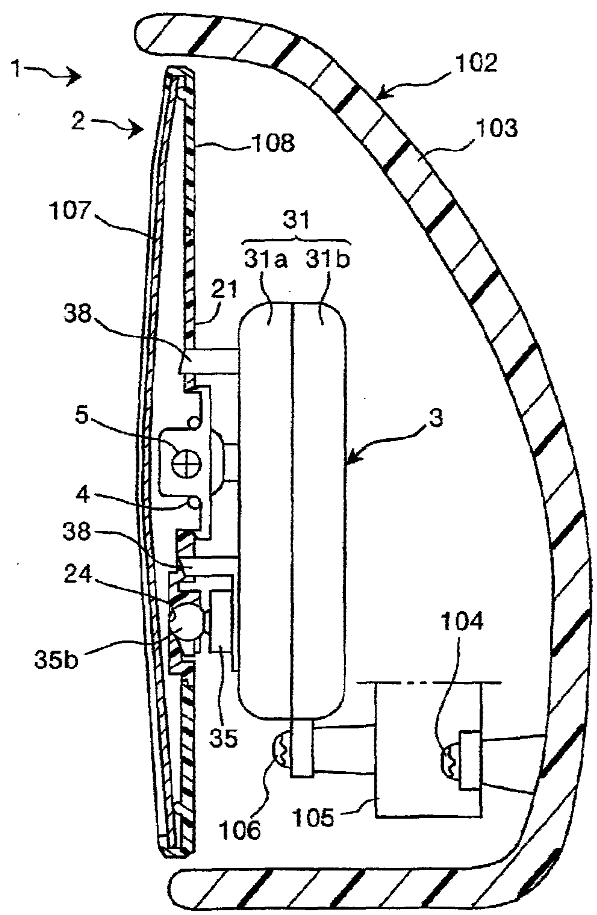

1
102
2
108
103
107
31
31a
31b
21
38
3
5
4
38
24
104
35b
35
106
105

FIG.3

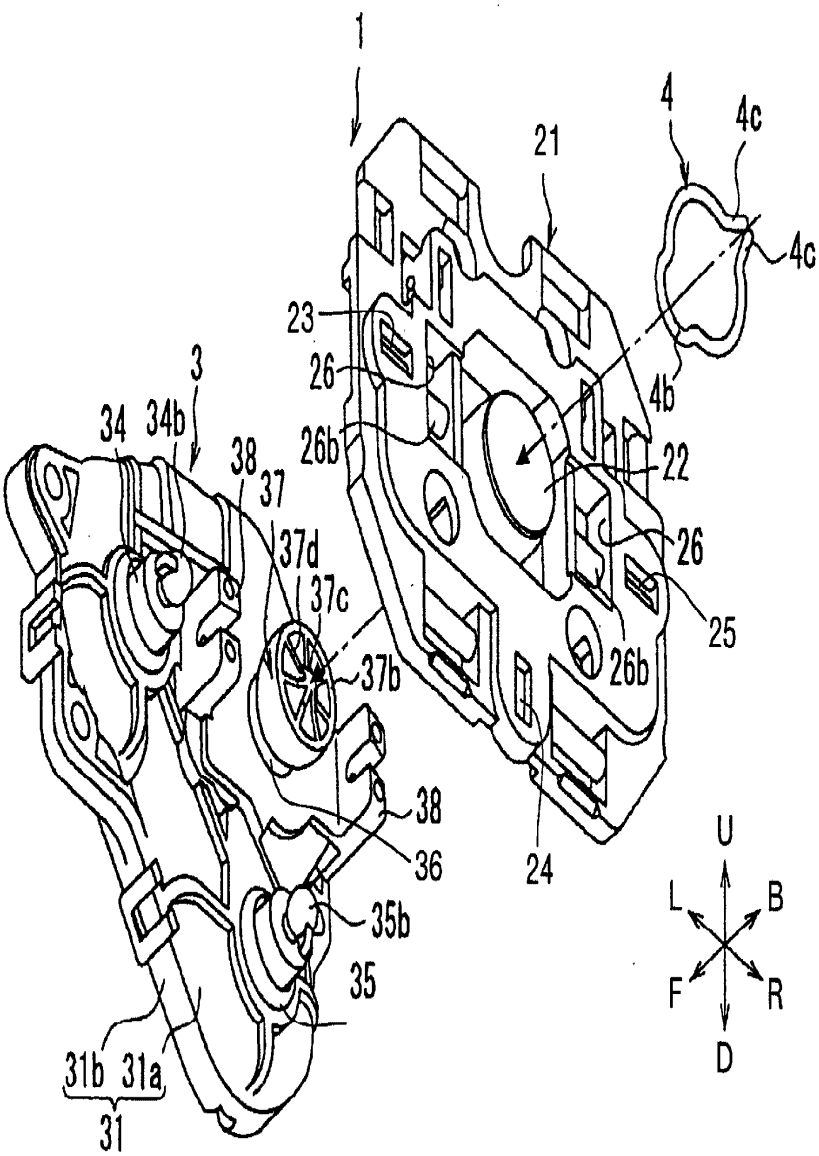

1
4
4c
21
4c
23
26
3
4b
34
34b
38
37
26b
22
37d
26
37c
25
37b
26b
38
36
24
35b
35
31b
31a
31
U
L
B
F
R
D

FIG.4

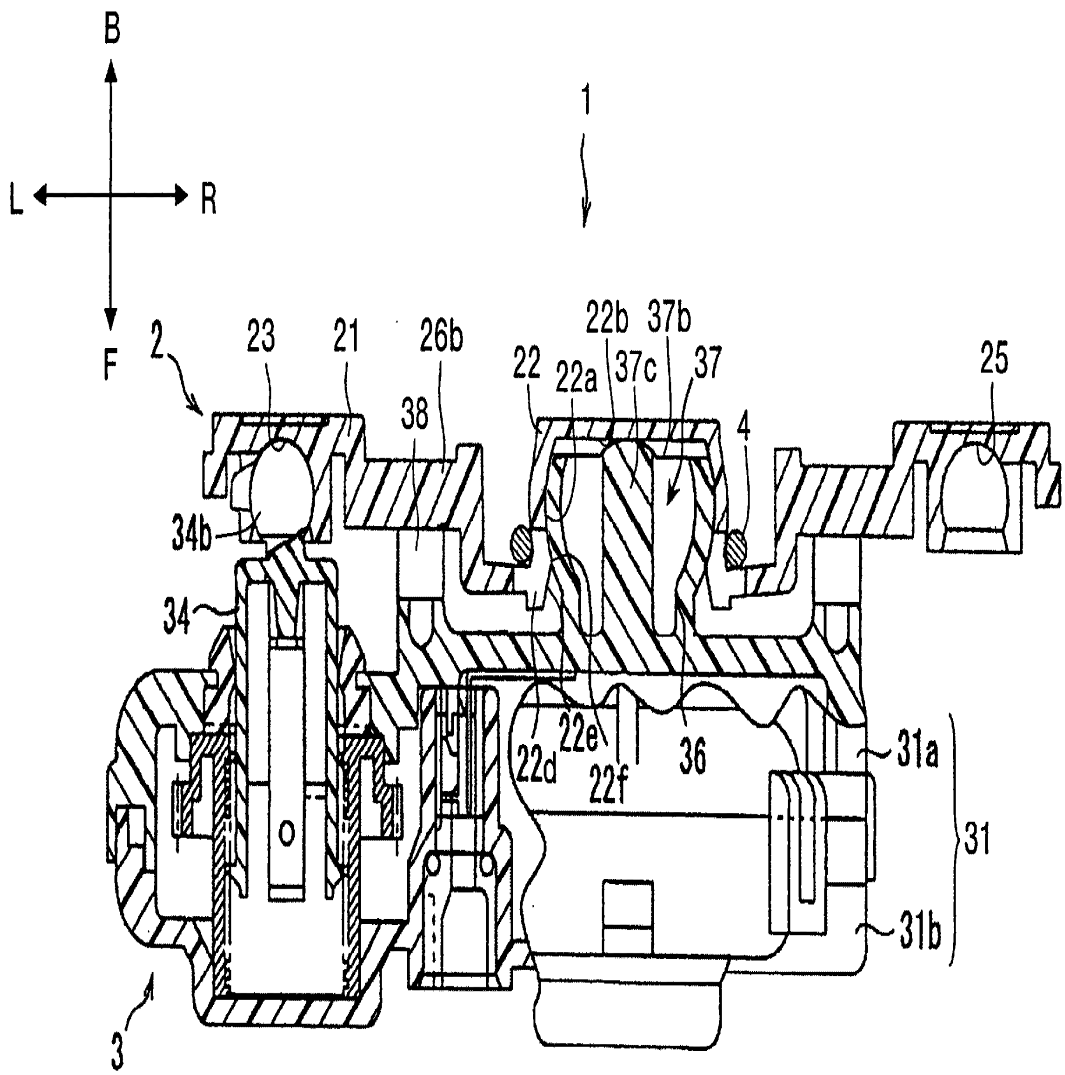

B
L
R
F
1
2
23
21
26b
22
22a
22b
37b
37c
37
25
38
4
34b
34
22d
22e
22f
36
31a
31
31b
3

FIG.5

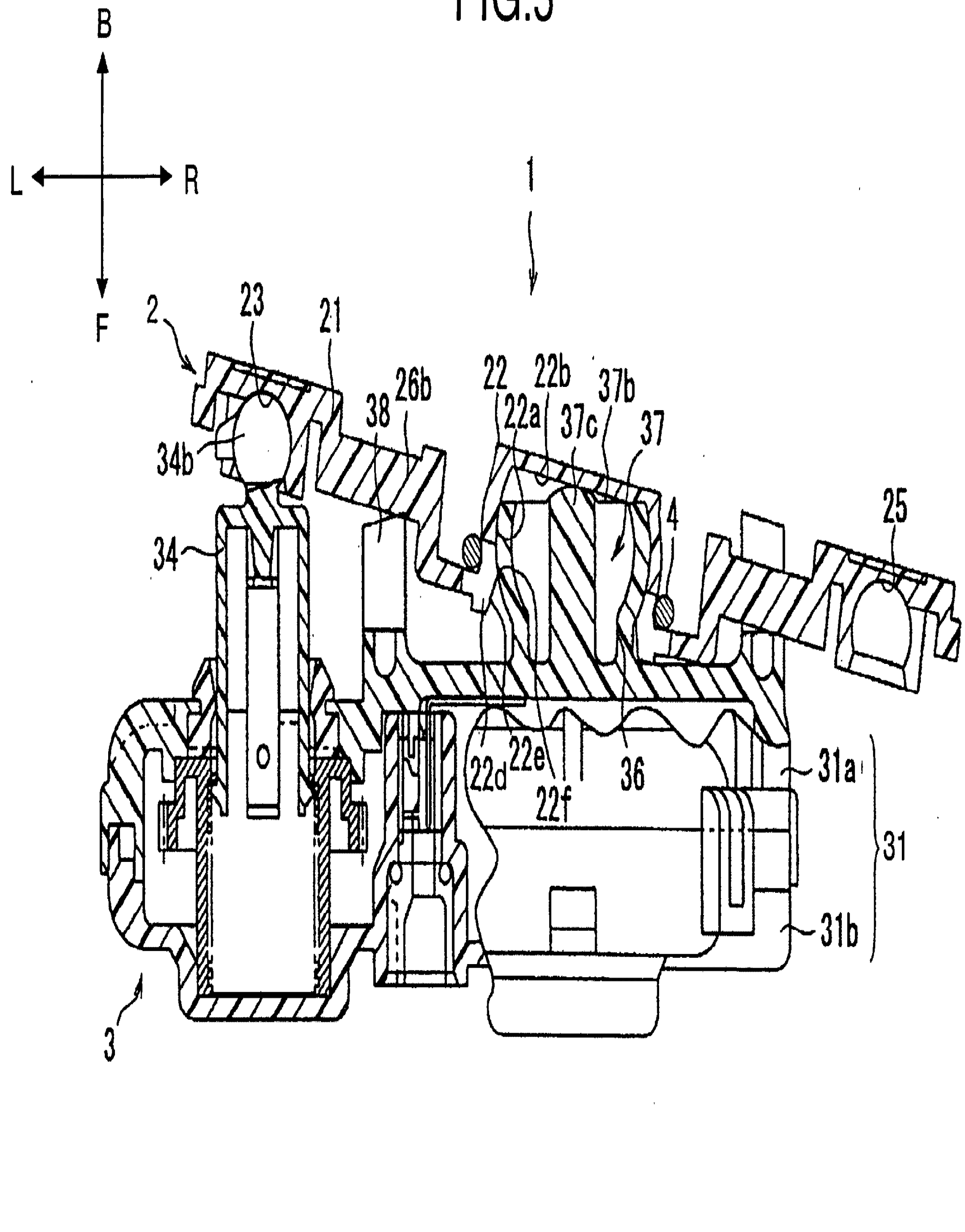

B
L
R
F
1
2
23
21
38
26b
22
22b
37b
22a
37c
37
34b
34
4
25
22d
22e
22f
36
31a
31
31b
3

FIG.6

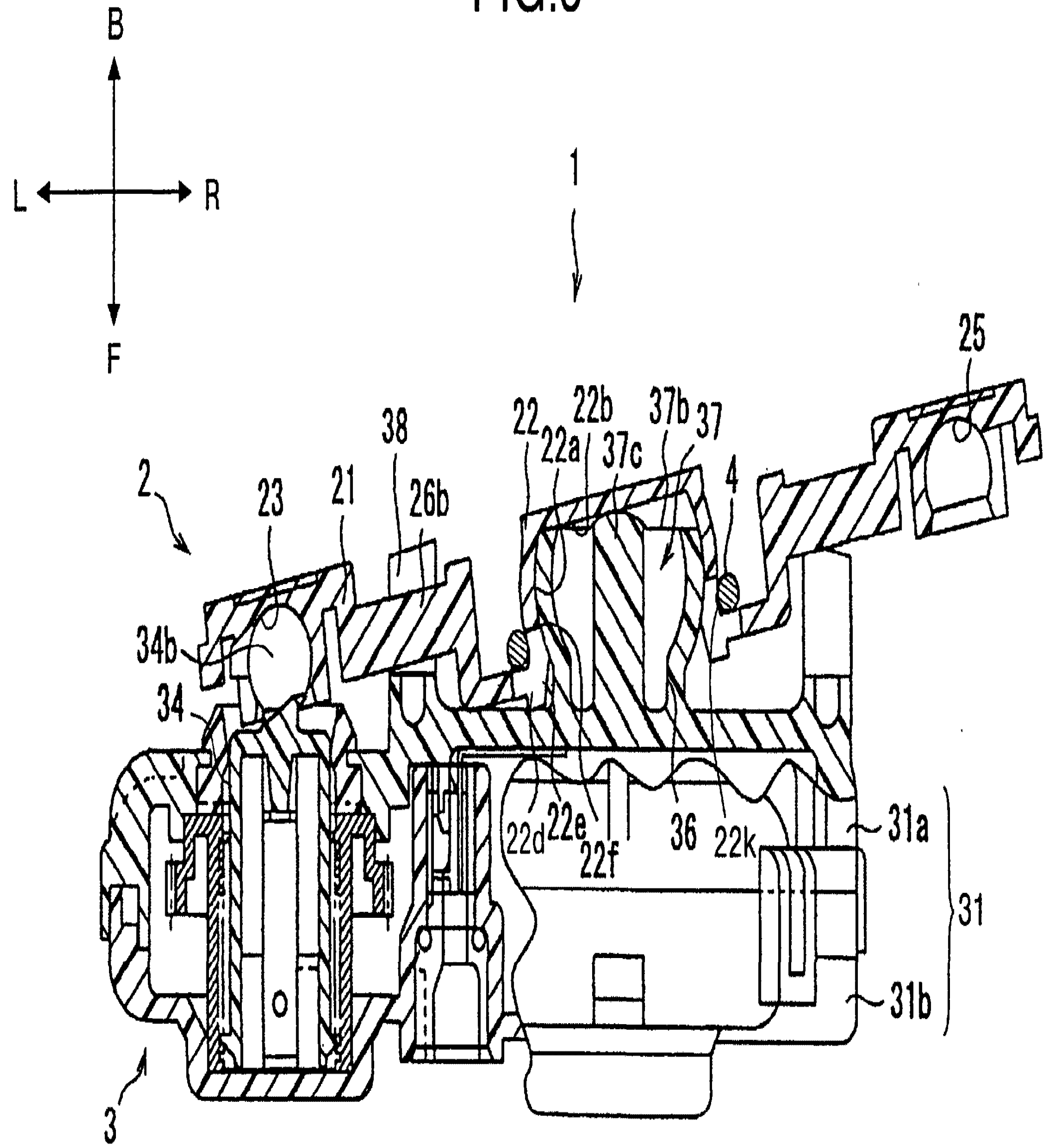

B
L
R
F
1
25
22
22b
37b
37
38
22a
37c
4
2
23
21
26b
34b
34
22d
22e
22f
36
22k
31a
31
31b
3

FIG.7

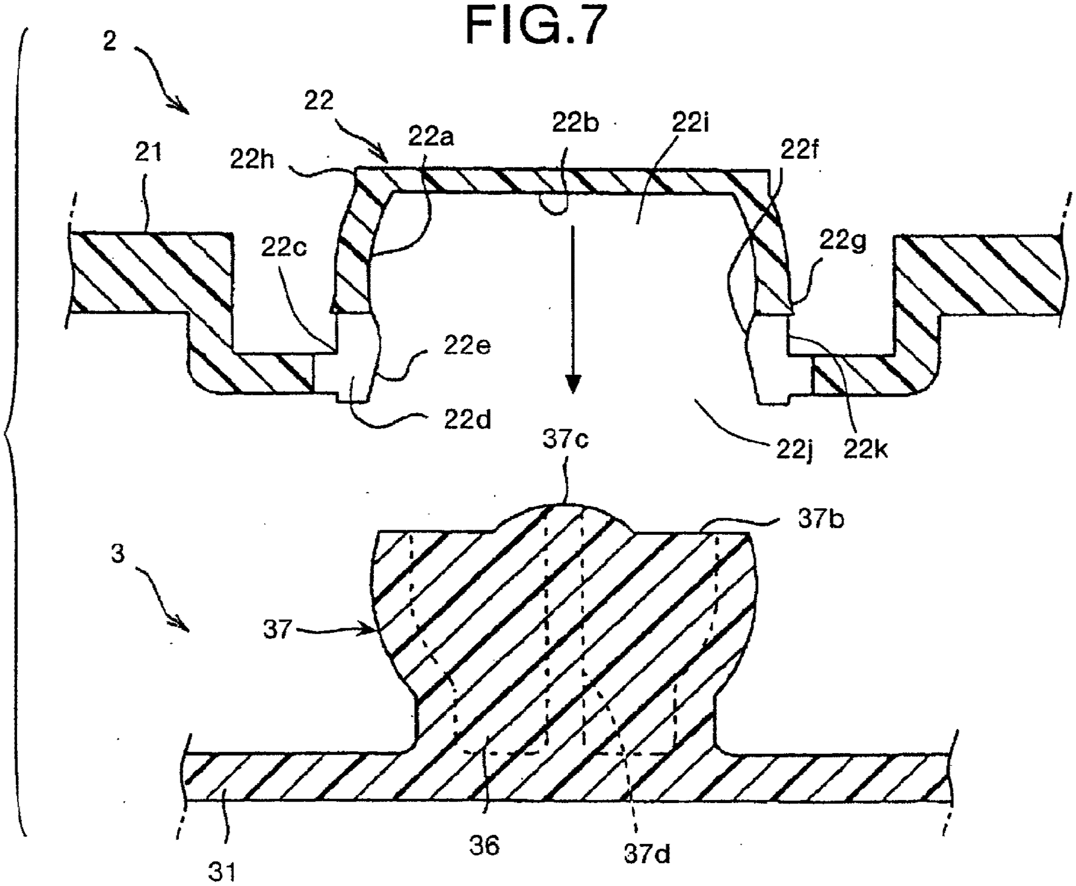

2
22
22a
22b
22i
21
22h
22f
22c
22g
22e
22d
37c
22j
22k
37b
3
37
31
36
37d

FIG.8

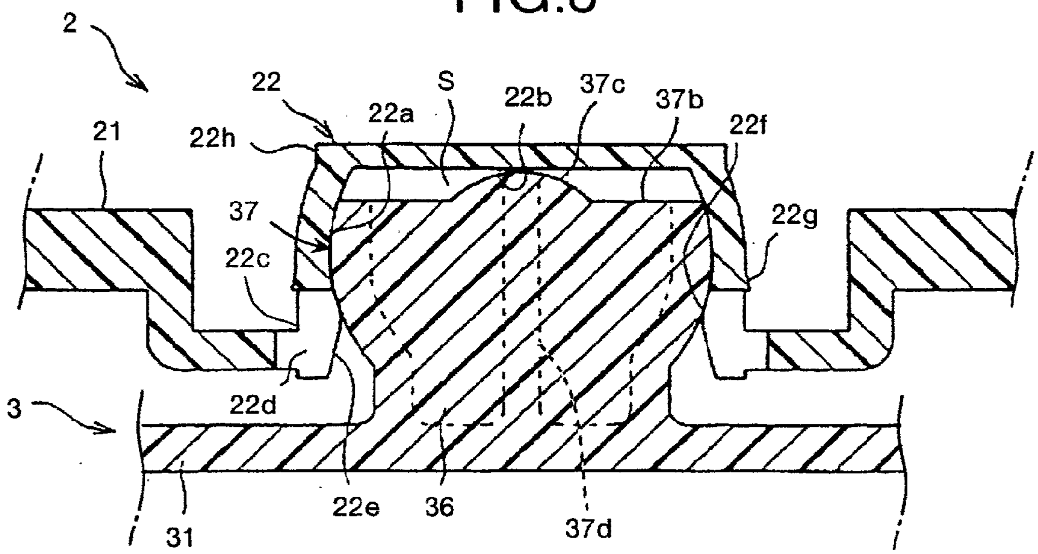

2
22
S
22b
37c
37b
22a
21
22h
22f
37
22g
22c
22d
3
31
22e
36
37d

FIG.9A

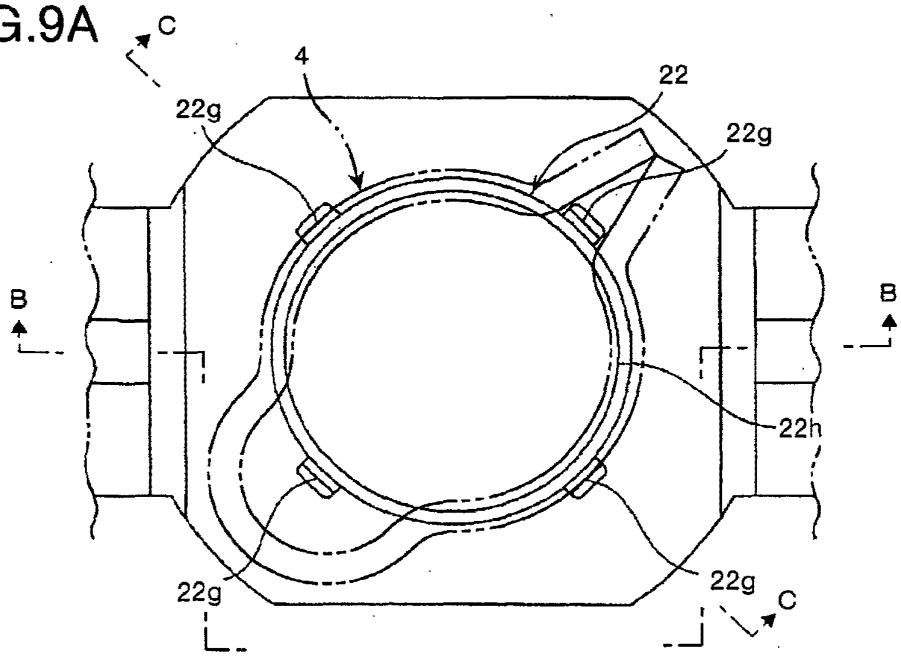


FIG.9B

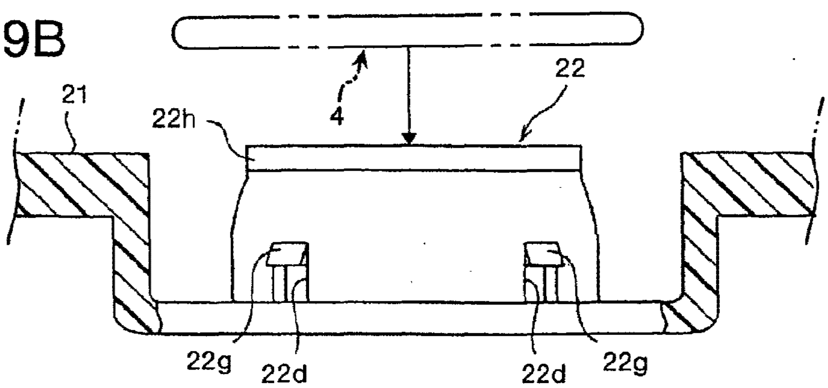


FIG.9C

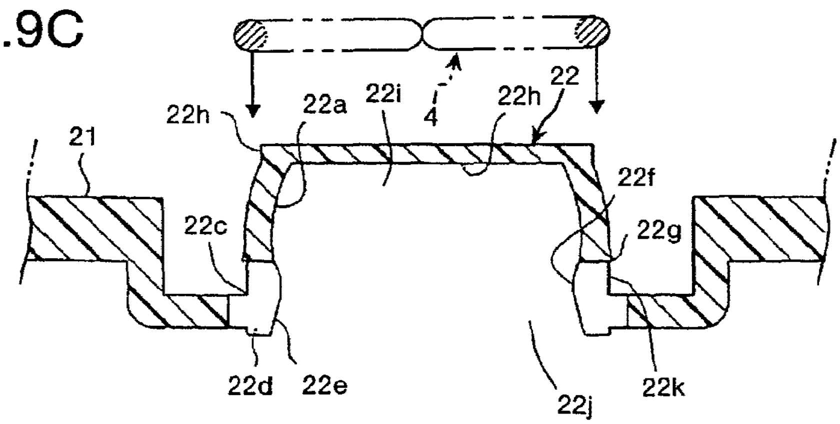


FIG.10A

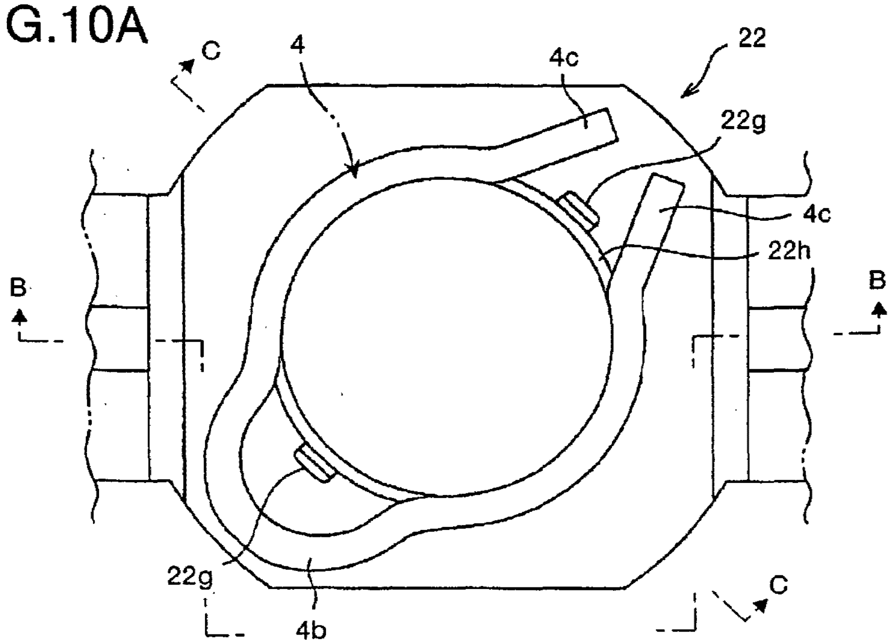


FIG.10B

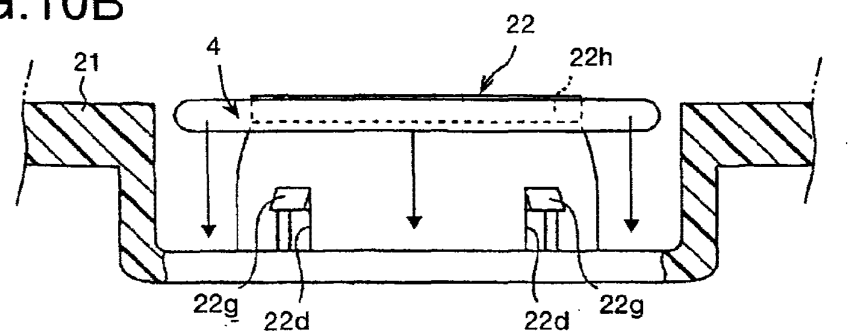


FIG.10C

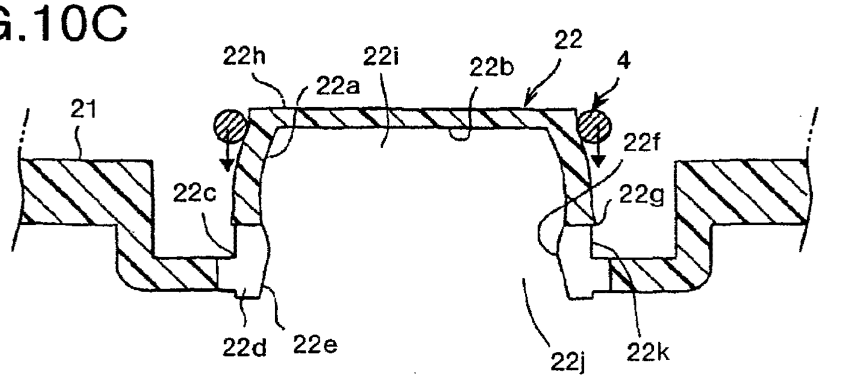


FIG.11A

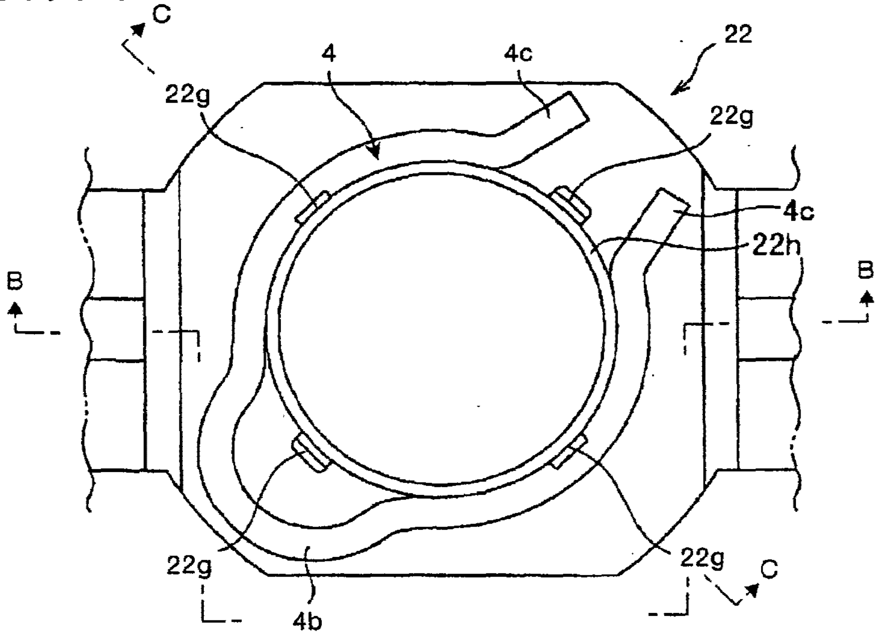


FIG.11B

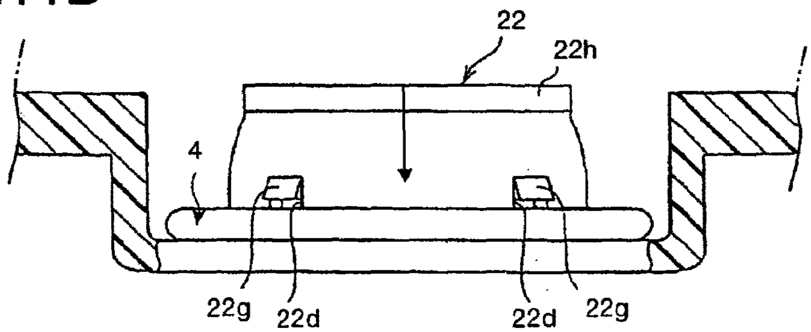
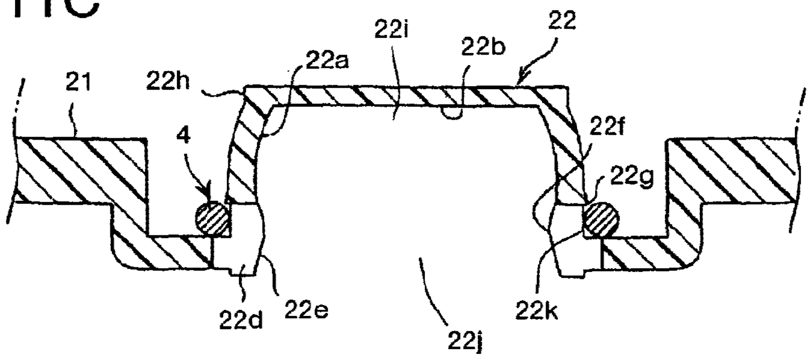


FIG.11C



(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 755 923 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
24.03.2010 Bulletin 2010/12

(21) Application number: **05737554.5**

(22) Date of filing: **19.04.2005**

(51) Int Cl.:
B60R 1/074 *(2006.01)*

(86) International application number:
PCT/NL2005/000285

(87) International publication number:
WO 2005/102778 (03.11.2005 Gazette 2005/44)

(54) **HINGE ACTUATOR, IN PARTICULAR FOR A WING MIRROR UNIT**

GELENKSTELLGLIED, INSBESONDERE FÜR EINE KOTFLÜGELSPIEGELEINHEIT

ACTIONNEUR A CHARNIERE DESTINE NOTAMMENT A UN RETROVISEUR EXTERIEUR

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU MC NL PL PT RO SE SI SK TR

(30) Priority: **22.04.2004 NL 1026002**

(43) Date of publication of application:
28.02.2007 Bulletin 2007/09

(73) Proprietor: **MCi (Mirror Controls International) Netherlands B.V.**
3417 XJ Montfoort (NL)

(72) Inventors:
- **VAN DEN BRINK, Albertus**
NL-3773 AC Barneveld (NL)
- **DUCHENNE, Milan**
NL-3031 SP Rotterdam (NL)
- **HAMMING, Peter, Alexander**
NL-8331 DB Steenwijk (NL)

(74) Representative: **van Loon, C.J.J. et al**
Vereenigde
Johan de Wittlaan 7
2517 JR Den Haag (NL)

(56) References cited:
EP-A- 1 238 858 US-A1- 2003 218 812

Printed by Jouve, 75001 PARIS (FR)

Description

[0001] The invention relates to a hinge actuator comprising a first part which is pivotably connected with a second part, and an electric drive for pivoting the parts relative to each other, wherein the first part and the second part are provided with stops cooperating in a first pivoting direction for defining a predetermined position of the actuator parts relative to each other, and wherein further a coupling is provided between the first and the second part, so that in a first position of the coupling the first part and the second part are connected via the drive and, driven by means of the drive, can be pivoted relative to each other, and a second position in which the first and the second part are not connected via the drive and can be pivoted relative to each other manually.

[0002] Such a hinge actuator is well known and is used, for instance, as a hinge actuator for a wing mirror unit of a motor vehicle as described in document EP-A-1 238 858, which discloses the preamble of claim 1. The first part of the actuator is then typically connected with the door of a motor vehicle. The first part then often comprises a base plate to be mounted on the door, which base plate is provided with a basic shaft. The second part then comprises a mirror support, which is typically arranged pivotably about the basic shaft. The mirror support, also referred to as mirror supporting frame, typically comprises a mirror housing in which a mirror glass is accommodated.

[0003] The mirror support, in particular the mirror housing, can then pivot relative to the base plate between a folded-in position, in which the width of the vehicle, for instance for the purpose parking, is reduced, and a folded-out position for use of the wing mirror unit under normal operating conditions. In the folded-in position, the mirror support extends in substantially rearward orientation along the longitudinal axis of the bodywork of the vehicle. In the folded-out position, the mirror support extends substantially transversely to the longitudinal axis of the bodywork.

[0004] The folded-out position is then defined in that the stops cooperate upon outward pivoting in the first pivoting direction from the folded-in position to the folded-out position, so that further pivoting is hampered. Upon an overload in the outward pivoting direction, typically, the cooperating stops can be overcome, so that the mirror support can pivot beyond the folded-out position to an overfold position.

[0005] The mirror support can be pivoted both electrically and non-electrically, for instance manually, relative to the base plate. By the use of the coupling between the first and the second part, the electric drive can be uncoupled, so that a pivoting movement of the mirror support not caused by the drive, for instance an inward pivoting movement resulting from impact forces or a manual inward pivoting movement, does not force any movements of the drives. Thus, damage to the electric drive, such as fracture in the drive train or defects in an electric motor, can be avoided.

[0006] It is desired that the predetermined position of the actuator parts relative to each other be well-defined. In the use of the hinge actuator in a wing mirror unit, in this way for instance the folded-out position of the mirror support can then be defined so well that unintentional pivoting to the overfold position is prevented. In practice, the folded-out position in the first pivoting direction, i.e. in an outward pivoting direction towards the overfold position, is typically defined in that the stops are under spring action and cooperate with high friction. The definition of the predetermined position in the second, opposite direction, i.e. in an inward or backward pivoting direction from the folded-out position towards the folded-in position, is typically defined in that the drive is made of self-braking design.

[0007] It has been found desirable, however, that the mirror housing upon manual adjustment be secured in the folded-out position in such a way that a clearly sensible coupling or "click" can be felt. For instance, the force that is needed to pivot the mirror support from the folded-out position to the folded-in position is of the same order of magnitude as the required force for pivoting from the folded-out position to the overfold position. By providing a pair of auxiliary stops which, from the predetermined position, cooperate in the second pivoting direction, i.e., in the case of a wing mirror unit, from the folded-out position in the inward pivoting direction, this problem can be solved.

[0008] However, the force required for overcoming both the stops and the extra stops would have to be of the same order of magnitude. However, the electric drive then cannot adjust the mirror housing from the folded-out position to the folded-in position, unless unacceptably powerful and costly electric motors are used, or the force required for overcoming the extra stops is so slight that upon manual inward pivoting from the folded-out position no resistance of significance is sensed. Also, as a consequence of this, the measure of arranging, by means of a simple current limiting circuit, for the electric motor to be switched off when the folded-out position is reached cannot be used without problems anymore.

[0009] The object of the invention is to provide a hinge actuator of the type mentioned in the opening paragraph hereof, in particular for use in a wing mirror, with which the predetermined position upon manual adjustment is well-defined as well, while yet a relatively light drive can suffice. To that end, the hinge actuator according to the invention is **characterized in that** the first and the second hinge part are furthermore provided with auxiliary stops for defining the predetermined position in a second, opposite pivoting direction, the auxiliary stops being adjustable relative to each other by means of the drive from a first position in which they block driven pivoting movement of the parts in the second direction, to a second position in which they clear driven pivoting movement in the second direction. What is thus achieved is that the auxiliary stops upon manual adjustment hamper backward pivoting, while the auxiliary stops upon electric adjustment are removed under the action of the drive.

[0010] Advantageously, at least one of the auxiliary stops is slidably or pivotably arranged on the hinge part. As a result, adjustment of the auxiliary stops relative to each other can be realized in a simple manner.

[0011] Preferably, the drive is provided with a drive element which carries an operating cam for adjusting at least one of the cooperating auxiliary stops from the first position into the second position or vice versa. As a result, the adjustment of the auxiliary stops can be realized in a reliable manner.

[0012] Elegantly, at least one of the auxiliary stops is under spring action to return from the second position to the first position or vice versa. As a result, the construction of the actuator can be further simplified.

[0013] Alternatively, the drive is provided with a guide track for constrained guiding of at least one of the auxiliary stops between the first and second position. As a result, the construction of the actuator can be further simplified in that one or more springs can be dispensed with.

[0014] Elegantly, the actuator is arranged, upon driven pivoting movement from the predetermined position in the second direction, first to adjust the auxiliary stops from the first position to the second position. What can thereby be achieved is that the power of the electric motor can be chosen to be relatively low. Preferably, to that end, the drive element which carries the operating cam is included in the train of the drive with free travel.

[0015] Further advantageous embodiments of the invention are set forth in the subclaims.

[0016] The invention will be further elucidated on the basis of an exemplary embodiment which is represented in a drawing. In the drawing:

Fig. 1 is a schematic perspective view of a hinge actuator in disassembled condition, viewed from above;

Fig. 2 is a schematic perspective view of a detail of Fig. 1, viewed from below;

Fig. 3 is a schematic perspective view of the detail of Fig. 2, viewed from above and in assembled condition; and

Fig. 4 is a schematic cross section of the actuator of Fig. 1 in assembled condition.

[0017] The figures concern only a preferred embodiment of the invention which is given by way of non-limiting exemplary embodiment. In the figures, the same or corresponding parts are indicated with the same reference numerals.

[0018] The figures show a hinge actuator 1 for a wing mirror unit. The hinge actuator 1 comprises a base plate 2 for mounting on a motor vehicle, for instance by mounting the base plate 2 via screw holes 20 onto the door of a motor vehicle. The base plate 2 is provided with a basic shaft 3 whose orientation during use is substantially upstanding. A mirror support 4 is arranged pivotably about the basic shaft 3, so that the geometric longitudinal axis A of the basic shaft 3 forms the rotation axis. In this exemplary embodiment, the hinge actuator is designed as a line hinge. The base plate 2 with basic shaft 3 then forms a first part of the hinge actuator. The first part is hingedly connected with the second part, formed by the mirror support 4 arranged about the basic shaft.

[0019] The mirror support 4 is usually coupled with a mirror cap, not represented in Fig. 4, which likewise surrounds the mirror supporting plate coupled with the mirror support, on which a mirror glass is mounted. Between the support 4 and the mirror supporting plate, usually a mirror adjustment mechanism is arranged by which the mirror glass can be pivoted relative to the mirror support about a substantially upstanding and/or horizontal pivoting axis.

[0020] It is noted that in Fig. 1 the base plate 2 and the mirror support 4 for practical reasons are represented as being built up from loose parts. It will be clear that the loose parts of both the base plate 2 and the mirror support 4 may also be composed of one part, or from still more parts.

[0021] The base plate 2 and the mirror support 4 are provided with cooperating stops 5a, 5b for defining a folded-out position S of the mirror support relative to the base plate 2. This position is shown in Fig. 1.

[0022] During use, the mirror support 4 in the folded-out position S usually extends substantially transversely to the longitudinal axis of the motor vehicle. The cooperating stops 5a, 5b in this exemplary embodiment are designed as slanting sides of two downwardly extending cams 5a' on the mirror support 4 which in the folded-out position S abut against corresponding slanting faces 5b1, 5b2 of two upwardly extending cams 5b' on the base plate 2. The cooperating stops 5a1, 5b1 on the one hand and 5a2, 5b2 on the other hand define, through cooperation, a predetermined position, i.e. the folded-out position S, in a first direction indicated with an arrow P, i.e. the outward folding direction.

[0023] From the folded-out position S, the mirror support, as will be further elucidated hereinafter, can pivot inwardly in a second, opposite pivoting direction to a folded-in position in which the mirror is lodged in substantially rearward orientation along the bodywork of the motor vehicle. Further, it is possible to pivot the mirror support 4 from the folded-out position S further towards an overfold position in which the mirror support is lodged in substantially forward orientation along the bodywork of the motor vehicle.

[0024] The cooperating stops 5a, 5b in the folded-out position S are under spring action in that the mirror support 4 is pressed onto the base plate 2 by means of a helical spring 6 arranged around the basic shaft 3.

[0025] The hinge actuator 1 further comprises a gearwheel 7, likewise subject to the action of the spring 6, which forms part of an electric drive 8 which is arranged on the mirror support 4. The drive 8 comprises an electric motor which at its output shaft is provided with a worm which cooperates by right-angle transmission with a worm wheel. The worm wheel in turn is provided with a shaft on which a second worm is arranged, which cooperates with the teeth along the periphery of the gearwheel 7.

[0026] The gearwheel 7 cooperates via a coupling 9 with a coupling ring 10 which is likewise arranged about the basic shaft 3 so as to be axially slidable under the action of the spring 6. The coupling 9 is designed as downwardly extending cams 9a arranged on the coupling ring 10, which cooperate with correspondingly shaped recesses 9b in the top surface of the gearwheel 7.

[0027] The coupling ring 10 is further arranged about the basic shaft 3 so as to be rotatable with limited travel. The coupling ring 10 is pivotable through an angle of preferably about 20° between a first angle $\alpha 1$ corresponding to the folded-out position S and a second angle $\alpha 2$. In this exemplary embodiment, to that end, the coupling ring 10 is provided with inwardly extending cams which are received in axially extending slots 12 recessed in the circumferential surface of the basic shaft 3. The cams can perform a free rotational stroke in the slots. Through cooperation of the sides of the inwardly extending cams 11 with the end faces of the slots 12, the free rotation of the coupling ring 10 about the basic shaft 3 is limited to about 20°.

[0028] The hinge actuator 1 further comprises a check spring 21 with which the helical spring 6 can be supported on an upper part of the mirror support 4 , and a friction plate 22 which, with respect to the basic shaft 3, is axially slidable but restrained from rotation, with which the other end of the helical spring 6 is supported on the coupling ring 10.

[0029] The coupling elements 9a, 9b form a coupling 9 with which in a first position, through cooperation of the cams 9a and the recesses 9b, the basic shaft 3 is connected with the mirror support 4 via the electric drive 8. Under the influence of an external operating force, for instance upon manual operation, the cams 9a can be pulled, against the action of the spring 6, out of the recesses 9b, so that the coupling can be brought in a second position in which basic shaft 3 and mirror support 4 are not connected via the drive. In the case of such a non-driven operation, the tops of the cams 9a move over the upper surface of the gearwheel 7, and the gearwheel 7 can rotate freely relative to the basic shaft 3.

[0030] As is clearly represented in Fig. 2, the hinge actuator 1 furthermore comprises two auxiliary stops 13a, 13b for defining the predetermined position S in a second, opposite pivoting direction. The auxiliary stops 13a are designed as stop surfaces 13a1, 13a2, provided on the mirror support 4, of cams 13a' arranged on the mirror support 4, which stop surfaces cooperate with corresponding stop surfaces 13b1, 13b2 of cam 5b' on the base plate 2.

[0031] By means of the drive 8, the auxiliary stops 13a, 13b are adjustable relative to each other from a first position represented in the left-hand part of Fig. 4, in which they block driven pivoting movement of the mirror support 4 in the inward folding direction, to a second position represented in the right-hand part of Fig. 4, in which they clear driven pivoting movement of the mirror support 4 relative to the basic shaft 3. This is implemented by accommodating the cams 13a' slidably in slots 14 which are provided in the mirror support 4. In the exemplary embodiment, the cooperating auxiliary stops 13a, 13b are each made of double design, leaving an intermediate space clear. Through displacement of the cams 13a', the stop surfaces can be aligned so as to cooperate (first position) or to correspond with the free intermediate spaces (second position).

[0032] In Fig. 3 it is clearly visualized that the gearwheel 7 carries two operating cams 15 for displacing the auxiliary stop cams 13a' through cooperation with corresponding operating cams 16. As a result, the auxiliary stops 13a, 13b can be adjusted relative to each other from the first position represented in Fig. 3 to the second position and vice versa. It is noted that the operating cams 15 carried by the gearwheel 7 are preferably integral with it. This is represented in Fig. 2. Of course, it is also possible to build up the gearwheel 7, as represented in Fig. 1, from separate parts.

[0033] The auxiliary stop cams 13a', and hence the auxiliary stops 13a1, 13a2, are each received in the guide slots 14 under radially inwardly directed spring action by means of a spring 23.

[0034] It will be clear that use can also be made of a spring whose action is directed radially outwardly. The operating cams will then work in the opposite direction.

[0035] In the folded-out position S, the cams 5b' on the base plate 2 are situated just between the cams 5a' and the cams 13a' of the mirror support 4. Pivoting in the first direction, that is, in the outward folding direction, is hindered through cooperation of the stop surfaces 5a1, 5a2 with the stop surfaces 5b1, 5b2. Pivoting in the opposite direction, that is, in the inward folding direction from the folded-out position S, is counteracted through cooperation of the auxiliary stop surfaces 13a1, 13a2 with the auxiliary stop surfaces 13b1, 13b2.

[0036] Upon electric inward folding from the folded-out position, the gearwheel 7, under the influence of the drive 8, will cause the coupling ring 10 to pivot from the angular position $\alpha 1$, corresponding to the folded-out position S, to the angular position $\alpha 2$, corresponding to the end of the stroke of free travel. During this movement, the operating cams 15 which are carried by the gearwheel 7 will cooperate with the operating cams 16 on the auxiliary stop cams 13a'. As a result, the auxiliary stop cams 13a' will be moved radially outwards in their guide slots 12, against the action of the springs. As a result, the auxiliary stops 13a, 13b come to lie free relative to each other in a rotation path, thereby enabling the mirror support to be pivoted relative to the basic shaft in the inward folding direction under the influence of the drive.

[0037] Upon pivoting outwards to the folded-out position S by means of the drive 8, the auxiliary stop cams

13a' will be brought into the first position again, after the cooperating stops 5a, 5b hinder further pivoting of the mirror support 4 relative to the basic shaft 3.

[0038] The drive 8 will, as soon as the stops 5a, 5b cooperate, cause the gearwheel 7 via the coupling ring 10 to pivot back from the second angular position $\alpha 2$ to the first angular position $\alpha 1$.

[0039] Upon manual pivoting of the mirror support 4 relative to the basic shaft 3, the coupling 9 between the gearwheel 7 and the coupling ring 10 will be broken, so that the gearwheel 7 can rotate freely about the basic shaft 3 and the drive will not be damaged. Upon manual operation, the gearwheel 7 will stand still relative to the mirror support 4, and the operating cams 15 of the gearwheel 7 will not operate the operating cams 16 of the auxiliary stop cams 13a'. Upon manual operation, the auxiliary stops will therefore remain in the first position, so that the auxiliary stops 13a, 13b need to be overcome against the action of the helical spring 6. As a consequence, upon manual adjustment, a clearly sensible "click" can be felt when reaching or leaving the folded-out position.

[0040] It will be clear that the invention is not limited to the exemplary embodiment represented here, but that many variants are possible. In particular, it is noted that the invention is not limited in any way to line hinges, but can also be advantageously used with other kinds of hinges. Furthermore, it is noted that the construction and the build-up of the hinge can be varied, and that specifically variants are conceivable whereby the auxiliary stops can for instance move between the first and second position relative to each other along curved paths or, for instance, along paths parallel to a hinge axis of the hinge.

[0041] Also, it will be clear to the skilled person that adjusting the auxiliary stops relative to each other between the first and the second position can also be realized in other ways, for instance by arranging the gearwheel to be without free travel and restrained from rotation relative to the basic shaft and arranging the coupling ring to be pivotable through a limited angle relative to the gearwheel.

[0042] Also, the type of drive can be made of a different design than a worm/worm wheel transmission. Also conceivable is, for instance, a planetary gear transmission, a harmonic drive or a gear train.

[0043] Such variants are understood to fall within the scope of the invention as set forth in the appended claims.

Claims

1. A hinge actuator (1), comprising a first part which is pivotably connected with a second part, and an electric drive (8) for pivoting the parts relative to each other, wherein the first and the second part are provided with stops (5a, 5b) cooperating in a first pivoting direction for defining a predetermined position of the actuator parts relative to each other, and wherein further a coupling (9) is provided between the first and the second part, so that in a first position of the coupling (9) the first part and the second part are connected via the electric drive (8) and, driven by means of the drive, can be pivoted relative to each other, and a second position in which the first and the second part are not connected via the drive (8) and can be pivoted relative to each other manually **characterized in that** the first and the second hinge part are furthermore provided with auxiliary stops (13a, 13b) for defining the predetermined position in a second, opposite pivoting direction, the auxiliary stops (13a, 13b) being adjustable relative to each other by means of the drive (8) from a first position in which they block driven pivoting movement of the hinge parts in the second direction, to a second position in which they clear driven pivoting movement of the hinge parts in the second direction.

2. A hinge actuator according to claim 1, wherein at least one of the auxiliary stops (13a, 13b) is slidably or pivotably arranged on the hinge part.

3. A hinge actuator according to claim 1 or 2, wherein the drive (8) is provided with a driving element which carries an operating cam (16) for adjusting at least one of the auxiliary stops between the first and the second position.

4. A hinge actuator according to any one of the preceding claims, wherein the auxiliary stops (13a, 13b), between the first and second position, are under spring action.

5. A hinge actuator according to any one of the preceding claims, wherein the drive (8) is provided with a guide track for the constrained guiding of at least one of the auxiliary stops between the first and second position.

6. A hinge actuator according to any one of the preceding claims, wherein the drive is arranged, upon driven pivoting movement from the predetermined position in the second direction, first to adjust the auxiliary stops (13a, 13b) from the first position to the second position.

Patentansprüche

1. Scharnierbetätigungsvorrichtung (1), die einen ersten Teil aufweist, der schwenkbar mit einem zweiten Teil verbunden ist, und einen elektrischen Antrieb (8) zum Schwenken der Teile relativ zueinander, wobei der erste und der zweite Teil mit Anschlägen (5a, 5b) versehen sind, die in einer ersten Schwenkrichtung zusammenarbeiten, um eine vorbestimmte Position der Betätigungsvorrichtungstei-

le relativ zueinander zu definieren, und wobei weiter eine Kupplung (9) zwischen dem ersten und dem zweiten Teil vorgesehen ist, so dass in einer erste Position der Kupplung (9) der erste Teil und der zweite Teil über den elektrischen Antrieb (8) verbunden sind und, angetrieben durch den Antrieb, relativ zueinander geschwenkt werden können, und das in einer zweiten Position in der der erste und der zweite Teil nicht über den Antrieb (8) verbunden sind, und diese relativ zueinander manuell geschwenkt werden können, **dadurch gekennzeichnet, dass** der erste und der zweite Scharnierteil weiter mit Zusatzanschlägen (13a, 13b) versehen sind, um die vorbestimmte Position in einer zweiten entgegengesetzten Schwenkrichtung zu definieren, wobei die Zusatzanschläge (13a, 13b) relativ zueinander mittels des Antriebs (8) einstellbar sind, und zwar von einer ersten Position, in der sie eine angetriebene Schwenkbewegung der Scharnierteile in der zweiten Richtung blockieren, zu einer zweiten Position, in der sie eine angetriebene Schwenkbewegung der Scharnierteile in der zweiten Richtung freimachen.

2. Scharnierbetätigungsvorrichtung nach Anspruch 1, wobei zumindest einer der Zusatzanschläge (13a, 13b) verschiebbar oder schwenkbar an dem Scharnierteil angebracht ist.

3. Scharnierbetätigungsvorrichtung nach Anspruch 1 oder 2, wobei der Antrieb (8) mit einem Antriebselement versehen ist, welches eine Betätigungsnocke (16) trägt, um zumindest einen der Zusatzanschläge zwischen der ersten und der zweiten Position einzustellen.

4. Scharnierbetätigungsvorrichtung nach einem der vorhergehenden Ansprüche, wobei die Zusatzanschläge (13a, 13b) zwischen der ersten und der zweiten Position unter Federbelastung sind.

5. Scharnierbetätigungsvorrichtung nach einem der vorhergehenden Ansprüche, wobei der Antrieb (8) mit einer Führungsbahn zur eingeschränkten Führung von mindestens einem der Zusatzanschläge zwischen der ersten und der zweiten Position versehen ist.

6. Scharnierbetätigungsvorrichtung nach einem der vorhergehenden Ansprüche, wobei der Antrieb derart angeordnet ist, dass er auf eine angetriebene Schwenkbewegung aus der vorbestimmten Position in die zweite Richtung zuerst die Zusatzanschläge (13a, 13b) von der ersten Position zur zweiten Position einstellt.

Revendications

1. Actionneur à charnière (1), comprenant une première partie reliée de manière pivotante à une seconde partie, et un dispositif d'entraînement électrique (8) servant à faire pivoter les parties l'une par rapport à l'autre, dans lequel les première et seconde parties sont pourvues de butées (5, 5b) coopérant dans une première direction de pivotement pour définir une position prédéterminée des parties d'actionneur l'une par rapport à l'autre, et dans lequel, en outre, un dispositif d'accouplement (9) est disposé entre les première et seconde parties, de sorte que, dans une première position du dispositif d'accouplement (9), la première partie et la seconde partie soient reliées par l'intermédiaire du dispositif d'entraînement électrique (8) et, entraînées à l'aide du dispositif d'entraînement, puissent pivoter l'une par rapport à l'autre, et que, dans une seconde position, les première et seconde parties ne soient pas reliées par l'intermédiaire du dispositif d'entraînement (8) et puissent pivoter manuellement l'une par rapport à l'autre, **caractérisé en ce que** les première et seconde parties charnières sont en outre pourvues de butées auxiliaires (13a, 13b') pour définir la position prédéterminée dans une seconde direction de pivotement opposée, les butées auxiliaires (13, 13b) pouvant être réglées l'une par rapport à l'autre à l'aide du dispositif d'entraînement (8) depuis une première position dans laquelle elles bloquent le déplacement pivotant entraîné des parties charnières dans la seconde direction, vers une seconde position dans laquelle elles permettent le déplacement pivotant des parties charnières dans la seconde direction.

2. Actionneur à charnière selon la revendication 1, dans lequel au moins une des butées auxiliaires (13a, 13b) est placée de manière coulissante ou pivotante sur la partie charnière.

3. Actionneur à charnière selon la revendication 1 ou 2, dans lequel le dispositif d'entraînement (8) est pourvu d'un élément d'entraînement qui porte une came d'actionnement (16) servant à régler au moins une des butées auxiliaires entre les première et seconde positions.

4. Actionneur à charnière selon l'une quelconque des revendications précédentes, dans lequel les butées auxiliaires (13a, 13b), entre les première et seconde positions, se trouvent sous l'action d'un ressort.

5. Actionneur à charnière selon l'une quelconque des revendications précédentes, dans lequel le dispositif d'entraînement (8) est pourvu d'une voie de guidage pour le guidage contraint d'au moins une des butées auxiliaires entre les première et seconde positions.

6. Actionneur à charnière selon l'une quelconque des revendications précédentes, dans lequel le dispositif d'entraînement est conçu, lors du déplacement pivotant entraîné depuis la position prédéterminée dans la seconde direction, pour en premier lieu régler les butées auxiliaires (13a, 13b) de la première position vers la seconde position.

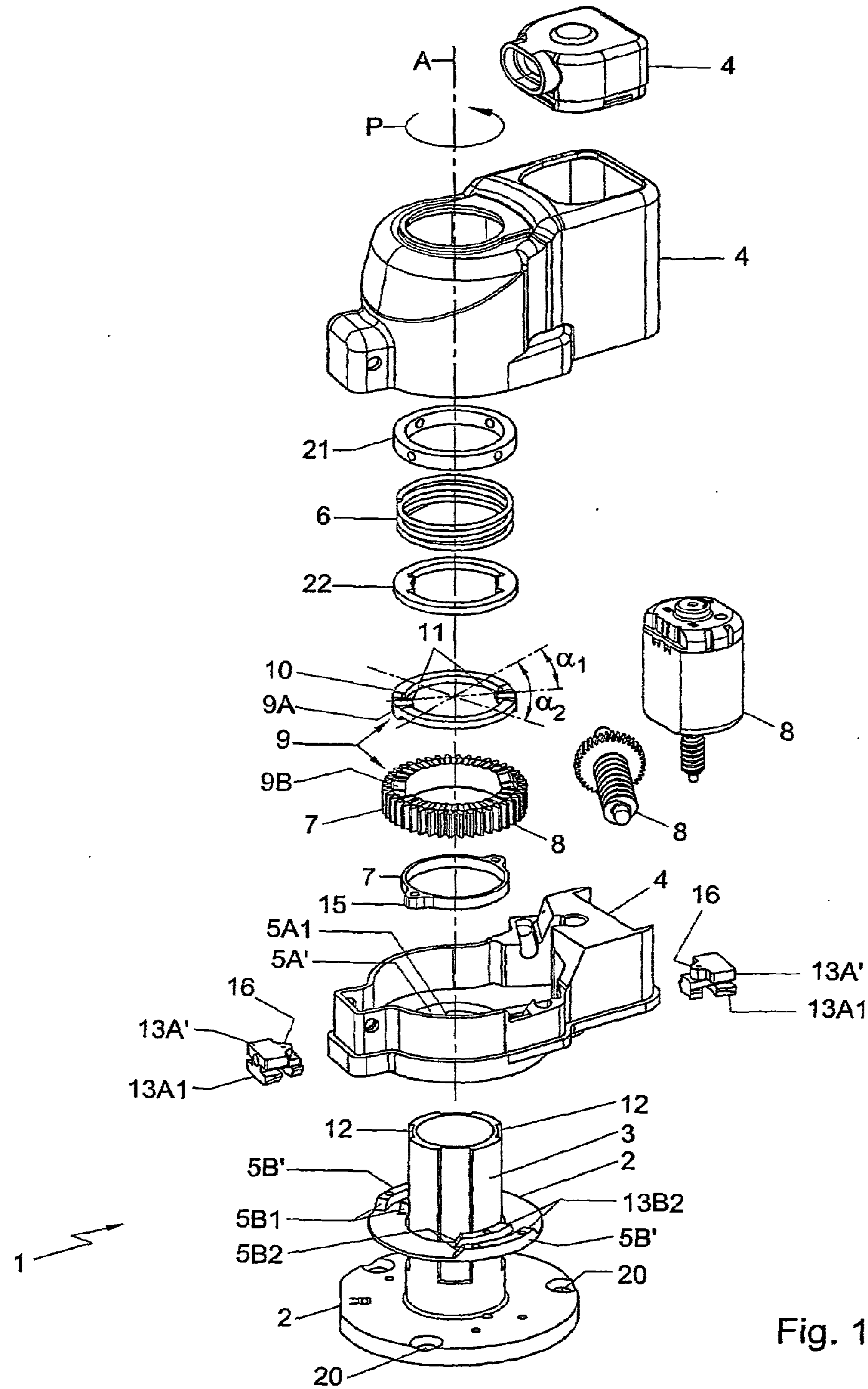

A
P
4
4
21
6
22
11
10
9A
9
9B
7
8
α_1
α_2
8
8
7
15
5A1
5A'
4
16
13A'
13A1
16
13A'
13A1
12
12
3
5B'
2
5B1
13B2
5B2
5B'
1
20
2
20

Fig. 1

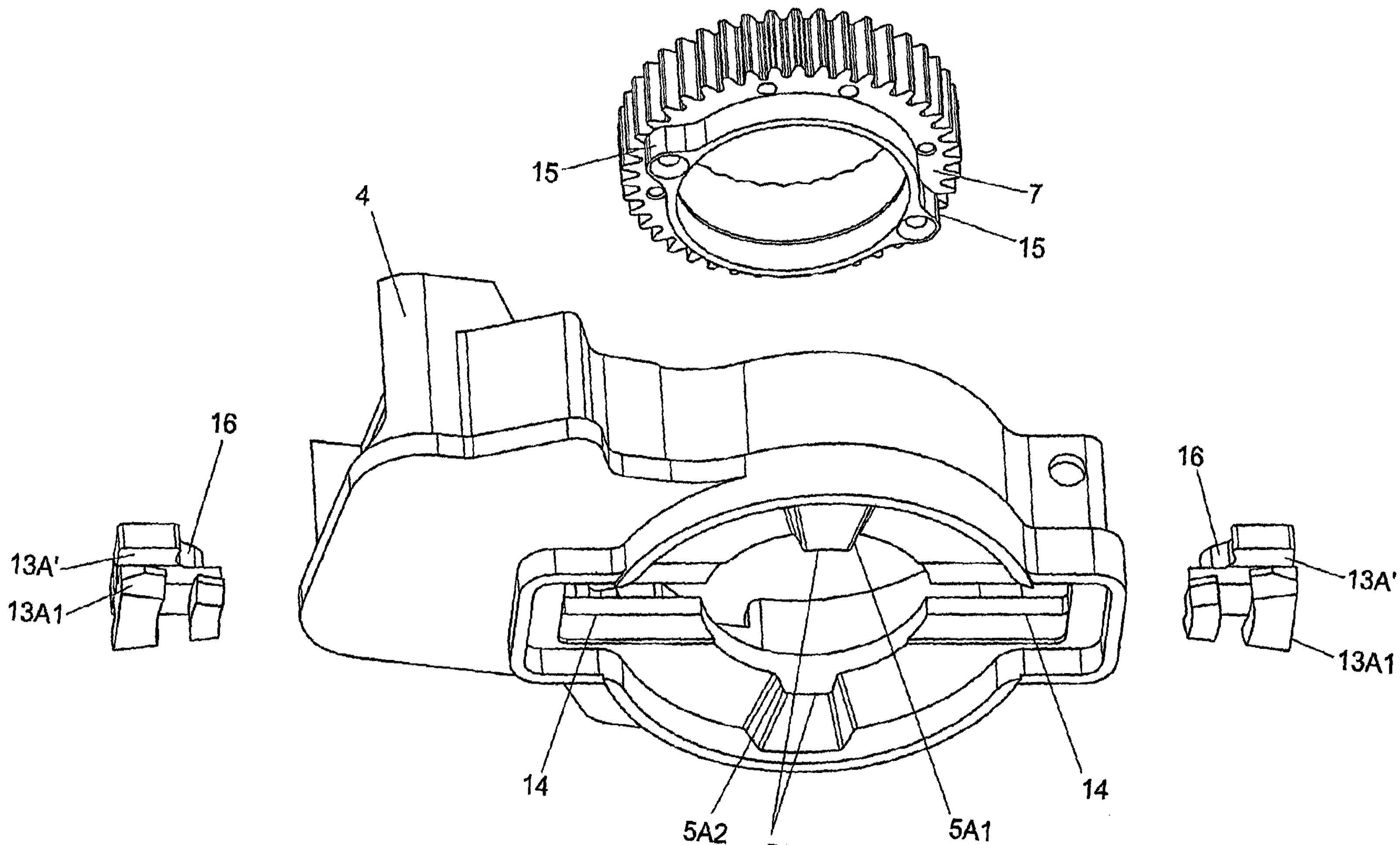


Fig. 2

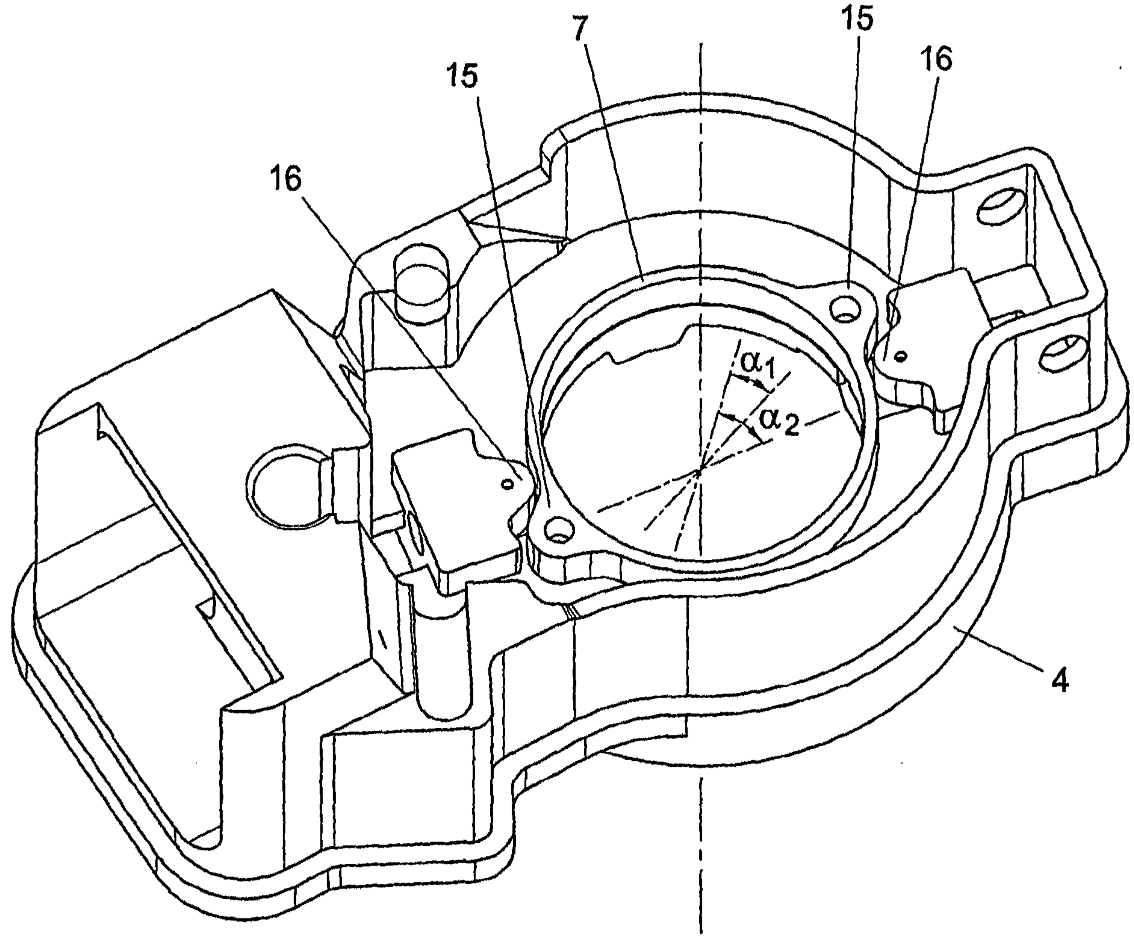


Fig. 3

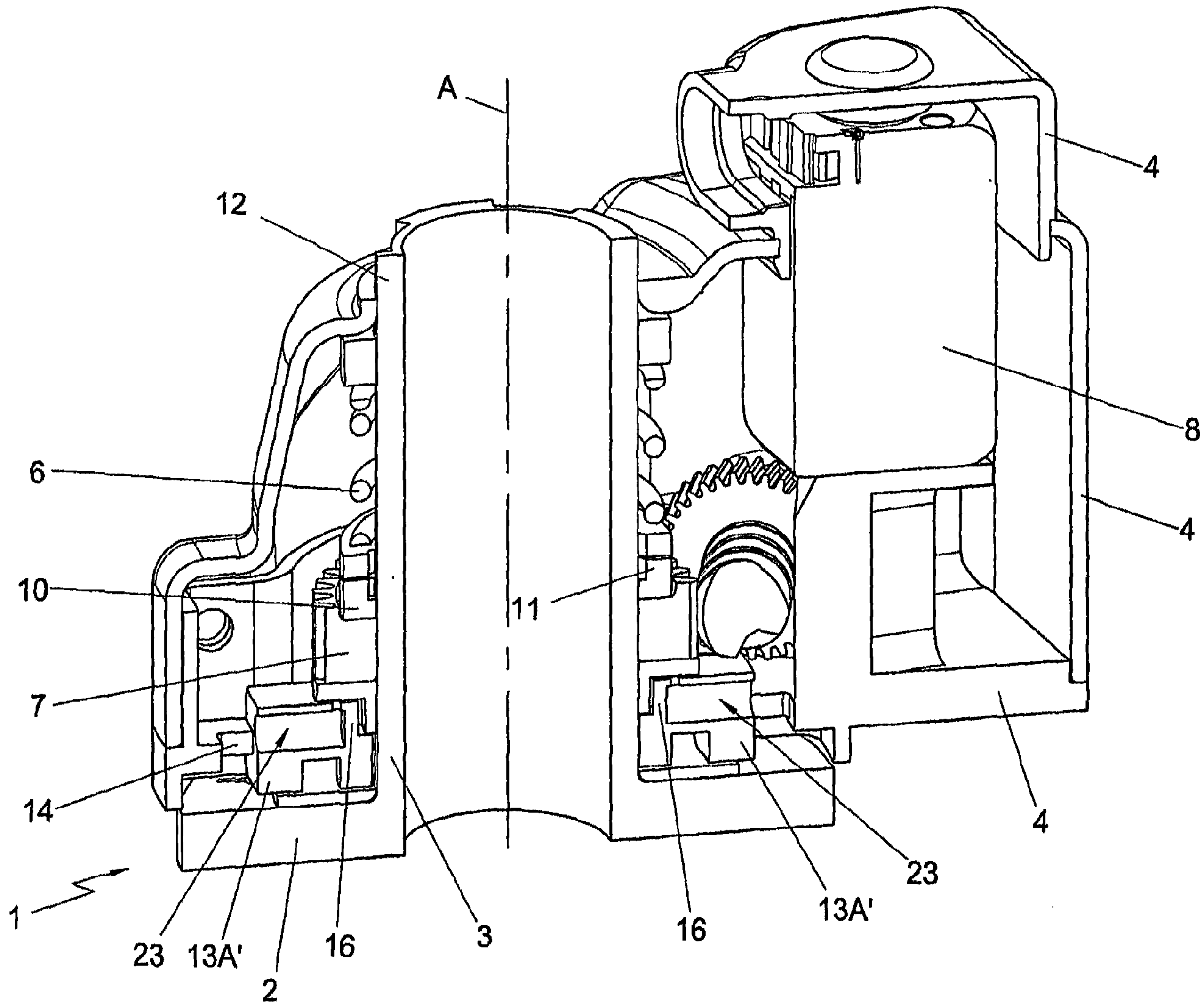


Fig. 4

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 1238858 A **[0002]**

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 017 127 A1

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
21.01.2009 Bulletin 2009/04

(21) Application number: **07014141.1**

(22) Date of filing: **19.07.2007**

(51) Int Cl.:
B60R 1/072 *(2006.01)*

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC MT NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK RS

(71) Applicant: **Visiocorp Patents S.à.r.l.**
1653 Luxembourg (LU)

(72) Inventors:
- **Tilg, Jürgen**
73230 Kirchheim/Teck (DE)
- **Flynn, Daniel Joseph**
Morphett Vale S.A. 5162 (AU)

(74) Representative: **Rausch, Gabriele**
Schefenacker Group Services GmbH
Hedelfinger Strasse 60
70327 Stuttgart (DE)

Remarks:
Amended claims in accordance with Rule 137(2) EPC.

(54) **Device to adjust the orientation of a mirror of a motorcar**

(57) A device (100) to adjust the orientation of a mirror of a motorcar, comprising a body (110, 6, 18) accommodating a first and a second electric motor (7, 8) and a first and a second gear (120, 121) driven by said first and second motor (7, 8) respectively, a reflective element support (4) pivot-mounted at the body (110, 6, 18) in relation to two pivot axles, at which reflective element support (4) two gear rods (17, 19) are arranged engaging with said gears (120, 121, 35), a first gear rod (17) engaging with the first gear (120, 35) to pivot the reflective element support (4) around a first pivot axle and a second gear rod (19) engaging with the second gear (121, 35) to pivot the reflective element support (4) around a second pivot axle. According to the invention, the gear rods (17, 19) are formed as circular arc sections each and the body (110, 6, 18) accommodates means (9) to springy press the first and second gear rod (17, 19) against the first and second gear (120, 121, 35) respectively, eliminating relative moving between the gearing of the gear rods (17, 19) and the gears (120, 121, 35) in operation conditions, and the gears (120, 121) comprise safety clutch means (10) each, allowing the gears (120, 121) to slip in overload conditions.

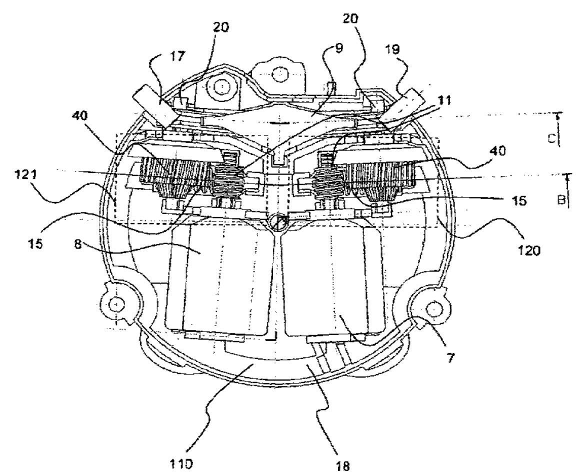


Fig. 15

EP 2 017 127 A1

Printed by Jouve, 75001 PARIS (FR)

Description

Technical field:

[0001] The invention relates to a device to adjust the orientation of a mirror of a motorcar according to the preamble of claim 1.

Background of the invention:

[0002] To adjust the orientation particularly of a door mirror of a motorcar, devices are known comprising electric motors whose shafts via motion transmission means are connected with a reflective element support, on which a reflective element, such as a mirror, is arranged.

[0003] In order to provide low cost light weight devices, most components, like e.g. body, reflective element support, transmission means such as gears and gear rods and the like, the bearing between the body and the reflective element support, are constructed from polymers including various plastics. With plastics, at least in comparison with metals, it is difficult to achieve required manufacturing tolerances, resulting in slackness and thus little movement or judder of the reflective element support around zero position. This leads to delayed response characteristics when adjusting the orientation of the mirror, since the electric motors in the very beginning of each adjustment procedure first have to break the slackness of the device, particularly of the transmission means. The slackness can also result in judder of the door mirrors at high speeds of a motorcar.

[0004] To counteract the judder, it is known to damp the movement of the reflective element support against the body by friction, disadvantageously resulting in abrasion and thus degeneration with increasing operating time.

[0005] From EP 0 596 182 A1 a device to adjust the orientation of a mirror of a motorcar is known, which comprises a body accommodating a first and a second electric motor and a first and a second worm drive driven by said first and second motor respectively. The device further comprises a reflective element support pivot-mounted at the body in relation to two perpendicular pivot axles, at which support two gear rods are arranged, each one engaging with said worm drives, a first gear rod engaging with the first worm drive to pivot the reflective element support around a first pivot axle and a second gear rod engaging with the second worm drive to pivot the reflective element support around a second pivot axle. Each gear rod is clipped on the reflective element support by inserting it into a mounting seat and engaging an end hole on a pivot. The latter is radially orientated towards the centre of the reflective element support and comprises a spherical projection on one of its ends retaining the gear rod on the pivot. This arrangement results in that the gear rod can commute in all directions relative to the reflective element support. To maintain the coupling between the commuting gear rods and the worm screws, springs are foreseen within the body. Disadvantageously this arrangement does not reduce slackness and thus judder because of the slackness of the commuting gear rods. A further disadvantage of this device is, that when manually adjusting the mirror, or, during overload conditions e.g. due to internal or external forces, the worm drives avoid back driving the gear and thus the electric motors. Due to this in overload conditions the springs have to allow the gear rods to disengage the worm drives and to skip their gearings. This results in noises and also abrasions of the gearing of the gear rods and worm drives.

[0006] From US 5,701,211 a device to adjust the orientation of a mirror of a motorcar is known, which comprises a body accommodating a first and a second electric motor and a first and a second gear train driven by said first and second motor respectively. The device further comprises a reflective element support pivot-mounted at the body in relation to two perpendicular pivot axles, at which support two gear rods are arranged, each one engaging with said gear trains, a first gear rod engaging with the first gear train to pivot the reflective element support around a first pivot axle and a second gear rod engaging with the second gear train to pivot the reflective element support around a second pivot axle. Each gear rod is mounted at the reflective element support by a ball head, allowing it to commute in any direction. In order to guide the gear rods in a duct through which they enter the body, a spring is arranged within said duct.

[0007] A disadvantage of all known devices is, that for a given angle of travel they require a relatively large, particularly deep installation space.

Object of the invention:

[0008] An object of the invention is to develop a device to adjust the orientation of a mirror of a motorcar requiring less installation space for a given angel of travel and having improved response characteristics, reduced abrasions in operation and overload conditions and reduced noises in overload conditions.

Disclosure of the invention and its advantages:

[0009] The object of the invention is met by a device to adjust the orientation of a mirror of a motorcar, comprising a body accommodating a first and a second electric motor and a first and a second gear driven by said first and second motor respectively. Said device further comprises a reflective element support pivot-mounted at the body in relation to two pivot axles, at which reflective element support two gear rods are arranged engaging with said gears, a first gear rod engaging with the first gear to pivot the reflective element support around a first pivot axle and a second gear rod engaging with the second gear to pivot the reflective element support around a second pivot axle. In order to reduce installation space requirements at a given angel of travel, the gear rods are formed as circular arc sections each, particularly reducing the depth of the device and allowing it to fit in a small space. The body of the device also accommodates means to springy press the first and second gear rod against the first and second gear respectively, eliminating relative moving between the gearing of the gear rods and the gears in operation conditions, and the gears comprise safety clutch means each, allowing the gears to slip in overload conditions.

[0010] The centre of the circular arc of the first gear rod has not to be the second pivot axle. Also each gear rod can be mounted in the support such that it can articulate. The gear teeth on each gear rod preferably are tapered to allow this movement in one direction. Movement in the other direction occurs as the gear rod rolls around the gear. The means to springy press the first and second gear rod against the first and second gear respectively preferably are positioned so that this movement is allowed.

[0011] Advantages of the invention over the state of the art are, that the means to springy press the gear rods against the gears improve the response characteristics of the device, since relative moving between the gearing of the gear rods and gears is eliminated. This results in a damping of the gears and gear rods instead of a damping of the reflective element support versus the body according to the state of the art. Compared to the state of the art, this damping is abrasion free and without degeneration over lifetime. Due to the safety clutch means abrasions of the gearing of the gear rods and gears and thus noises caused by overload conditions, like e.g. one or both gear rods and/or the reflective element support reach the end of their adjusting range, the reflective element and thus the reflective element support is exposed to external forces like e.g. manual pivoting during a manual adjustment, during repairs and the like, are eliminated. The safety clutch means thus allow using gears that are non-back drivable, such as gears having at least one worm drive, without hazarding the consequences of abrasions of such gears in overload conditions. In order to provide low cost lightweight gear trains, preferably gears constructed from polymers including various plastics are employed. The curved gear rods reduce installation space requirements of the device at a given angel of travel of the reflective element support. Particularly the curved gear rods reduce the depth of the device and allow it to fit in a small space.

[0012] The safety clutch means preferably comprise a disc spring having a friction face forced against a corresponding friction face on another gear train member. Disc springs or bellview washers are compact and low cost.

[0013] The safety clutch means preferably comprise a drive shaft, a torque transmission member co-axially mounted to the drive shaft, a clutch member operably connected to or integral with the torque transmission member and having a first friction face. The safety clutch means further comprise a disc spring mounted around the drive shaft and having a second friction face engaging the first friction face, a resilient retainer retaining the disc spring in a compressed condition in which the first and second friction faces are compressed together to allow torque transmission. The retainer includes a fractured ring having first and second ends resulting from the fracture, the ends adjacent and biased towards each other. The safety clutch means further preferably comprise a third friction face on the gear opposite of the first friction face and a cone on the shaft. Said cone has a fourth friction face against which the retainer via the disc spring presses the third friction face to improve torque transmission between the shaft and the gear. The advantage of this is that it lowers the spring force required to achieve a certain torque. This means that the pressure is lowered and therefore the clutch will wear less.

[0014] In a preferred embodiment of said invention, the gear rods are formed as circular arc sections each, wherein the centre of the circular arc section of the first gear rod is the first pivot axle and the centre of the circular arc section of the second gear rod is the second pivot axle, and wherein each gear rod is fixed arranged at the reflective element support at least in relation to the pivot axle around which it pivots the reflective element support and in relation to an axle perpendicular to the two pivot axles.

[0015] Thereby each, i.e. the first and the second gear rod preferably is pivot mounted in relation to the pivot axle around which the other, i.e. the second and the first gear rod pivots the reflective element support.

[0016] In another preferred embodiment of said invention, the means to springy press the first and second gear rod against the first and second gear respectively comprise one spring per gear rod and gear.

[0017] Preferably the spring is a leaf spring.

[0018] In an additional preferred embodiment of said invention, the means to springy press the first and second gear rod against the first and second gear respectively comprise a spring jack pressing the first gear rod against the first gear as well as pressing the second gear rod against the second gear.

[0019] The spring jack preferably comprises a spring jack support arranged within the body between the gear rods and the electric motors and/or the gears, a first extension with a first free end springy pressing the first gear rod against the first gear and a first fixed end connected with the spring jack support, plus a second extension with a second free end springy pressing the second gear rod against the second gear and a second fixed end connected with the spring jack support.

[0020] According to a particularly preferred embodiment of the invention, the pivot axles are arranged perpendicular to each other.

[0021] A specific embodiment of the invention will now be described in some further detail with reference to and as illustrated in the accompanying Figures in which:

Fig. 1	is an isometric view of a safety clutch means in form of a compact clutch assembly of a device according to the invention according to the invention.
Fig. 2	is an exploded view of the assembly of Fig. 1.
Fig. 3	is a front end view of the assembly of Fig. 1.
Fig. 4	is a side view of the assembly of Fig.1.
Fig. 5	is a rear end view of the assembly of Fig.1.
Fig. 6	is a cross sectional view through section lines 6-6 shown on Fig.3.
Fig. 7	is a cross sectional view through section line 7-7 shown on Fig.4.
Fig. 8	is an isometric view of a retaining ring component of the assembly of Fig.1.
Fig. 9	is an end view of the retainment of Fig.8.
Fig. 10	is a cross sectional view through section line 10-10 shown on Fig.9.
Fig. 10, 11 and 12	show progressive assembly of the assembly of Fig.1 in cross- sectional view.
Fig. 13	is an exploded view of a device according to the invention.
Fig. 14	shows a detail of the device of Fig. 13.
Fig. 15	shows a first cross section of the device of Fig. 13 in assembled condition.
Fig. 16	shows a second cross section of the device of Fig. 13 in assembled condition.
Fig. 17	shows a third cross section of the device of Fig. 13 in assembled condition.

[0022] A device 100 to adjust the orientation of a mirror of a motorcar shown in Figs. 13, 15, 16 and 17 comprises a body 110 having an upper half 6 and a lower half 18 accommodating a first and a second electric motor 7, 8 and a first and a second gear train 120, 121 driven by said first and second motor 7, 8 respectively. Each gear train 120, 121 comprises a worm drive 15 driven by one of the electric motors 7, 8. The worm drive 15 engages a gear 40 mounted on a drive shaft 20. An output gear 35 is integral part of the drive shaft 20. Said device 100 further comprises a reflective element support 4 pivot-mounted in a spherical pivot bearing 5 at the body 110 in relation to two pivot axles, arranged perpendicular to each other. At the reflective element support 4 two gear rods 17, 19 are arranged engaging with said gears 120, 121, a first gear rod 17 engaging with the first gear train 120 to pivot the reflective element support 4 around a first pivot axle and a second gear rod 19 engaging with the second gear train 121 to pivot the reflective element support 4 around a second pivot axle. In detail, each gear rod 17, 19 engages the output gear 35 of one of the two gears 120, 121. The body 110 of the device 100 also accommodates means 9 to springy press the first and second gear rod 17, 19 against the first and second gear train 120, 121 respectively, eliminating relative movement between the gearing of the gear rods 17, 19 and the gear trains 120, 121 in operation conditions. The gear trains 120, 121 comprise safety clutch means 10 each, allowing the gear trains 120, 121 to slip in overload conditions. In detail, the safety clutch means 10 allow the gear 40 to slip versus the drive shaft 20. The safety clutch means 10 are described in detail thereinafter. The body 110 further accommodates a carrier circuit 16 to electrically connect the electric motors 7, 8. The upper 6 and lower half 18 of the body 110 are held together by a single screw 1 which also fixes the reflective element support 4 in the spherical pivot bearing 5 at the body 110. To ensure tight and also movable mounting, a pivot spring 3 and a pivot ball 2 are foreseen via which the screw 1 holds the reflective element support 4 in the spherical pivot bearing 5 on the body.

[0023] The gear rods 17, 19 are formed as circular arc sections each, wherein the centre of the circular arc section of the first gear rod 17 is the first pivot axle, and the centre of the circular arc section of the second gear rod 19 is the second pivot axle. Each gear rod 17, 19 is fixed arranged at the reflective element support 4 at least in relation to the pivot axle around which it pivots the reflective element support 4 and in relation to an axle perpendicular to the two pivot axles. Thereby each, i.e. the first and the second gear rod 17, 19, preferably is pivot mounted in relation to the pivot axle around which the other, i.e. the second and the first gear rod 19, 17, pivots the reflective element support 4.

[0024] The means 9 to springy press the first and second gear rod 17, 19 against the first and second gear train 120, 121 respectively comprise a spring jack 9 pressing the first gear rod 17 against the output gear 35 of the first gear train 120 and pressing the second gear rod 19 against the output gear 35 of the second gear train 121.

[0025] The spring jack 9 shown in detail in Fig. 14 comprises a spring jack support 90 arranged within the body 110 between the gear rods 17, 19 and the electric motors 7, 8 and/or the gears 120, 121, a first extension 91 with a first free end 92 forming a shoulder springy pressing the first gear rod 17 against the output gear 35 of the first gear train 120 and a first fixed end 93 connected with the spring jack support 91, plus a second extension 94 with a second free end 95 also forming a shoulder springy pressing the second gear rod 19 against the output gear 35 of the second gear train 121 and a second fixed end 96 connected with the spring jack support 90.

[0026] Referring to Fig. 1 and 2, a safety clutch means 10 in form of a clutch assembly 10 is shown in detail. The assembly 10 includes a drive shaft 20, the shaft 20 having a plurality of shoulders 30. A torque transmission member the form of a helical gear 40 is coaxially mounted to the drive shaft 20. A clutch member 41 is integral with the gear 40 and has a first friction face 44. It is also thinkable that the clutch member 41 maybe separate from the torque transmission member 40. A disc spring 50, most clearly shown in Fig. 2, is mounted around the drive shaft 20 and has a second friction face 54 engaging the first friction face 44. A resilient retainer 60 retains the disc spring 50 in a compressed condition in which the first and second friction face 44 and 54 are compressed together to allow torque transmission between the shaft 20 and the gear 40 via a third friction face 46 on the gear 40 opposite of the first friction face 44 and a fourth friction face 22 on a cone 24 on the shaft 20 (Fig. 6). The retainer is characterized in that it includes a fractured ring having first and second ends 62 and 64, the ends resulting from a fracture and the ends being biased towards each other. The ends 62 and 64 are biased toward each other by the resilience of the material from which the retainer 60 is constructed.

[0027] The retainer 60 can be constructed from various materials. In the embodiment of the invention shown, the retainer is constructed from plastic including a stiffening additive.

[0028] Stiffening additives such as carbon and glass fiber may be used. Various plastics including nylon and Polytetrafluoroethylene (PTFE) may be used.

[0029] Referring now to Fig. 4, operation of the compact clutch assembly will now be described. A worm drive 15 driven by an electric motor 7 or 8, depending on to which gear train 120, 121 the worm drive 15 belongs, is operably connected to the gear 40 to drive it around the axis 21 of the shaft 20. A double reduction worm gear train comprising the worm drive 15 and a worm drive 11 on the shaft of the electric motor 7 or 8 (Fig. 13 and Fig. 15) is employed between the motor 7 or 8 and gear 40 to achieve the desired gearing.

[0030] In normal operation, the shaft 20 rotates with the gear 40 by virtue of the friction between the first friction face 44 of the clutch area 41 of the gear 40 engaging with the second friction face 54 on the disc spring 50. The disc spring 50 is keyed to the shaft 20 by virtue of tabs 57 that key into corresponding slots 27 on shaft 20 as can most clearly can be seen in Figs. 2 and 3. Output gear 35 is keyed to the disc spring 50 through slots 27. Thus, as the disc spring 50 rotates with the gear 40, the output gear 35 also rotates. The output gear 35 mates with a gear rod 17, 19 that drives a reflective element support 4 (Fig. 13). A reflective element mounted on that support 4 typically is a mirror. When an operator manually moves the mirror thereby causing the gear rod 17, 19 to drive the output gear 35, the disc spring 50 slips against the friction face 44 of the gear and clutch components 40 and 41. This slippage prevents damage of the non-back drivable worm drive 15 meshing with the gear 40.

[0031] It is important to mention that the disc spring 50 is correctly compressed between the friction face 44 of the clutch member 41 and the retainer 60 so that an appropriate level torque can be transmitted without slippage. There must be sufficient torque to allow the gear trains 120, 121 to drive the reflective element support 4 against secretions such as dirt and ice. On the other hand, the torque transmission should not be too high otherwise damage may occur to the gear trains 120, 121 when an operator manually attempts to override the mechanism by pressing on the surface of e.g. the mirror glass. The retainer 60 of the invention is important in achieving the goal of appropriate torque transmission that is torque transmission within a specified tolerance.

[0032] Referring now to Figs. 8, 9 and 10, the retainer 60 is shown in more detail. The retainer 60 includes a necked region 63 that will preferentially fracture when sufficient hoop stress is applied.

[0033] A method of assembling the compact clutch assembly will now be described with reference to Figs. 2, 11, 12 and 13. A clutch member 41 mounted around a drive shaft 20 is provided. The clutch member has a first friction face 44. A disc spring 50 is mounted around the shaft so that a second friction face 54 is engagable with the first friction face

44. An annular retainer 60 is then forced in an axial direction against the ramped faces 31 of the shoulders 30 and the spring 50 so as to create sufficient hoop stress to create a fracture through the retainer 50, at necked region 63, the fracture allowing the retainer 50 to expand and pass over the shoulders 30. This is shown progressively in Figs. 11, 12 and 13.

[0034] The necked area 63 of the retainer 60 is designed such that it acts as a complete hoop during assembly to enable the retainer 60 to centralize itself on the ramped faces 31 of the shoulders 30. Once the retainer 60 has centralized itself with respect to the ramped surfaces 31 and the drive shaft axis 21, the assembly force progressively increases and the retainer splits at the necked area 63.

[0035] After fracturing and passing over the shoulders 30 the newly formed ends 62 and 64 (shown in Fig. 1) snap towards each other due to the resilience of the retainer 60. The fractured retainer 60 is then seated between the undercut faces 32 of the shoulders 30 and the disc spring 50 to thereby retain the spring 50 as is shown in Fig. 1.

[0036] Referring to Fig. 12, the retainer 60 is shown in its fractured state passing over the outer faces 33 of the shoulders 30. Because the retainer 60 is now fractured, the compressive force it exerts on the outer faces 33 of the shoulders 30 is relatively small. This ensures that damage to the shoulders 30 is minimized and that the exact position of the retainer 60 when it reaches the position under the undercut face 32 is predictable and controllable. This in turn means that the degree of compression of the spring 50 between the retainer 60 and the gear 40 is predictable and controllable.

[0037] The afore-mentioned centralizing of the retainer 60 and subsequent splitting of the retainer 60 eliminates or at least reduces damage to the ramped faces 31, the outer faces 33 and the under cut faces 32 of the shoulders 30. The effect of this is to more predictably and controllably compress the spring 50 between the retainer 60 and the gear 40. In turn, this means that the clutch force can be more accurately set therefore enabling mass production of the clutch assembly 10 while meeting exacting torque transmission and clutching characteristics.

[0038] While the present invention has been described in terms of preferred embodiments in order to facilitate better understanding of the invention, it should be appreciated that the various modifications can be made without departing from the principles of the invention. Therefore, the invention should be understood to include all such modifications within its scope.

Claims

1. Device (100) to adjust the orientation of a mirror of a motorcar, comprising a body (110, 6, 18) accommodating a first and a second electric motor (7, 8) and a first and a second gear (120, 121) driven by said first and second motor (7, 8) respectively, a reflective element support (4) pivot-mounted at the body (110, 6, 18) in relation to two pivot axles, at which reflective element support (4) two gear rods (17, 19) are arranged engaging with said gears (120, 121, 35), a first gear rod (17) engaging with the first gear (120, 35) to pivot the reflective element support (4) around a first pivot axle and a second gear rod (19) engaging with the second gear (121, 35) to pivot the reflective element support (4) around a second pivot axle, **characterized in that** the gear rods (17, 19) are formed as circular arc sections each and the body (110, 6, 18) accommodates means (9) to springy press the first and second gear rod (17, 19) against the first and second gear (120, 121, 35) respectively, eliminating relative movement between the gearing of the gear rods (17, 19) and the gears (120, 121, 35) in operation conditions, and the gears (120, 121) comprise safety clutch means (10) each, allowing the gears (120, 121) to slip in overload conditions.

2. Device according to claim 1, **characterized in that** the safety clutch means (10) comprise a disc spring (50) having a friction face (54) forced against a corresponding friction face (44) on another gear train (120, 121) member (40).

3. Device according to claim 2, **characterized in that** the safety clutch means (10) comprise a drive shaft (20), a torque transmission member (40) co-axially mounted to the drive shaft (20), a clutch member (41) operably connected to or integral with the torque transmission member (40), the clutch member (41) having a first friction face (44), a disc spring (50) mounted around the drive shaft (20) and having a second friction face (54) engaging the first friction face (44), a resilient retainer (60) retaining the disc spring (50) in a compressed condition in which the first (54) and second friction faces (44) are compressed together to allow torque transmission, wherein the retainer (60) includes a fractured ring having first and second ends (62, 64) resulting from the fracture, the ends (62, 64) adjacent and biased towards each other.

4. Device according to claim 3, **characterized in that** the safety clutch means further comprise a third friction face (46) on the gear (40) opposite of the first friction face (44) and a cone (24) on the shaft (20), said cone (24) having a fourth friction face (22) against which the retainer (60) via the disc spring presses the third friction face (46) to improve torque transmission between the shaft (20) and the gear (40).

5. Device according to one of the previous claims, **characterized in that** the centre of the circular arc section of the first gear rod (17) is the first pivot axle and the centre of the circular arc section of the second gear rod (19) is the second pivot axle, and wherein each gear rod (17, 19) is fixed arranged at the reflective element support (4) at least in relation to the pivot axle around which it pivots the reflective element support (4) and in relation to an axle perpendicular to the two pivot axles.

6. Device according to claim 5, **characterized in that** each gear rod (17, 19) is pivot mounted in relation to the pivot axle around which the other gear rod (19, 17) pivots the reflective element support (4).

7. Device according to one of the previous claims, **characterized in that** the means (9) to springy press the first and second gear rod (17, 19) against the first and second gear (120, 121, 35) respectively comprise one spring per gear rod (17, 19) and gear (120, 121, 35).

8. Device according to claim 7, **characterized in that** the spring is a leaf spring.

9. Device according to one of the claims 1 to 6, **characterized in that** the means (9) to springy press the first and second gear rod (17, 19) against the first and second gear (120, 121, 35) respectively comprise a spring jack (9) pressing the first gear rod (17) against the first gear (120, 35) as well as pressing the second gear rod (19) against the second gear (121, 35).

10. Device according to claim 9, **characterized in that** the spring jack (9) comprises a spring jack support (90) arranged within the body (110, 6, 18) between the gear rods (17, 19) and the electric motors (7, 8) and/or the gears (120, 121), a first extension (91) with a first free end (92) springy pressing the first gear rod (17) against the first gear (120, 35) and a first fixed end (93) connected with the spring jack support (90), plus a second extension (94) with a second free end (95) springy pressing the second gear rod (19) against the second gear (121, 35) and a second fixed end (96) connected with the spring jack support (90).

11. Device according to one of the previous claims, **characterized in that** the pivot axles are arranged perpendicular to each other.

Amended claims in accordance with Rule 137(2) EPC.

1. Device (100) to adjust the orientation of a mirror of a motorcar, comprising a body (110, 6, 18) accommodating a first and a second electric motor (7, 8) and a first and a second gear (120, 121) driven by said first and second motor (7, 8) respectively, a reflective element support (4) pivot-mounted at the body (110, 6, 18) in relation to two pivot axles, at which reflective element support (4) two gear rods (17, 19) are arranged engaging with said gears (120, 121, 35), a first gear rod (17) engaging with the first gear (120, 35) to pivot the reflective element support (4) around a first pivot axle and a second gear rod (19) engaging with the second gear (121, 35) to pivot the reflective element support (4) around a second pivot axle, wherein gear rods (17, 19) are formed as circular arc sections each and the body (110, 6, 18) accommodates means (9) to springy press the first and second gear rod (17, 19) against the first and second gear (120, 121, 35) respectively, eliminating relative movement between the gearing of the gear rods (17, 19) and the gears (120, 121, 35) in operation conditions, and the gears (120, 121) comprise safety clutch means (10) each, allowing the gears (120, 121) to slip in overload conditions, **characterized in that** the safety clutch means (10) comprise a disc spring (50) having a friction face (54) forced against a corresponding friction face (44) on another gear train (120, 121) member (40).

2. Device according to claim 1, **characterized in that** the safety clutch means (10) comprise a drive shaft (20), a torque transmission member (40) co-axially mounted to the drive shaft (20), a clutch member (41) operably connected to or integral with the torque transmission member (40), the clutch member (41) having a first friction face (44), a disc spring (50) mounted around the drive shaft (20) and having a second friction face (54) engaging the first friction face (44), a resilient retainer (60) retaining the disc spring (50) in a compressed condition in which the first (54) and second friction faces (44) are compressed together to allow torque transmission, wherein the retainer (60) includes a fractured ring having first and second ends (62, 64) resulting from the fracture, the ends (62, 64) adjacent and biased towards each other.

3. Device according to claim 2, **characterized in that** the safety clutch means further comprise a third friction face (46) on the gear (40) opposite of the first friction face (44) and a cone (24) on the shaft (20), said cone (24) having a fourth friction face (22) against which the retainer (60) via the disc spring presses the third friction face (46) to improve torque transmission between the shaft (20) and the gear (40).

4. Device according to one of the previous claims, **characterized in that** the centre of the circular arc section of the first gear rod (17) is the first pivot axle and the centre of the circular arc section of the second gear rod (19) is the second pivot axle, and wherein each gear rod (17, 19) is fixed arranged at the reflective element support (4) at least in relation to the pivot axle around which it pivots the reflective element support (4) and in relation to an axle perpendicular to the two pivot axles.

5. Device according to claim 4, **characterized in that** each gear rod (17, 19) is pivot mounted in relation to the pivot axle around which the other gear rod (19, 17) pivots the reflective element support (4).

6. Device according to one of the previous claims, **characterized in that** the means (9) to springy press the first and second gear rod (17, 19) against the first and second gear (120, 121, 35) respectively comprise one spring per gear rod (17, 19) and gear (120, 121, 35).

7. Device according to claim 6, **characterized in that** the spring is a leaf spring.

8. Device according to one of the claims 1 to 5, **characterized in that** the means (9) to springy press the first and second gear rod (17, 19) against the first and second gear (120, 121, 35) respectively comprise a spring jack (9) pressing the first gear rod (17) against the first gear (120, 35) as well as pressing the second gear rod (19) against the second gear (121, 35).

9. Device according to claim 8, **characterized in that** the spring jack (9) comprises a spring jack support (90) arranged within the body (110, 6, 18) between the gear rods (17, 19) and the electric motors (7, 8) and/or the gears (120, 121), a first extension (91) with a first free end (92) springy pressing the first gear rod (17) against the first gear (120, 35) and a first fixed end (93) connected with the spring jack support (90), plus a second extension (94) with a second free end (95) springy pressing the second gear rod (19) against the second gear (121, 35) and a second fixed end (96) connected with the spring jack support (90).

10. Device according to one of the previous claims, **characterized in that** the pivot axles are arranged perpendicular to each other.

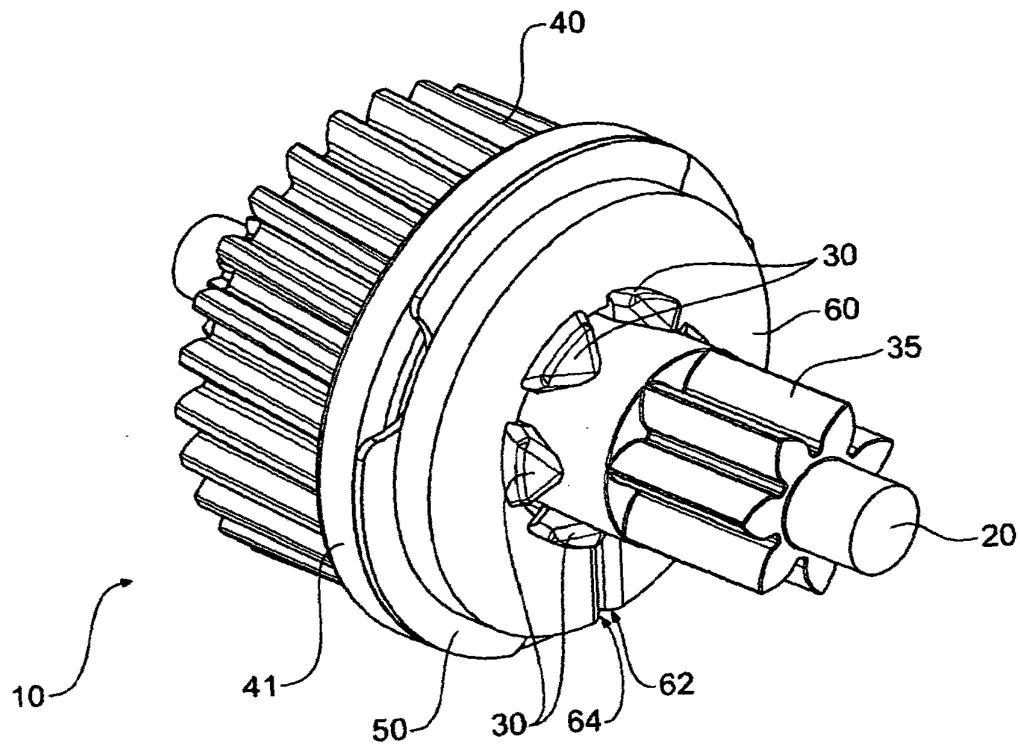


Fig 1

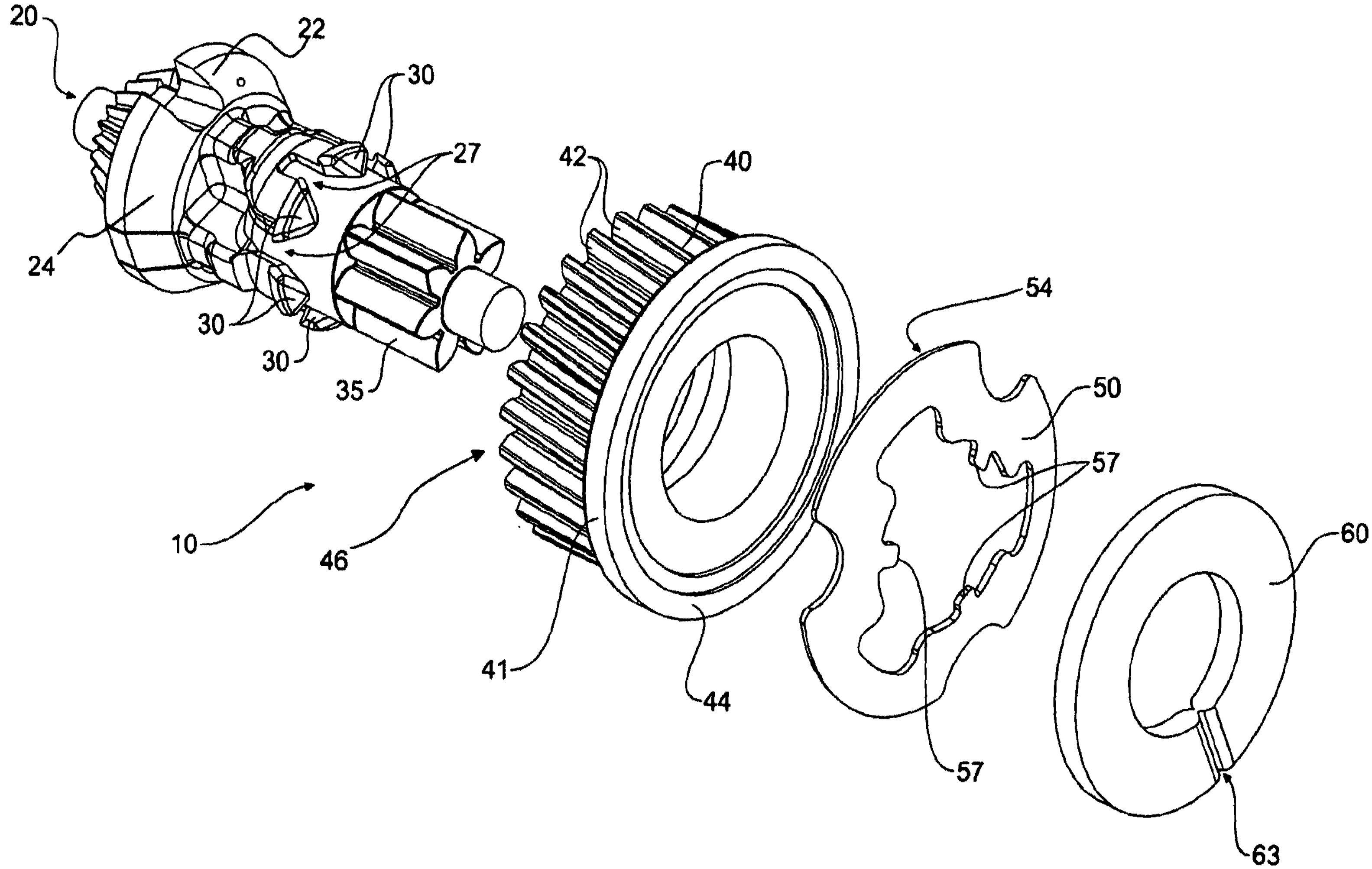


Fig 2

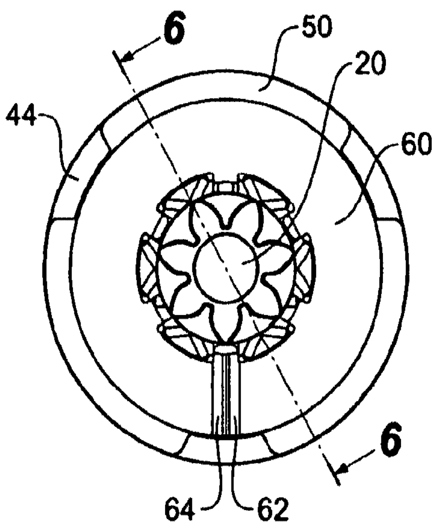


Fig 3

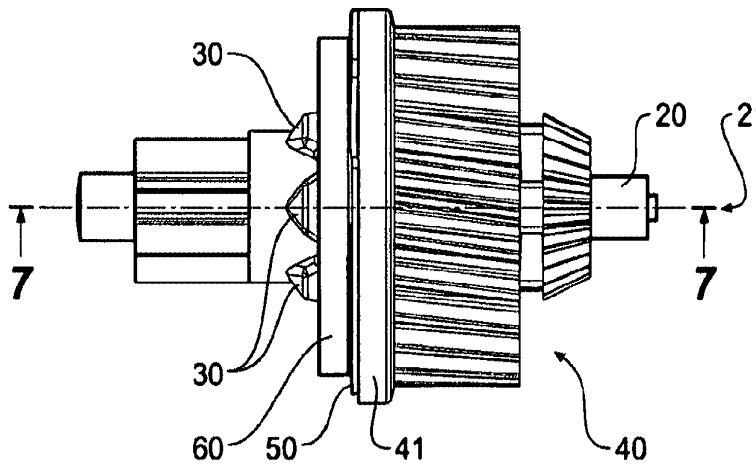


Fig 4

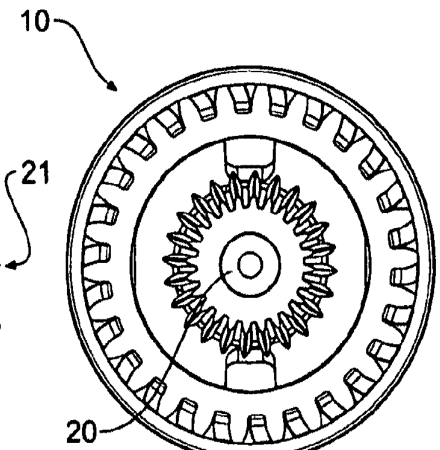


Fig 5

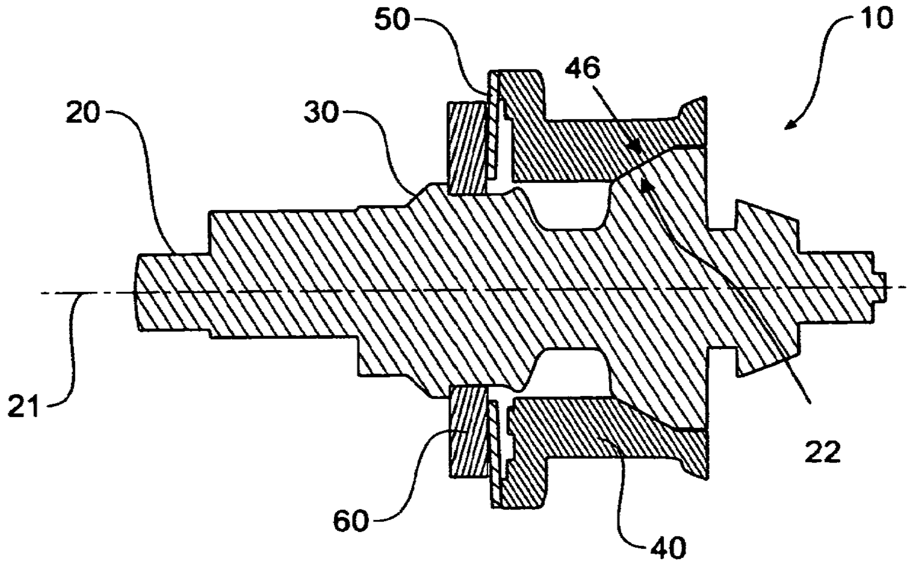


Fig 6

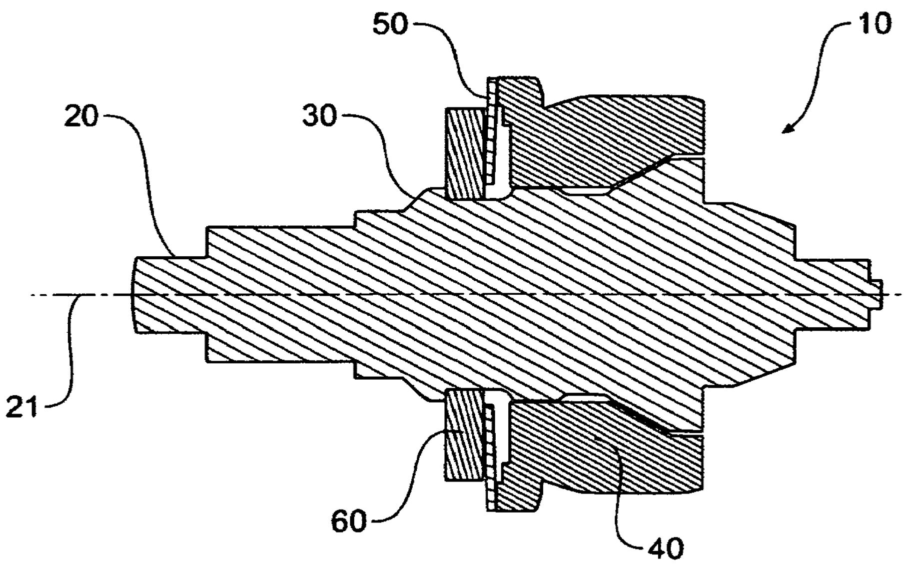


Fig 7

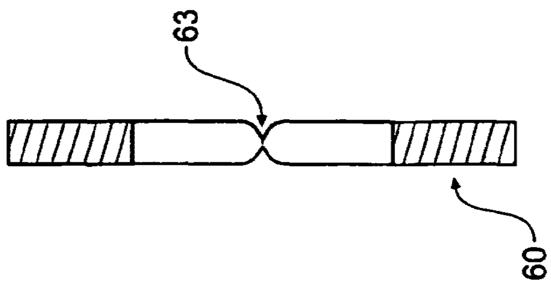


Fig 10

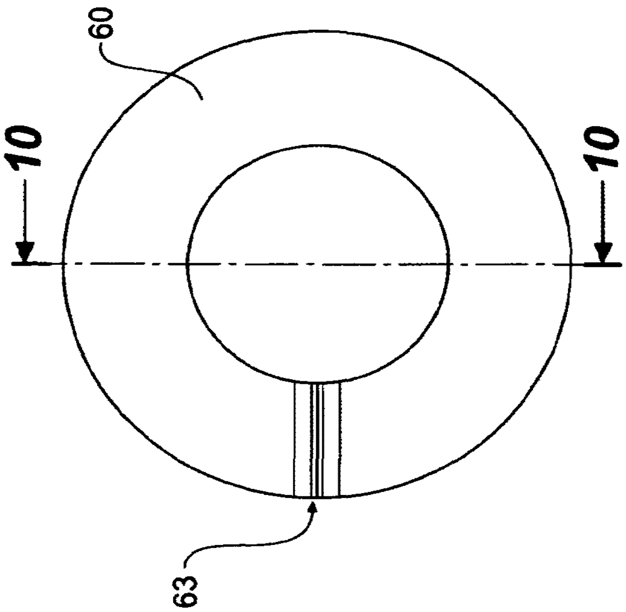


Fig 9

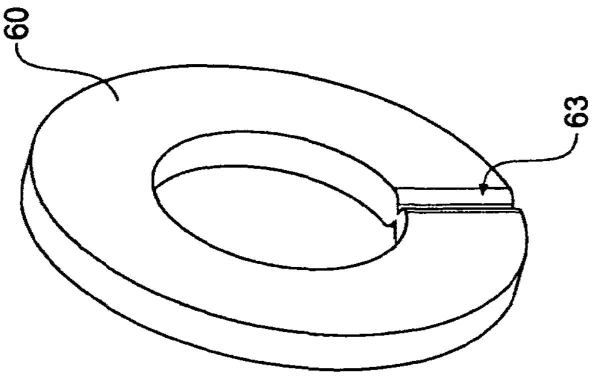


Fig 8

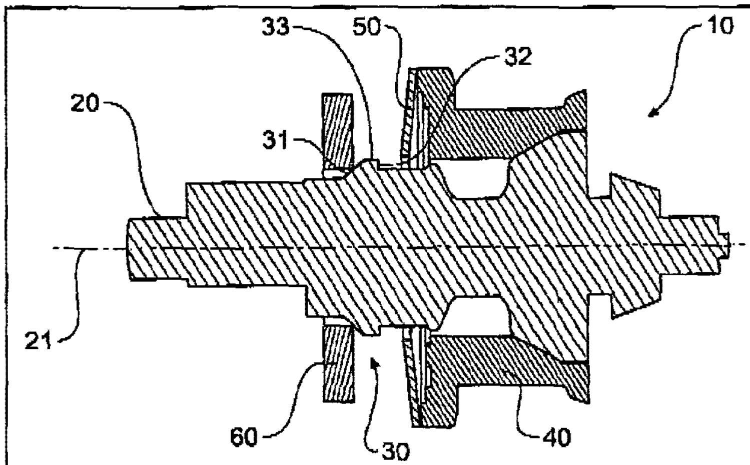


Fig 11

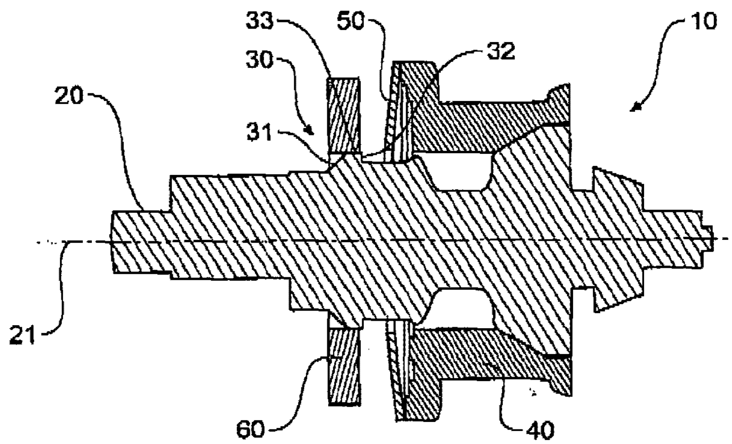


Fig 12a

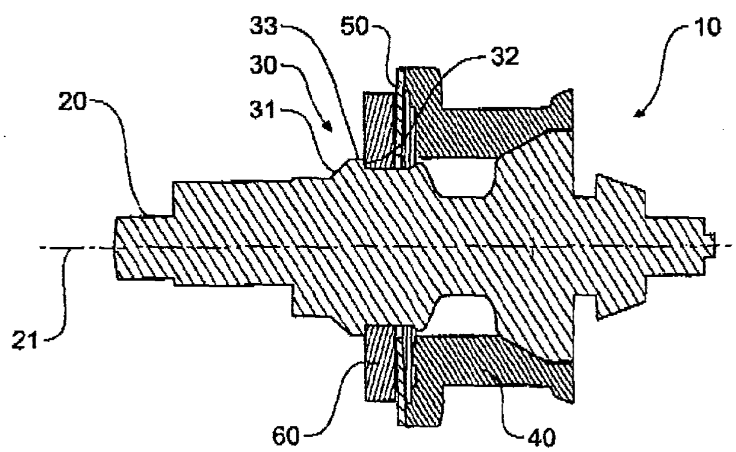


Fig 12b

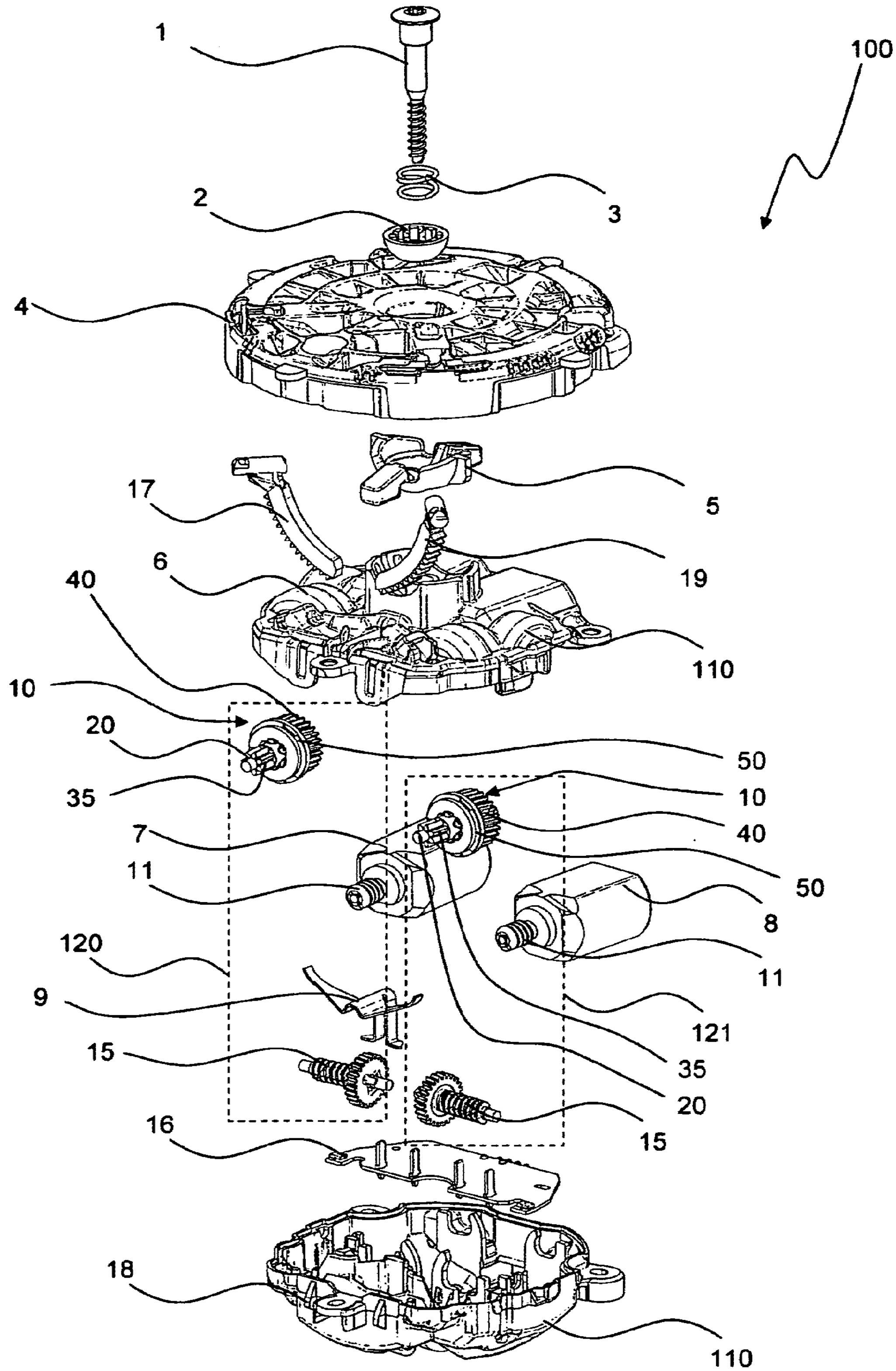

1
100
2
3
4
5
17
19
6
40
110
10
20
50
35
10
7
40
11
50
8
11
120
121
9
35
15
20
15
16
18
110

Fig 13

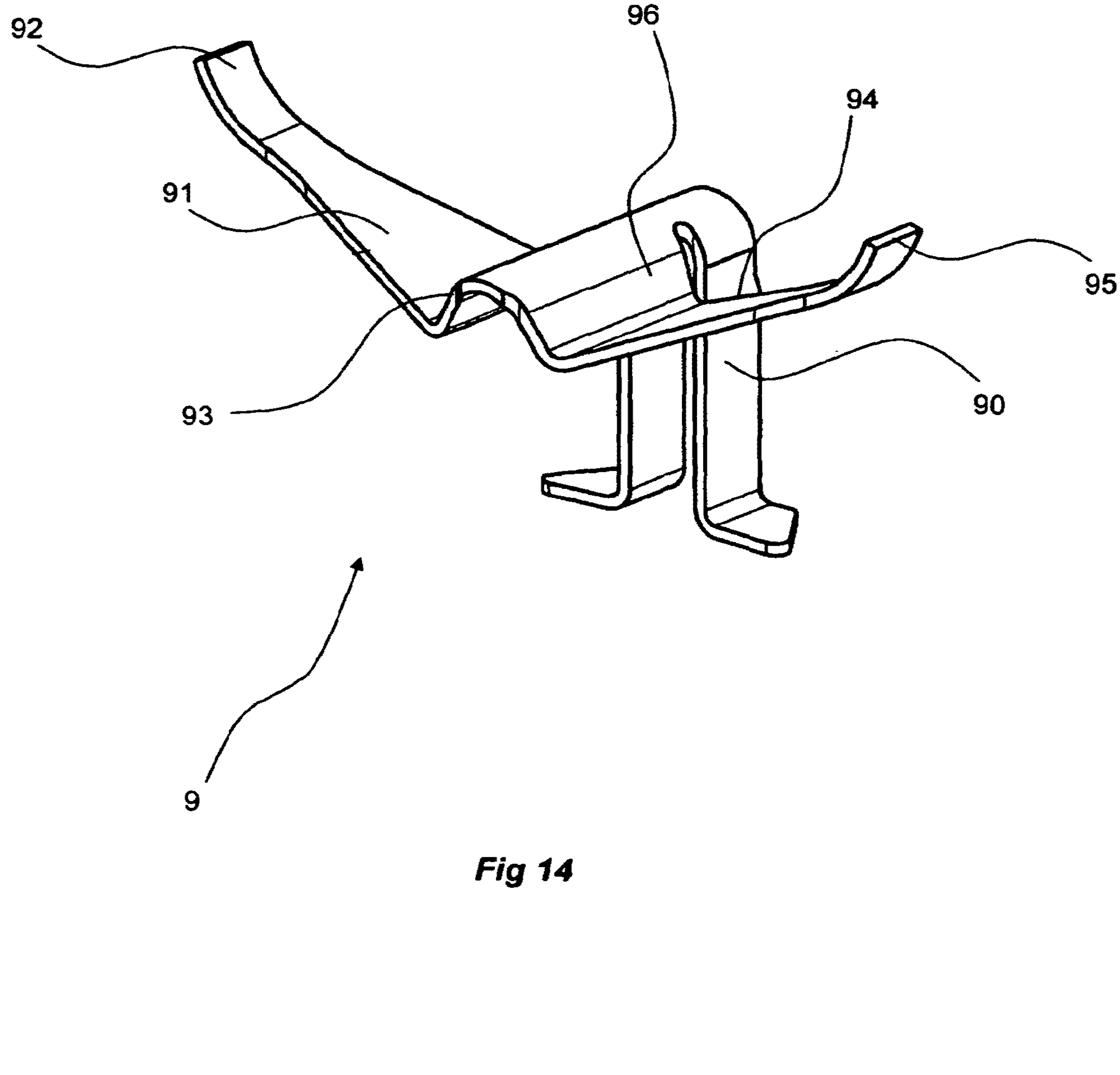


Fig 14

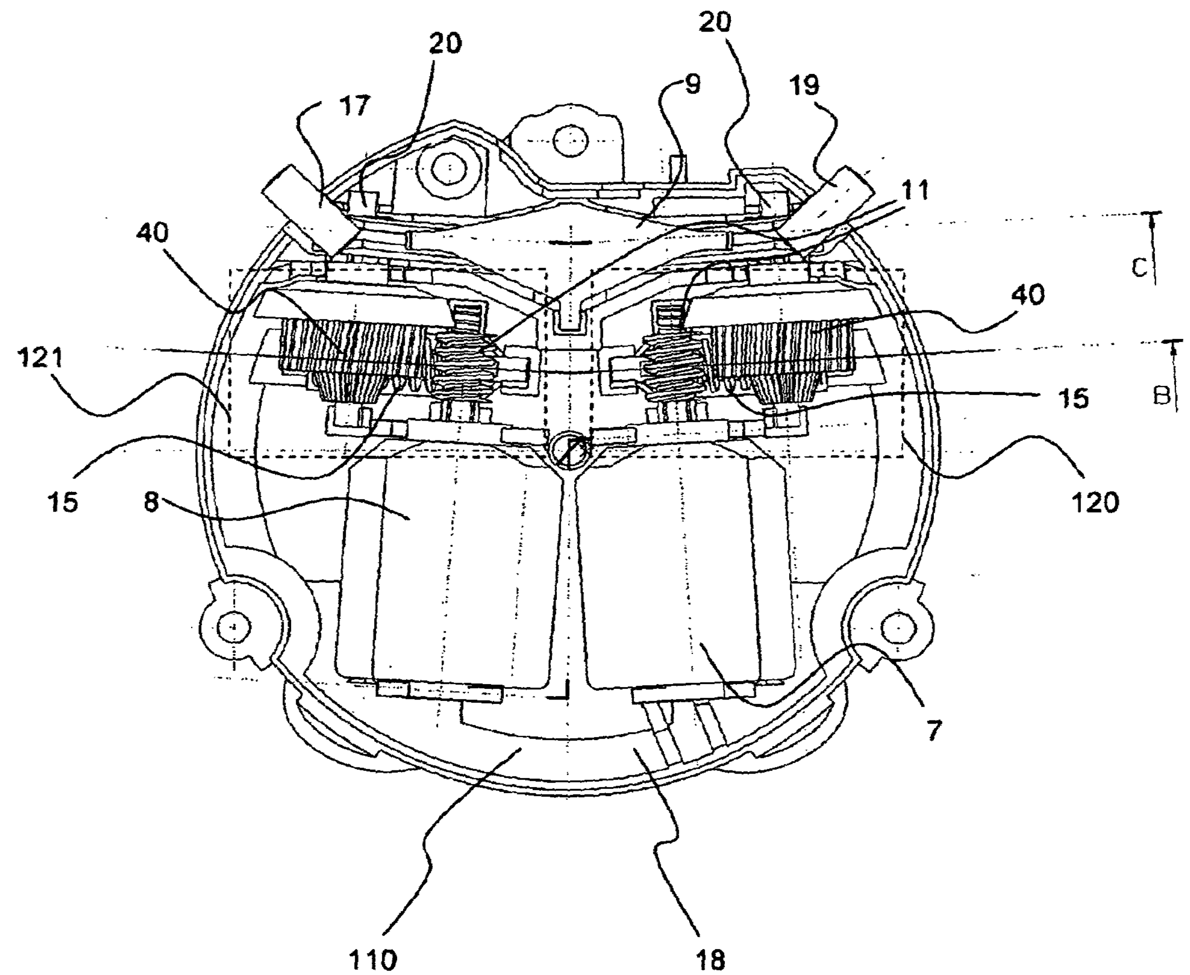


Fig. 15

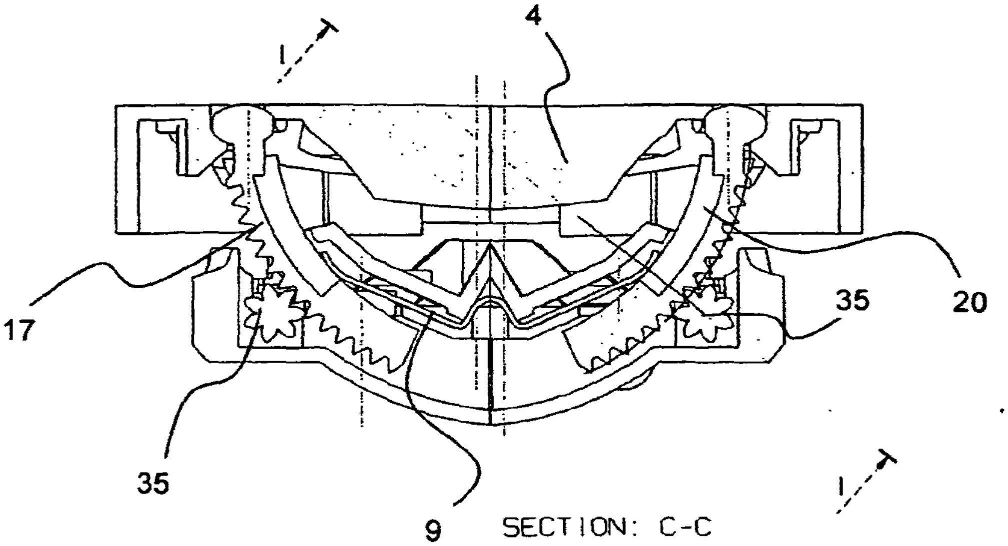


Fig 16

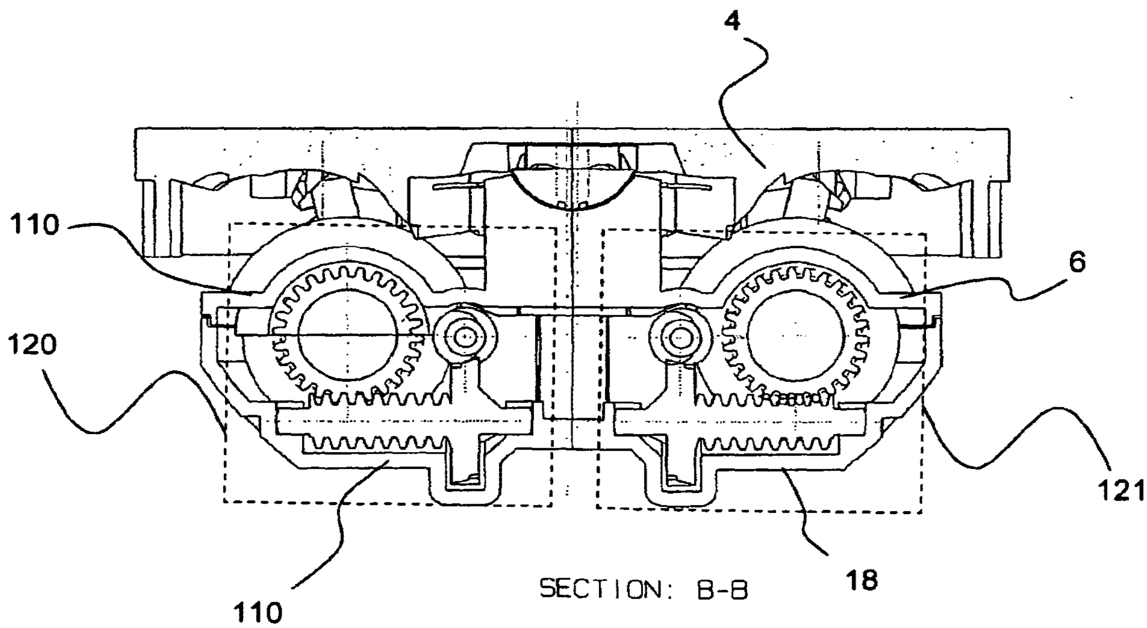


Fig 17

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 01 4141

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2006/045159 A (SCHEFENACKER VISION SYS AU [AU]; DAVIES GRAHAM [AU]; TILG JURGEN [AU];) 4 May 2006 (2006-05-04)	1,5-11	INV. B60R1/072
Y	* the whole document *	2-4	
Y	DE 39 14 334 A1 (KIENZLE UHRENFABRIKEN GMBH [DE]) 31 October 1990 (1990-10-31)	2-4	
A	* column 3, line 66 - column 4, line 26; figure 2b *	1	
A	US 2005/099710 A1 (RO HYUK-JOON [KR]) 12 May 2005 (2005-05-12) * paragraph [0028] - paragraph [0063]; figures 1-5 *	1-5	
A	DE 103 08 067 A1 (EM KUNSTSTOFFTECHNIK GMBH [DE]) 9 September 2004 (2004-09-09) * paragraph [0046] - paragraph [0057]; figure 1 *	1,7-11	
			TECHNICAL FIELDS SEARCHED (IPC)
			B60R

The present search report has been drawn up for all claims

1

Place of search	Date of completion of the search	Examiner
The Hague	17 December 2007	Burley, James

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons
& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 07 01 4141

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

17-12-2007

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2006045159 A	04-05-2006	NONE	
DE 3914334 A1	31-10-1990	NONE	
US 2005099710 A1	12-05-2005	NONE	
DE 10308067 A1	09-09-2004	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 0596182 A1 **[0005]**
- US 5701211 A **[0006]**

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 165 886 A1

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
24.03.2010 Bulletin 2010/12

(51) Int Cl.:
B60R 1/074 (2006.01) ***B60R 1/06*** (2006.01)

(21) Application number: **08164588.9**

(22) Date of filing: **18.09.2008**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT RO SE SI SK TR
Designated Extension States:
AL BA MK RS

(71) Applicant: **SMR Patents S.à.r.l.**
1653 Luxembourg (LU)

(72) Inventor: **Negel, Raimund**
72669 Unterensingen (DE)

(74) Representative: **Rausch, Gabriele et al**
SMR Automotive Services GmbH
Patents and Standards
Hedelfinger Strasse 60
70327 Stuttgart (DE)

Remarks:
Amended claims in accordance with Rule 137(2) EPC.

(54) **Rear view mirror**

(57) The invention is related to a rear view mirror attached to a vehicle comprising a mirror housing. The reflective element is fixed in relation to the mirror housing and the mirror housing is movable versus the vehicle by separately extendable elements.

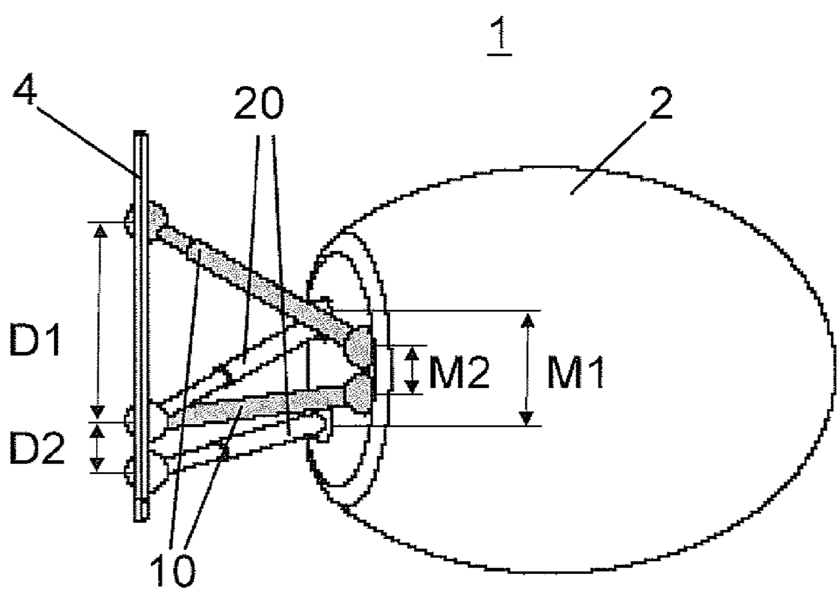


Fig. 3

EP 2 165 886 A1

Description

[0001] The invention is related to a rear view mirror as it is used for vehicles that allow overcoming a couple of problems with existing technical designs. More specially is the invention related to a rear view mirror attached to a vehicle with a mirror housing comprising a reflective element. The reflective element is fixed in relation to the mirror housing and the mirror housing is movable versus the vehicle by separately elonagable elements.

[0002] The invention also related to a method to adjust a rear view mirror.

Prior Art

[0003] Rear view mirrors are designed in different designs, but all designs have the objective to provide a rear view field as defined in national or international regulations. Moreover a modern mirror has to offer electrical glass actuation to optimize the rear view field in relation to the driver. More and more mirror assemblies offers electrical power fold functions with the intention to narrow the width of a vehicle at least in parking position or small streets.

On the other side a lot of telescoping mirrors are know that allow to extend the view of a driver with a vehicle towing a trailer.

[0004] To achieve all this functions a common modern rear view mirror needs a glass actuator for adapting the mirror glass in relation to the rigid housing of the rear view mirror. For the power fold function a rear view mirror needs an additional actuator and a special design in the mirror base that allows a manual folding of the head in back and forth position according regulations and an electrical driven function for the parking position.

[0005] For a telescoping rear view mirror a third actuator is necessary to extend an arm attached to the base of the mirror along this arm's length.

[0006] The inventional idea solves all these functional requests by mounting a mirror housing with at least three telescoping connections to a vehicle.

[0007] In prior art positioning of products of tools are known from robotic applications. For example the EP 0314839 discloses a positioning apparatus with elongable elements positioned in one plane. The elongable elements are pivotally mounted to a support and at least in part pivotally mounted to the element to be positioned.

[0008] The telescoping elements in form of an electrical cylinder with a fixed outer housing and a screw driven internal member which is translated in the direction of the housing are available on the market for several purposes.

[0009] The invention uses these elongable elements to provide a rear view mirror as it is attached to a vehicle with a fixed reflective element in relation to the housing and a three dimensional motion possibility to achieve the functionalities of a rear view mirror.

[0010] Preferably the rear view mirror comprises a fixed reflective mirror. The fixed mirror opens design possibilities and better technical solutions.

The high dimensional movement of the mirror head due to the elongable elements allows positioning the complete mirror head together with the fixed reflective element in relation to the vehicle's driver and to achieve the view filed as defined in several regulations.

In this function the commonly used mirror glass actuator is obsolete. To save the actuator device results in a weight reduction of the mirror head and a reduction of the need to have a die cast base element in the mirror. The overall weight reduction is high.

[0011] The number of elongable elements is preferably three or four elements that control the relative position of mirror head versus drivers' position.

[0012] Preferably the reflective element is a plastic glass coated with a metal layer. The advantage is again the weight of the whole mirror head that in a basic version of the rear view mirror only comprises the plastic housing optimized to the design and the aerodynamic needs.

[0013] In addition a rear view mirror according the invention saves a power fold actuator in the mirror base.

[0014] In another advantageous embodiment the rear view mirror is covered with a fabric cover to hide the elongable elements and a harness for connecting electrical functions in the mirror head.

The method to adjust the rear view mirror according the invention allows to fold the rear view mirror in travelling direction and in counter direction without the conventional power fold actuator.

This results in another weight reduction.

Short Description of Invention

[0015] The following figures describe the invention but do not restrict the invention to the embodiments. The invention encloses further all equivalent solutions a person skilled in art would know.

Fig. 1 to 5 shows a left rear view mirror in driving position in different views.

Fig. 6 to 10 shows a rear view mirror in a fold away position.

Fig. 11 to 15 shows a rear view mirror in park position

Fig. 16 to 18 shows a rear view mirror with a fabric cover

[0016] Figure 1 show the inventional rear view mirror 1. The rear view mirror has two main elements: a mirror housing 2 and the elongable elements 10 and 20. The elongabale elements are attached to a support 4 at the vehicle. The attachment is a pivotable connection to the support that enables the elongabel elements to move in three dimensions. The elongable elements are also connected to the mirror housing with pivotable connections. In this embodiment the mirror housing 2 has a flat mountig surface on which the elements 10 and 20 are attached. It is not necessary to attach the elongable elements on a flat surface. They also can be attached on a structured surface or a mounting mean in the mirror housing. There are two sets of elongable elements: a first set 10 which is fixed to the support 4 close to the vehicle's driver but at the farer end of the mirror head mounting surface 5 and a second set 20 fixed at the farer end of the support 4 but closer to driver's end of the mirror housing mounting surface 5. The first set of elements 10 is attached to the support 4 in a distance D1 between the two telescoping elements. At the mirror housing side these two telescoping elements 10 are arranged in a distance M2. The second set of elongable elements 20 is mounted on the support side in a distance D2 and on the mirror housing side in a distance M1.

The two sets of elongable elements are mounted in a way that one element of the first set 10 extend into the gap between the elements of the second set of elements.

[0017] In the embodiments as described in the figures 1 to 15 the attachment positions of the telescoping elements have a distance D2 or M2. In another embodiment the telescoping elements have a single common pivotable member so that D2 and M2 are becoming zero..

[0018] The mirror housing comprises a reflective element 3. This reflective element 3 is a coated glass that is mounted into the plastic housing. The mirror glass is fixed in relation to the mirror housing and can be easily mounted by clips or a pressing into a groove. Also other ways to fix the reflective element into the housing are possible. The mirror housing is moulded in one part or several parts according the design needs. It is also possible to mount the mirror glass with a bezel into the mirror housing. It is important that the mirror glass 3 is fixed in relation to the mirror housing. This allows characteristic designs for the gap between glass and plastic needed in existing rear view mirrors is obsolete.

[0019] In another embodiment of the invention the mirror glass 3 is a plastic glass. To use a plastic glass opens the possibility to create new designs and again to reduce the all over weight of the mirror head.

A solution with a plastic glass flat or curved surface and injection moulded bezel in one piece reduces the number of productions steps for the rear view mirror. The plastic glass is produced for example in a two component injection mould process wherein a transparent plastic glass material is used to create the substrate for the reflective coating and normal coloured or black plastic material is used to form the bezel structure with curved edge and with the possibility to be connected to the housing of the rear view mirror.

[0020] A full plastic rear view mirror can be achieved which is moulded with small tolerances. As a result of a full plastic rear view mirror weight and seize can be reduced to improve the aerodynamic of the rear-view mirror and the vehicle and to reduce CO_2 emissions.

In further preferred embodiments the rear view mirror comprises electrical element s as known from prior art as all kind of illumination elements as running light, position light, security light, turn signal indicator, reverse light and other illumination types which are allowed by regulation to be installed in a rear view mirror.

Also other electrical elements as sensors, cameras, antennas, indicators and displays are possible to be mounted into the inventional rear view mirror.

The use of modern LED illumination means is preferred again to reduce weight and power consumption of the device.

[0021] To connect the electrical element a harness is necessary that is placed between the telescoping elements in a length that enables the telescoping function of the elongable elements.

[0022] The position as shown in figure 1 to 5 is the driving position. The elongable elements 10 and 20 are all extended to a defined length. The combination of lengths defines the relative position to driver's eyes. The driving position can to a some extend be adapted if the vehicle is towing a trailer. The rear view can be extended according to the maximal possible extension lengths of the elongable elements.

Figures 6 to 10 show the folded position that is mandatory for security regulations. The mirror head must be able to be folded in forward direction of a vehicle. In this situation the first set of elongable elements 10 are completely extended and the second set of elongable elements 20 is completely shortened. Fig 9 shows the extreme position.

[0023] The parking position as shown in figure 11 to 15 shows the second extreme position of the two sets of elongable elements with full extended set 20 and a completely shortened set 10.

[0024] The elongable elements are not hidden in the embodiments of fig 1-15. If an electrical element is installed into the mirror housing a harness must be integrated. The appearance to the rear view mirror with a harness will be not sufficient for a smooth design. Therefore the invention proposes to hide the telescoping parts and a harness behind a cover that must be flexible enough to allow the motion of the mirror housing and has a acceptable appearance in the normal driving position.

[0025] An example of an alternative non rigid material to cover a vehicle is described in a BMW study overcoming the idea of a metal carriage.

The GINA Light Visionary Model has dispensed with the usual body elements found on production vehicles such as front apron, bonnet, side panels, doors, wheel arches, roof, trunk lid and rear deck. Instead, a structure with a minimum amount of components has taken their place. A special, highly durable and extremely expansion-resistant fabric material stretches across a metal structure. This material offers designers a significantly higher level of freedom of design and functionality.

The fact that the body surface is designed by means of a flexible fabric cover that stretches across a metal substructure means that the materials used must meet exacting requirements. Industrially produced hybrid fabric made from a stabilizing mesh netting support and an outer layer that is both water-repellent and resistant to high and low temperatures is suitable for this application. Another essential material property is a maximum level of dimensional stability. It must remain dimensionally stable irrespective of the temperature and air humidity it is exposed to even after severe and constant expansion. The dimensional stability helps retain the cover's surface tension for a long period of time. The movement of individual body elements creates accurately reproducible folds in the material.

[0026] The basic idea behind the skeleton and fabric body for a vehicle was used to build Zeppelin airships. Also in automotive use a vehicle named Velorex was built in the years 1950 to 1970 with bodywork consisting of vinyl stretched over the cage and attached by turn button fasteners.

[0027] Today for example Spandex materials are in favor to create flexible bodies.

An example how to cover the area between mirror housing 2 and support 4 with a fabric is shown in fig. 16 to 19. In the driving position of fig. 16 the fabric is stretched form the housing to the support 4. The fabric 6 is flexible and allows the fold position as in Fig. 17 or the parking position of Fig. 18. In both extreme positions the one side of the fabric cover produces fold wherein the other side is stretched.

To achieve the fabric cover the fabric is fixed at a frame structure at the mounting surface of the rear view mirror and a frame structure at the support 4. The housing itself can be injection moulded as it is today. The next step of mirror evolution is a rear view mirror with a plastic or metal skeleton fully covered by a flexible elastic fabric material.

Claims

1. A rear view mirror (1) attached to a vehicle with a mirror housing (2) comprising a reflective element (3) **characterized in that** the reflective element (3) is fixed in relation to the mirror housing (2) and the mirror housing (2) is movable versus the vehicle by separately elonagable elements (10, 20).

2. Rear view mirror (1) according to claim 1 **characterized in that** the mirror housing (2) is attached with at least three elongable elements (10, 20).

3. Rear view mirror according to claim 1 **characterized in that** mirror housing (2) comprises a reflective element (3) with a plastic glass substrate.

4. Rear view mirror according to claim 3 **characterized in that** the reflective element (3) with plastic glass substrate is moulded together with at least a part of the housing (2).

5. Rear view mirror (1) according to claim 1 **characterized in that** the mirror housing (2) comprises electrical elements, at least one of the group of running light, turn signal indicator, security light, positioning light, warning indictors, displays, sensors, cameras, antennas, controllers.

6. Rear view mirror (1) according to claim 1 **characterized in that** the rear view mirror (1) is at least partly designed as a substructure covered by a flexible fabric.

7. Method to adjust a rear view mirror (1) at a vehicle, wherein the mirror housing (2) encloses a reflective element (3) **characterized in that** the reflective element (3) is fixed in relation to the mirror housing (2) and the mirror housing (2) is attached to the vehicle by separately elongable elements (10,20).

8. Method to adjust a rear view mirror according claim 7 with two sets of elongable elements wherein the first set (10) of elements is adjusting the rear view mirror reflective element in fold forward position by elongating these elements where the second set of elements (20) is shortened..

9. Method to adjust a rear view mirror according claim 7 with two sets of elongable elements wherein the second set of elements (20) is adjusting the rear view mirror reflective element in a park position by elongating these elements where the first set of elements (10) is shortened.

10. Method to adjust a rear view mirror according claim 7 with two sets of elongable elements wherein both sets of elements (10, 20) are adjusting the rear view mirror reflective element (3) in optimal position by elongating and shortening these elements.

11. Method to adjust a rear view mirror according claim 7 with two sets of elongable elements (10,20) wherein both sets of elements are adjusting the rear view mirror reflective element in a extended position by elongating all these elements.

Amended claims in accordance with Rule 137(2) EPC.

1. A rear view mirror (1) attachable to a vehicle support (4) with a mirror housing (2) comprising a reflective element (3) that is fixed in relation to the mirror housing (2) **characterized in that** the reflective element (3) and the mirror housing (2) is movable versus the vehicle by elements (10, 20), that can be elongated separately and **in that** each of the elements (10, 20) is mounted between mirror housing (2) and support (4).

2. A rear view mirror (1) according claim 1 **characterized in that** the elements are electrical cylinder with a fixed housing and an internal member translating in direction of the housing.

3. Rear view mirror (1) according to claim 1 **characterized in that** the mirror housing (2) is attached with at least three elements (10, 20).

4. Rear view mirror according to claim 1 **characterized in that** mirror housing (2) comprises a reflective element (3) with a plastic glass substrate.

5. Rear view mirror according to claim 3 **characterized in that** the reflective element (3) with plastic glass substrate is moulded together with at least a part of the housing (2).

6. Rear view mirror (1) according to claim 1 **characterized in that** the mirror housing (2) comprises electrical elements, at least one of the group of running light, turn signal indicator, security light, positioning light, warning indictors, displays, sensors, cameras, antennas, controllers.

7. Rear view mirror (1) according to claim 1 **characterized in that** the rear view mirror (1) is at least partly designed as a substructure covered by a flexible fabric.

8. Method to adjust a rear view mirror (1) at a vehicle, wherein the mirror housing (2) encloses a reflective element (3) fixed in relation to the mirror housing (2) **characterized in that** the reflective element (3) and the mirror housing (2) is attached to the vehicle by elements (10, 20), that can be elongated separately and **in that** each of the elements (10, 20) is mounted between mirror housing (2) and support (4).

9. Method to adjust a rear view mirror according claim 8 with two pairs of elements that can be elongated separately wherein the first pair (10) of elements is adjusting the rear view mirror reflective element in fold forward position by elongating these elements where the second pair of elements (20) is shortened.

10. Method to adjust a rear view mirror according claim 8 wherein the second pair of elements (20) is adjusting the rear view mirror reflective element in a park position by elongating these elements where the first pair of elements (10) is shortened.

11. Method to adjust a rear view mirror according claim 8 wherein both pairs of elements (10, 20) are adjusting the rear view mirror reflective element (3) in optimal position by elongating and shortening these elements .

12. Method to adjust a rear view mirror according claim 8 wherein both pairs of elements are adjusting the rear view mirror reflective element in a extended position by elongating all these elements.

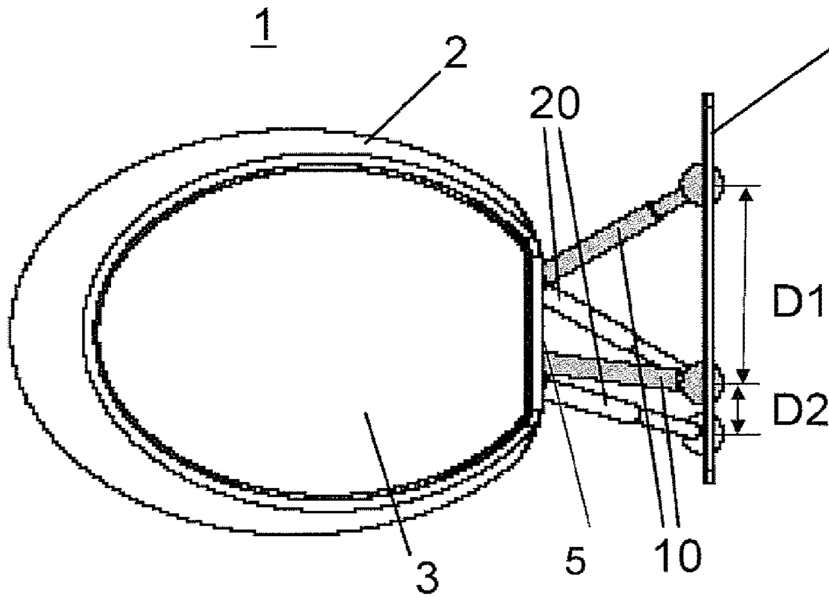


Fig. 1

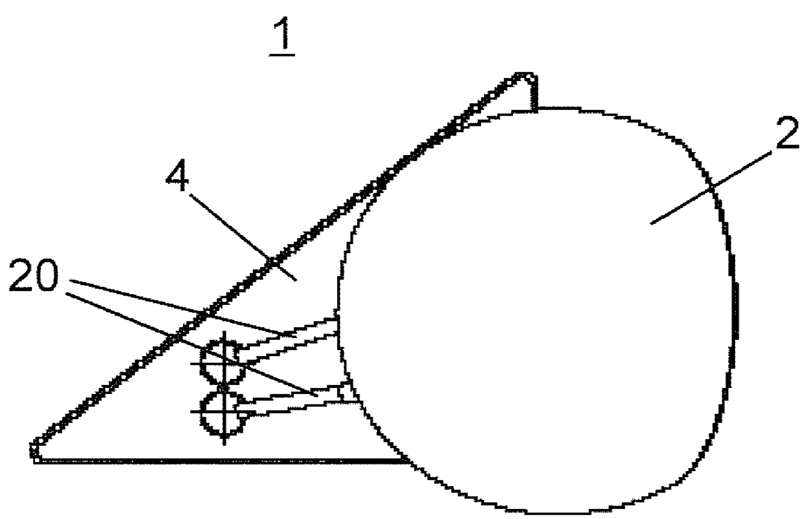


Fig. 2

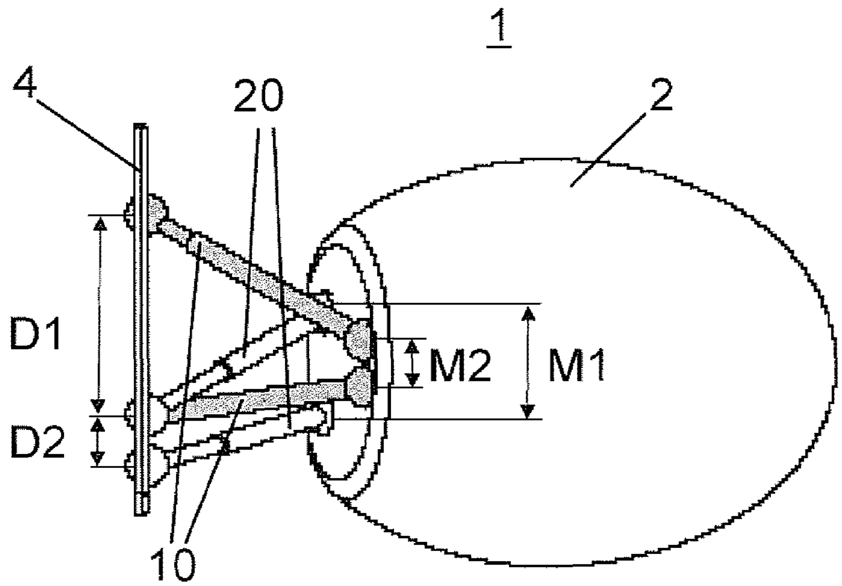


Fig. 3

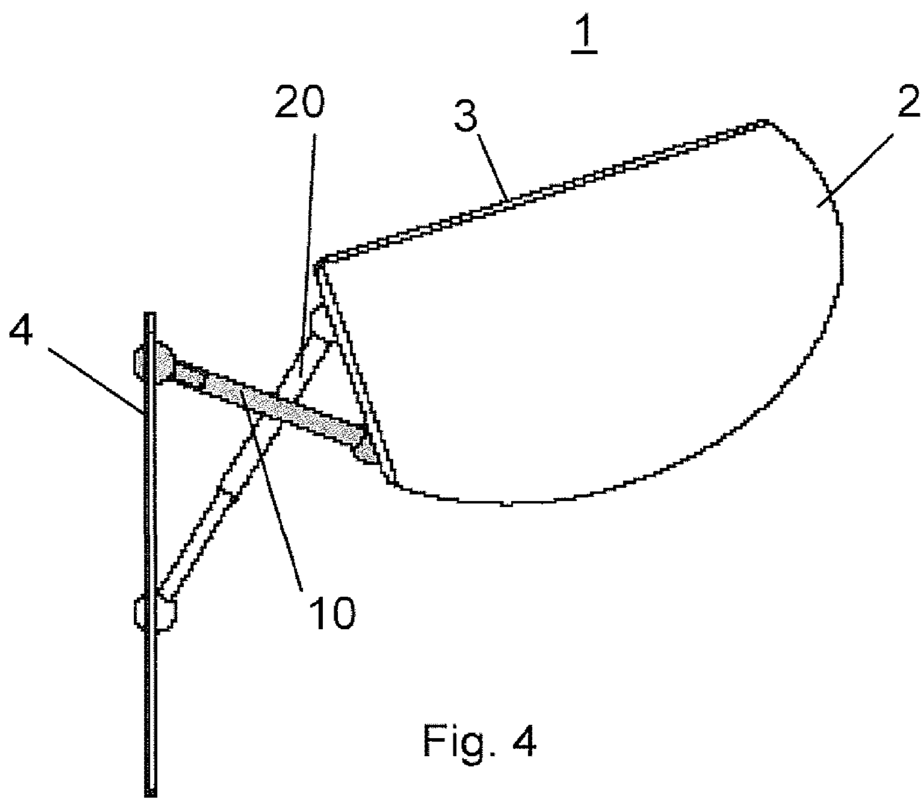


Fig. 4

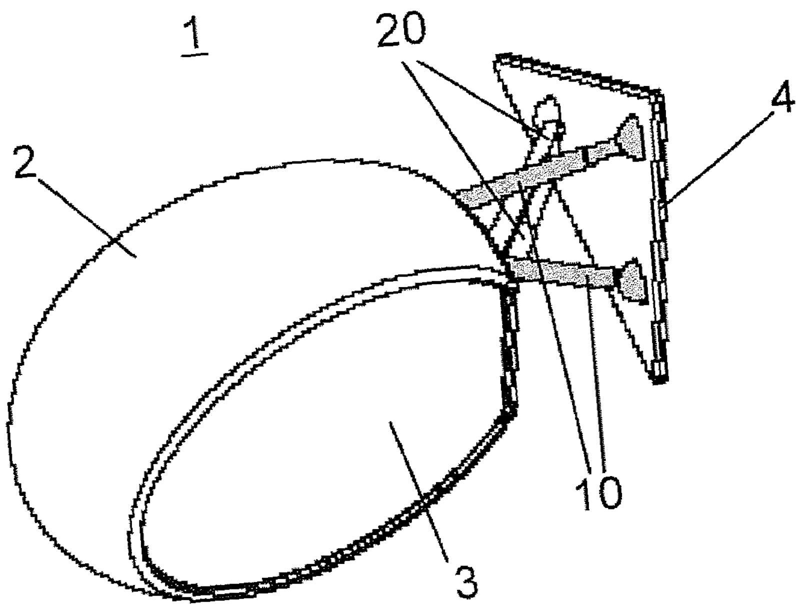


Fig. 5

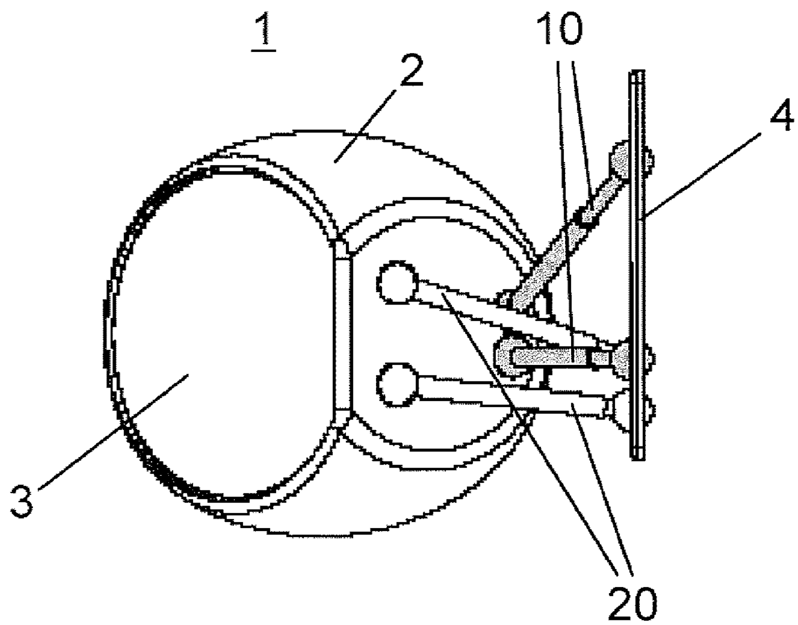


Fig. 6

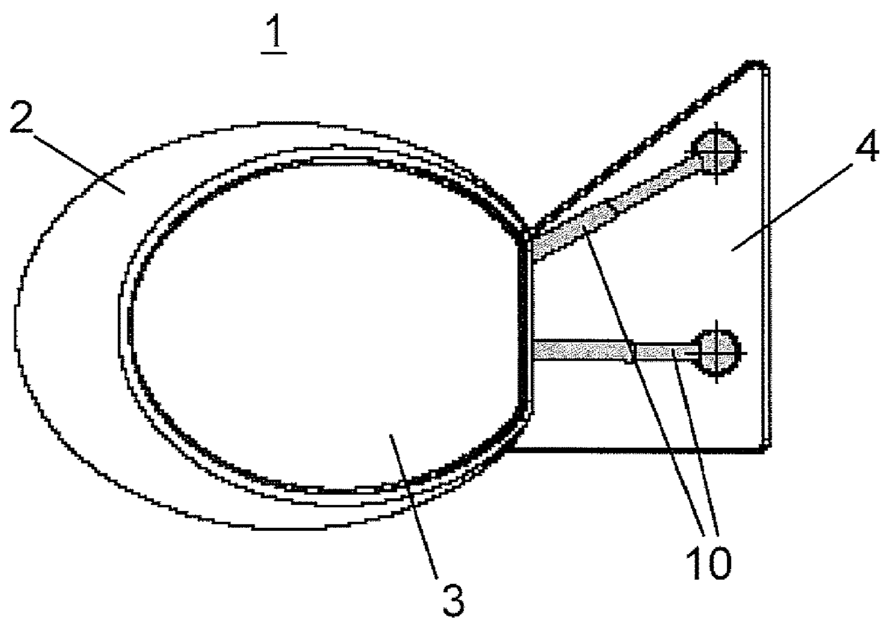


Fig. 7

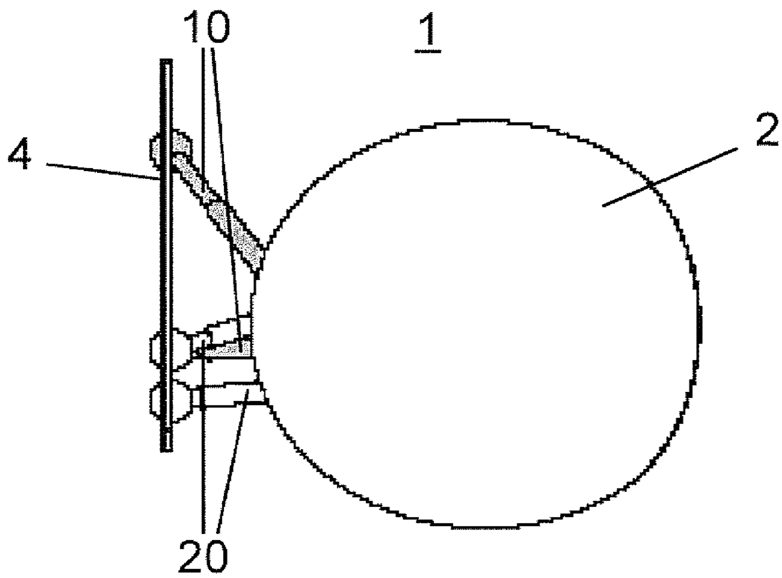


Fig. 8

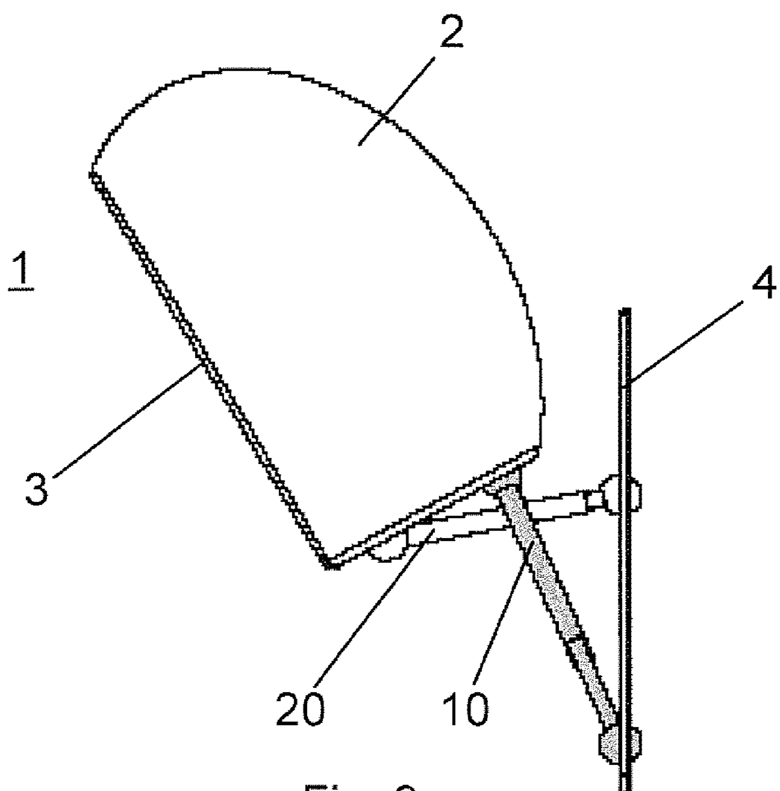


Fig. 9

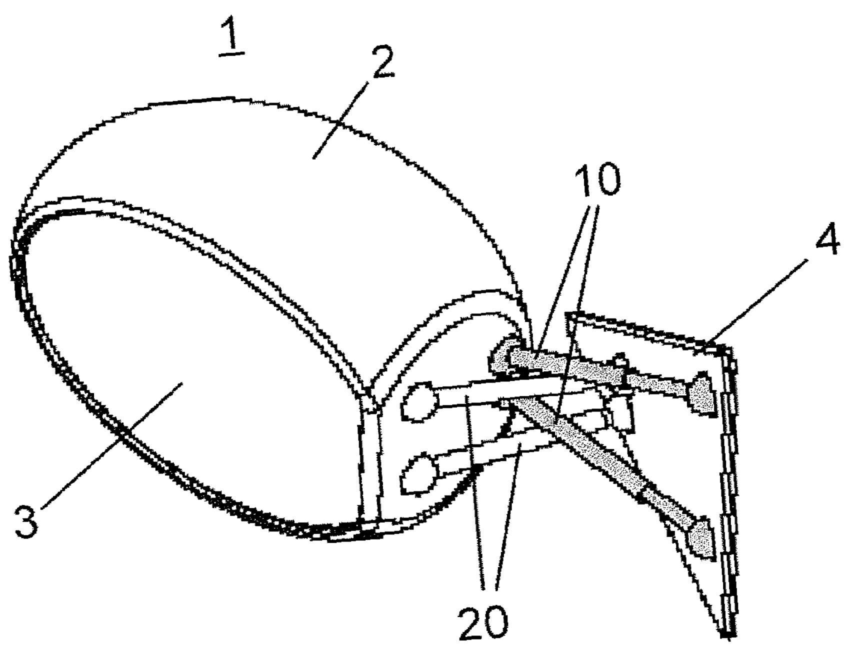


Fig. 10

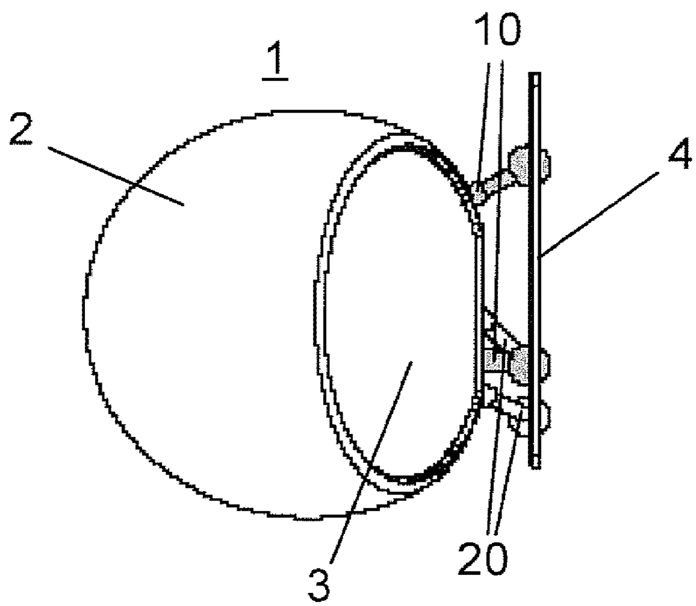


Fig. 11

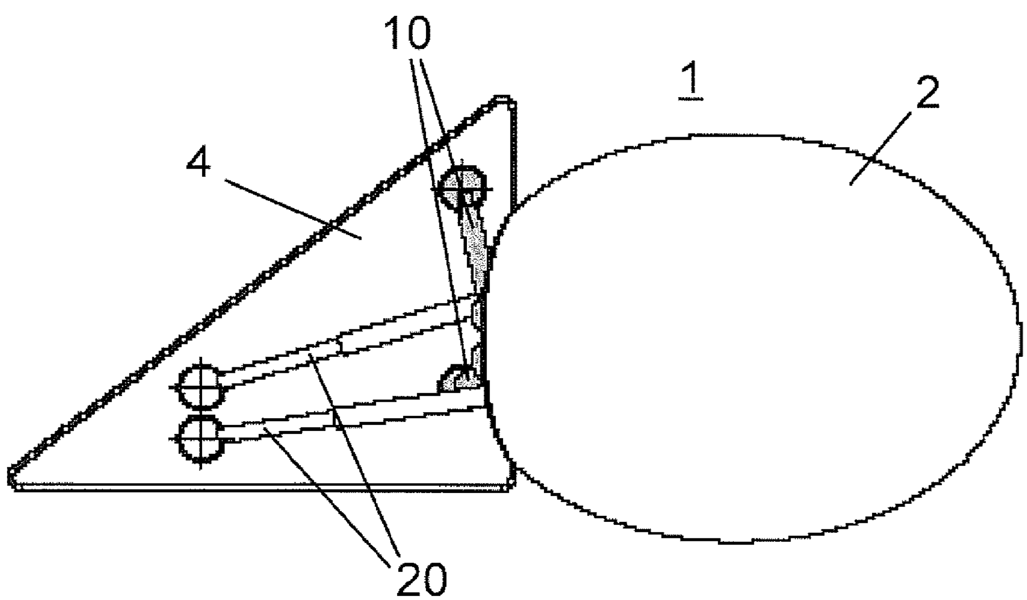


Fig. 12

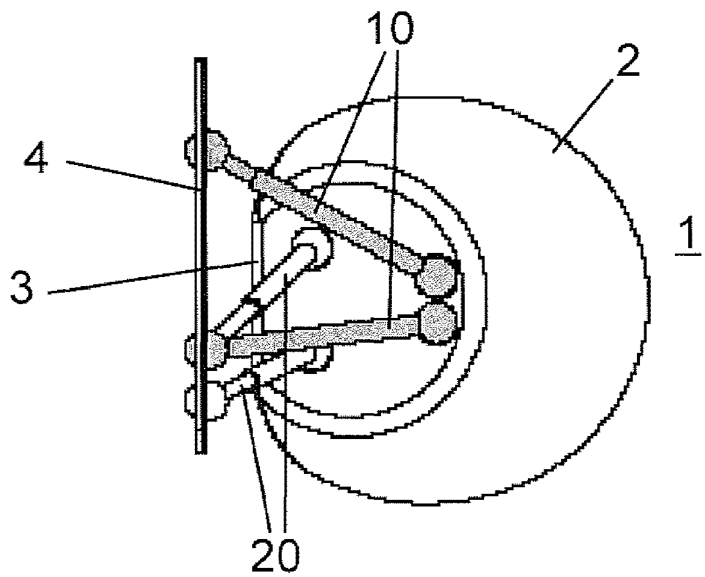


Fig. 13

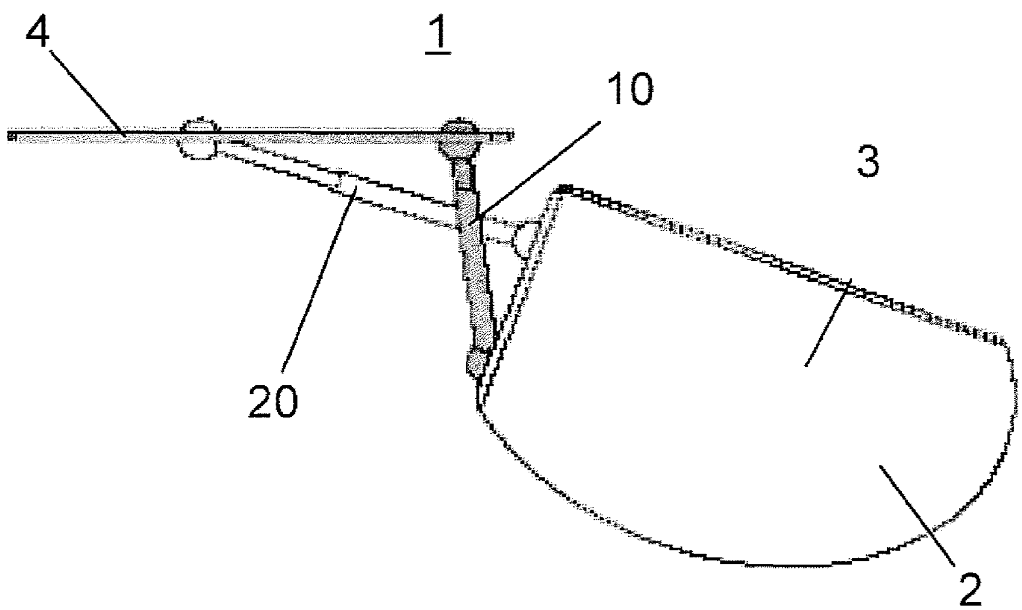


Fig. 14

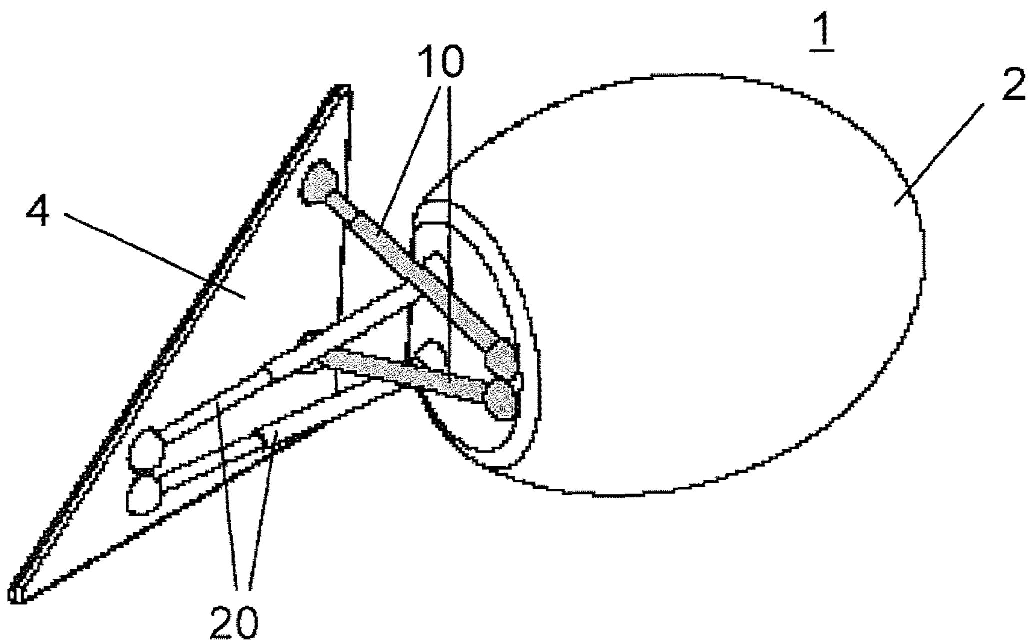


Fig. 15

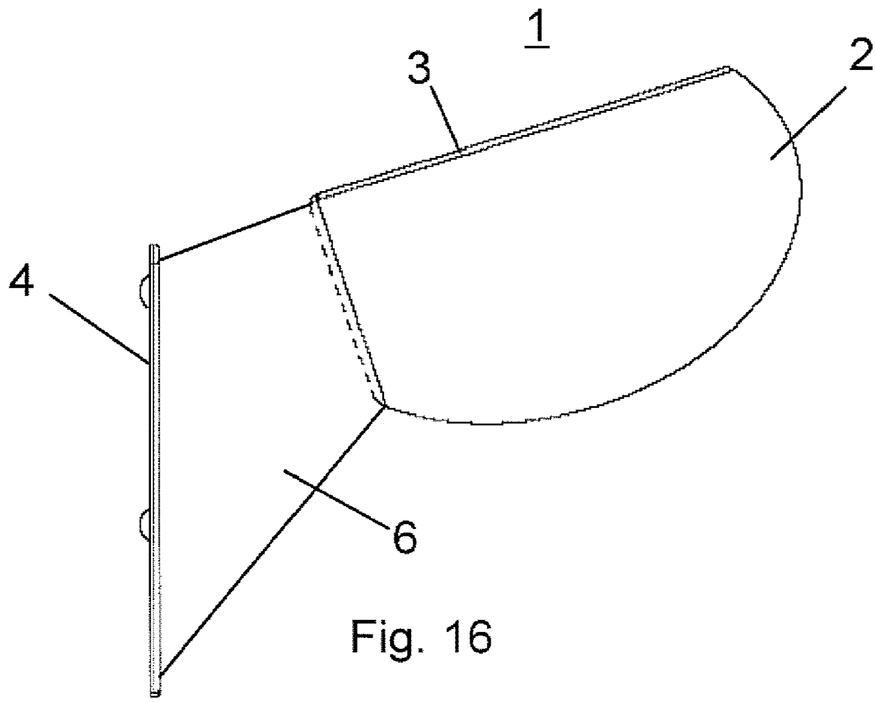


Fig. 16

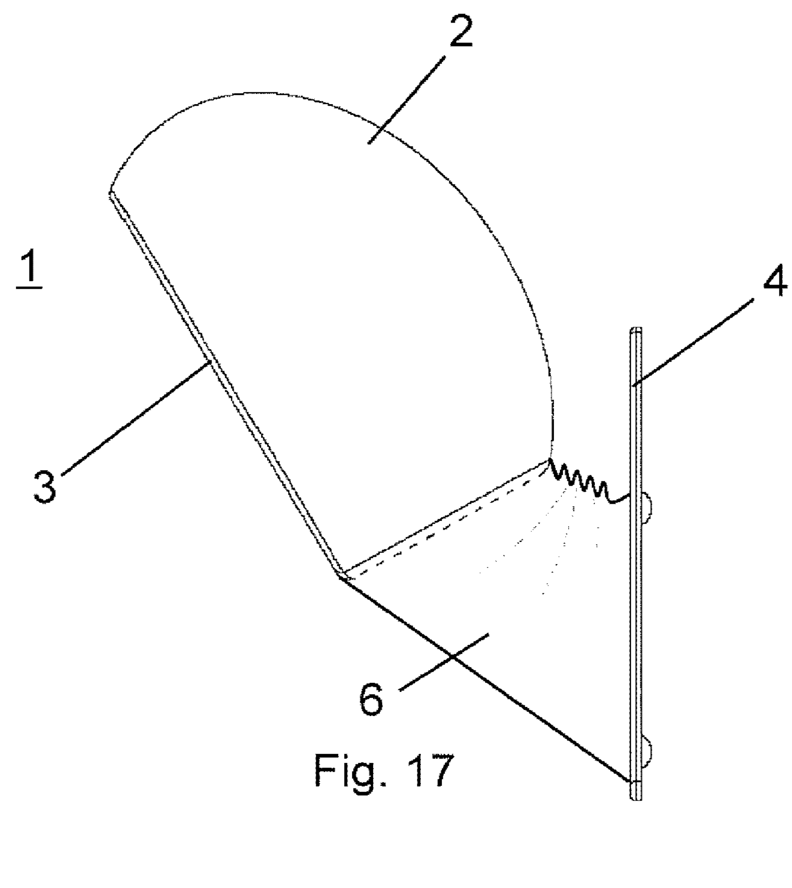


Fig. 17

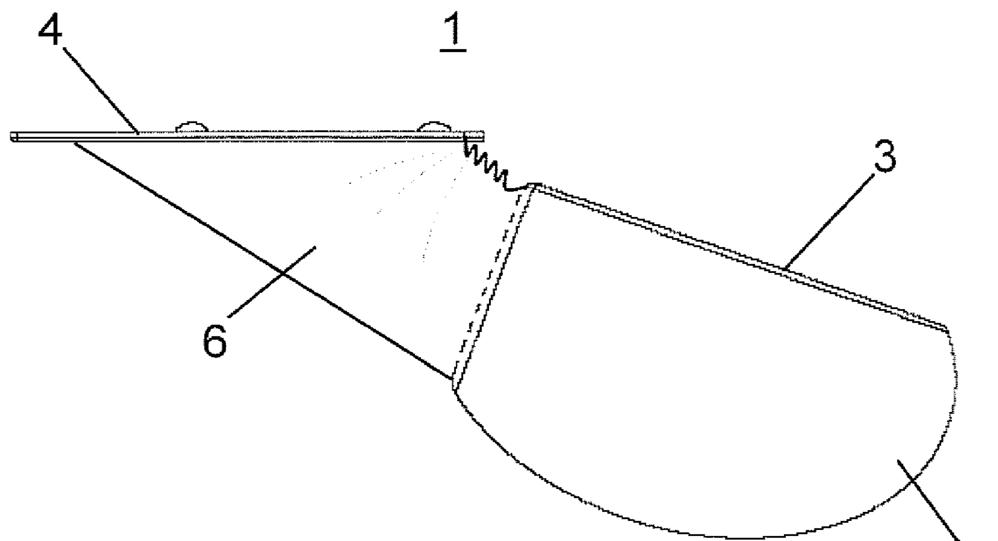


Fig. 18

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 08 16 4588

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2 969 715 A (MOSBY EDGAR T) 31 January 1961 (1961-01-31) * column 2, lines 14-23; figure 1 * -----	1,2,7-10	INV. B60R1/074 B60R1/06
X	US 2 552 074 A (THOMAS THOMPSON) 8 May 1951 (1951-05-08) * column 3, lines 1-16 * * column 4, lines 30-41; figures 1-3 * -----	1,7	
X	US 4 558 930 A (DEEDRICK HAROLD [US]) 17 December 1985 (1985-12-17) * the whole document * -----	1,7	
A	US 6 847 288 B1 (BASCHNAGEL ROBERT J [US] BASCHNAGEL III ROBERT J [US]) 25 January 2005 (2005-01-25) * figure 3 * -----	1,6,7	
A	US 7 178 925 B1 (TIDWELL DONALD R [US]) 20 February 2007 (2007-02-20) * the whole document * -----	1,7	TECHNICAL FIELDS SEARCHED (IPC): B60R

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	23 February 2009	Schombacher, Hanno

3

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons
& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 08 16 4588

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

23-02-2009

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 2969715	A	31-01-1961	NONE	
US 2552074	A	08-05-1951	NONE	
US 4558930	A	17-12-1985	NONE	
US 6847288	B1	25-01-2005	US 2005017853 A1	27-01-2005
US 7178925	B1	20-02-2007	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 0314839 A **[0007]**

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 3 321 132 A1

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
16.05.2018 Bulletin 2018/20

(51) Int Cl.:
B60R 1/072 *(2006.01)* ***B60R 1/066*** *(2006.01)*

(21) Application number: **16198759.9**

(22) Date of filing: **14.11.2016**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

(71) Applicant: **SMR Patents S.à.r.l.**
1653 Luxembourg (LU)

(72) Inventors:
- **Lettis, Andrew**
  West Sussex PO19 8TA (GB)
- **Rehill, Graham**
  West Sussex PO19 3DJ (GB)

(74) Representative: **Weber-Bruls, Dorothée**
Jones Day
Nextower
Thurn-und-Taxis-Platz 6
60313 Frankfurt am Main (DE)

(54) EXTERNAL REAR VIEW DEVICE WITH MOVEABLE HEAD ASSEMBLY

(57) The present invention relates to External rear vision device for a motor vehicle having a fixed base assembly (10) provided for arrangement on the motor vehicle and a moveable head assembly (60) attached to the base assembly (10) via an articulation assembly (30), said articulation assembly (30) having a fixed part (32) rigidly attached to the fixed base assembly (10) and a moveable part (34) rigidly attached to the head assembly (60), and said articulation assembly (30) comprising two articulation axes, the direction vectors of said articulation axes being independent of each other, characterized by a foot (12) of the base assembly (10) providing a spherical seat (13) for a casing (40), in particular a lower casing element (42), of the head assembly (60), and frame means (20) providing at least one spherical seat (22, 25) for the casing (40), with the frame means (20) being rigidly attached to the fixed part (32) or comprised by the fixed part (32).

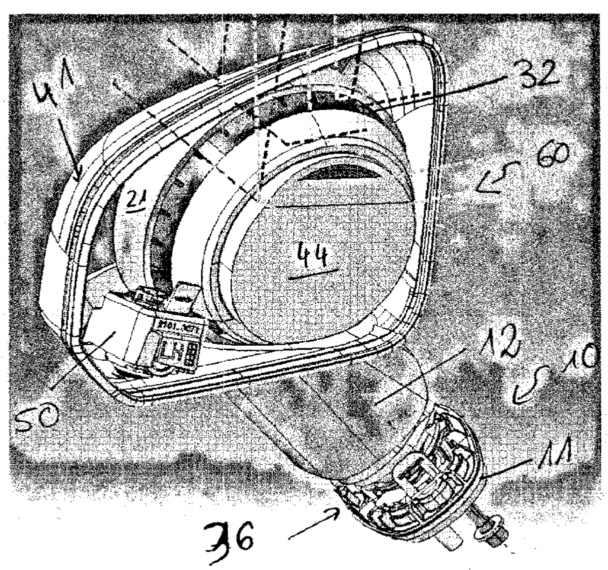


Fig. 5a

EP 3 321 132 A1

Description

[0001] The present invention refers to an external rear vision device for a motor vehicle having a fixed base assembly provided for arrangement on the motor vehicle and a moveable head assembly attached to the base assembly via an articulation assembly, said articulation assembly having a fixed part rigidly attached to the fixed base assembly and a moveable part rigidly attached to the moveable head assembly, and said articulation assembly comprising two articulation axes, the direction vectors of said articulation axes being independent of each other.

[0002] EP 2 492 145 B1 refers to an external rear view mirror with a mirror head and a mirror base, which are covered with at least one body element in the form of a body frame, a body cap and a mirror base cover, and a mirror glass that is installed rigidly relative to the mirror head. The mirror head rests on the mirror base; the body cover of the mirror head is composed of multiple pieces of the body frame and the body cap; and the mirror base is equipped with a mirror base cover, wherein the body cap has an opening designed for the passage of the mirror base and the mirror base cover. The mirror base is rigidly connected to a mirror carrier that carries an electrical glass adjustment drive, wherein the glass adjustment drive is connected to at least one body element.

[0003] Another external rear view mirror assembly for a motor vehicle having a mirror base or foot provided for arrangement on the motor vehicle and a mirror head arranged on the mirror foot as well as a mirror glass accommodated in the mirror head and arranged rigidly and fixed non adjustably with respect thereto, is known from EP 2 492 145 B1. At least one articulation is provided between the mirror head and the arrangement of the mirror foot on the motor vehicle, said articulation comprising a total of two articulation axes, the direction vectors of said articulation axes being independent of each other, and wherein the two articulation axes are associated, jointly and/or independently of each other, to swiveling at least the mirror head from an operating position to a swung-in position and vice versa, to swinging-in at least the mirror head in and against the direction of motion, as well as adjusting an individual adjusting position of at least the mirror glass by adjusting the mirror head depending on, e.g., the seating position and the height of a driver of the motor vehicle, as well as having a first adjusting drive driven by an electric motor and associated to a first articulation axis of the two articulation axes and having a second adjusting drive driven by an electric motor and associated to a second articulation axis of the two articulation axes.

[0004] It is the object of the present invention to further develop the known external rear vision device to enhance functionality and efficiency while at the same time reducing size and costs.

[0005] This object is solved by a foot of the base assembly providing a spherical seat for a casing, in particular a lower casing element, of the head assembly, and frame means providing at least one spherical seat for the casing, with the frame means being rigidly attached to the fixed part or comprised by the fixed part.

[0006] According to the invention the base assembly can comprise an attachment part for the attachment to the motor vehicle, with the attachment part carrying a control system for or of the articulation assembly, and/or the attachment part guiding cables from the interior of the motor vehicles to the interior of the foot, and/or the attachment part closing the foot at its end opposite its spherical seat.

[0007] It is also proposed that the base assembly comprises a carrier part for the attachment of the fixed part of the articulation assembly and/or of a fixation part of the frame means, with the carrier part extending from the spherical seat of the base assembly, and/or the carrier part guiding the cables from inside the foot through a cable exit into the head assembly.

[0008] Further, it is proposed with the invention that the carrier part is at least partly arranged within the fixation part, and/or the carrier part is attached to the fixation part by a screw or clip connection and/or by a bayonet attachment.

[0009] The frame means can comprises a support part supporting the fixed part of the articulation assembly, preferably by at least partly encompassing the fixed part, with the support part in particular having a ring shape, and/or by a clips or snap connection.

[0010] Preferred embodiments of the invention are characterized in that the frame means comprises a first spherical seat for the lower casing element and a second spherical seat for an upper casing element of the casing, with preferably the first and second spherical seats of the frame means being provided by extensions arranged at opposite ends of the fixation part and/or on the side of support part facing away from the fixed part of the articulation means.

[0011] With the invention it is proposed that the first spherical seat is provided by a first extension facing away from the fixed part of the articulation means and a second extension facing towards the moveable part of the articulation means, with preferably the support part and the first and second extensions form a part of a ring with a cut-out providing a rim facing towards the moveable part of the articulation means.

[0012] It is preferred that the fixation means is provided with a cable exit, with the cable exit of the fixation means being aligned with the cable exit of the carrier part, and/or the cable exit of the fixation means being arranged on the side of the fixation means facing away from the fixed part of the articulation means, and/or cables exiting the cable exit of the fixation means being connected to at least one camera and/or at least one light unit at least partly arranged within the head assembly.

[0013] Still further it is proposed with the invention that the lower casing element has a first spherical seat cooperating with the spherical seat of the foot and/or a second spherical seat cooperating with the first spherical seat of the frame means, with preferably the first and second spherical seats of the lower casing element being provided by a base part of the lower casing element.

[0014] The lower casing element preferably has an attachment part fixed to the moveable part of the articulation assembly, with preferably the attachment part extending substantially perpendicularly to the base part of the lower casing element, and/or preferably the attachment part and the frame means being arranged on opposite sides of the unit provided by the fixed and the moveable parts of the articulation means (30), and/or preferably the attachment part encompassing the moveable part at least partly, and/or preferably the attachment part and the moveable part being connected via a clips, plug and/or snap connection.

[0015] In addition, it is proposed that the attachment part is provided with a part ring for partly encompassing the moveable part of the articulation assembly, with preferably the part ring is provided by a cut-out determined by the part ring provided by the support part and the first and second extensions.

[0016] The unit can be an actuator for a reflective element, in particular in form of mirror element, being attached to the attachment part.

[0017] Finally it is proposed that the lower casing element carries the upper casing element and/or the camera, and/or a bezel is attached to the lower and upper casing elements, with the bezel preferably surrounding the reflective element.

[0018] It is the astonishing perception of the invention that a head assembly of an external rear vision device, in particular in the form of a mirror head of an external rear view mirror, can be articulated inboard/outboard and up/down using an articulation means, in particular glass actuator, around a spherical joint, with spherical seats being provided between parts moving relative to each other such that they can rotate around two articulation axes perpendicular to each other having a common joint point. This ensures the maintenance of current end user functionality while offering significant smaller mirror size, with a reduction of size up to 30%. In addition, the unique layout of the internal mechanism with its spherical seats enhances packaging and performances.

[0019] The articulation assembly is also supported and protected for impact using the spherical seats, in particular due to the arrangement of frame means between the articulation assembly and a casing of the head assembly. The casing being assembled from several casing elements, one of which is secured to the moveable part of the articulation assembly, improves the weight distribution and reduces total housing frontal area on the vehicle which in turn improves aero performance and, thus, provides a higher fuel efficiency.

[0020] The pivot system used for the rear vision device of the invention with the single pivot point for two articulation axes permits a mirror adjustment movement while providing dynamic mirror performance and mirror impact support.

[0021] The invention, together with further objects and advantages, may be best understood, by example, with reference to the following description of embodiments taken together with the accompanying schematic drawings:

Figure 1	is a perspective view of a base assembly of a rear vision device of the invention;
Figure 2a and Figure 2b	are two perspective views of the base assembly of figure 1 having frame means attached thereto, as viewed from two different sides;
Figure 3a and Figure 3b	are perspective views like figure 2a with an articulation assembly and an articulation assembly as well as a lower casing element being attached, respectively;
Figure 4a and Figure 4b	are perspective views of the base assembly 10 of figure 1 with the lower casing element and the lower casing element plus the articulation assembly being attached, respectively; and
Figure 5a and Figure 5b	are perspective views of the base assembly to which the frame means, the articulation assembly and part of the casing are attached, as viewed from two different sides.

[0022] An external rear vision device of the invention, in particular in form of an external rearview mirror, comprises a base assembly 10, a frame means 20, an articulation assembly 30 and a casing 40. These parts will be described in the following with reference to the figures.

[0023] According to figure 1 the base assembly 10 comprises a foot 12 provided with a spherical seat 13 from which a shaft type carrier part 14 extends, with the carrier part 14 being provided with a cable exit 15. The foot 12 can be closed at its end opposite the spherical seat 13 by an attachment part 11 discussed with respect to figures 5a and 5b below.

[0024] The base assembly 10 is fixedly secured to a motor vehicle (not shown) via the attachment part 11 when in use.

[0025] Figures 2a and 2b depict the frame means 20 fixedly secured to the base assembly 10. The frame means 20 is provided by a support part 21 more or less with a ring shape, two spherical seats 22 and 25 provided by extensions 22a, 22b and 25a and a fixation part 23 into which the carrier part 14 of the base assembly 10 is inserted such that the lower spherical seat 22 in figures 2a and 2b is facing the spherical seat 13 of the foot 12. The extensions 22a, 22b and

25a extend from opposite sides of the fixation part 23, with two lower extensions 22a, 22b providing a lower spherical seat 22 and the upper spherical seat 25 being provided by an upper extension 25a.

[0026] The fixation part 23 is provided with a cable exit 24 in alignment with the cable exit 15 of the carrier part 14. For securing the attachment of the frame means 20 to the base assembly 10 a screw (not shown) can be entered into a screw hole 27 provided by the fixation part 23 and the carrier part 14.

[0027] As can be seen in figure 3a the articulation means 30 can be attached to the frame means 20 by partly inserting a fixed part 32 of the articulation assembly 30 into the support part 21. The respective arrangement can be fixed with a clip connection or the like. The fixed part 32 is moveably connected to a moveable part 34 of the articulation assembly 30, with the moveable part 34 facing away from the frame means 20.

[0028] The lower extensions 22a and 22b provide a part ring together with the lower part of support part 21 to provide the spherical seat 22, with a rim 28 being provided by a cut-out at the end facing the moveable part 34 of the articulation assembly 30. The moveable part 34 is provided with attachment means 35 in form of recesses for the attachment of a casing 40. Figure 3b shows the subassembly of figure 3a with a lower casing element 42 of the casing 40 attached thereto. The lower casing element 42 is provided with an attachment part 44 attached to the moveable part 34 of the articulation assembly 30 in a fixed manner in order to move together with the moveable part 34. For that purpose, the attachment part 44 is formed with attachment bosses 45 shown in figure 4a, with the attachment bosses 45 being insertable into the attachment recesses 35, and with a part ring 44a for partly encompassing the moveable part 34 to add strength to the connection of the lower casing element 42 and the moveable part 34 due to an enhanced power transmission. Further ribs and the like can be added to further increase the strength.

[0029] As can be best seen in figure 3b the part ring 21, 22a, 22b and the part ring 44a are complementary to each other to lead to a compromise of the spherical seat 22 enabling a smooth movement of the lower casing element 42 together with the moveable part 34 on the one hand and a strong connection of the lower casing element 42 to the moveable part 34 on the other hand.

[0030] In addition, the lower casing element 42 is provided with a base part 46 arranged between the foot 12 and the frame means 20, in particular the lower extension of the frame means. The base part 46 is provided with a lower spherical seat 47 cooperating with the spherical seat 13 of the foot 12 and an upper spherical seat 48 cooperating with the lowest spherical seat 22 of the frame means 20. Accordingly, the overall structure is that of three parts spheres with the inner part sphere provided by the frame means 20 and the outer part sphere provided by the foot 12 of the base assembly 10 being fixed, whereas the part sphere provided by the lower casing element 42, and being arranged in the middle can be moved around two articulation axes in order to provide an inbound/outboard and up/down movement. Attached to the attachment part 44 is a not shown mirror glass which can thus be moved via the articulation assembly 30 to fulfil the legal field of view requirements of the rear view mirror.

[0031] Figure 4a provides further details of the relative arrangement of the lower casing element 42 with respect to the base assembly 10.

[0032] Figure 4b shows the subassembly of figure 4a together with the fixed part 32 and movable part 34 attached between the carrier part 14 of the base assembly 10 and the attachment part 44 of the lower casing 42. The articulation assembly 30 also comprises not shown drive means, in particular comprising two motors for the movement of the moveable part 34 around the two articulation axes, and a control system 36, for the drive means which is partly shown in figures 5a and 5b.

[0033] The perspective view of figure 5a not only shows the subassembly provided by the base assembly 10, the articulation assembly 30 and the lower casing element 42, but also an upper casing element 41 of the casing 40 and a camera 50 both being attached to the lower casing element 42. Figure 5b shows the subassembly of figure 5a from an opposite side, still without the casing 40 closed via a non-shown additional casing element to complete a head assembly 60. But figure 5b shows in addition to the upper casing element 41 and the lower casing element 42 a bezel 49 attached to the upper and lower casing elements 41, 42. Said bezel 49 surrounds the not shown mirror glass of the completely assembled external rear view mirror of the present invention.

[0034] Still further, the control system 36 of the articulation assembly 30 is carried by the attachment part 11. When the attachment part 11 is secured to the foot 12, the control system 36 is completely arranged within the foot 12. Also arranged within the foot 12 are cables which exit the base assembly 10 at the cable exit 15 and reach the interior of the head assembly 60 by passing also through to the cable exit 24 of the frame means 20 in order to be connected to the camera 50 and other non-shown units like lighting units and the like, which are arranged within the head assembly 60.

[0035] The head assembly 60 or rather the mirror head as a whole can be articulated using the articulation assembly 30 in particular via the movable part 34. The movable part 34 is connected to the drive system which can be a part of the control system 36. The control system 36 can also comprise memory means for memorizing a position of the movable 34 and, thus, the mirror glass attached thereto via the attachment part 44.

[0036] The support part 21 is provided in form of an actuator ring which is clipsed onto the fixed part 32 to provide improved support in an impact situation. Due to its upper spherical seat 25 the frame assembly 20 is ensuring a smooth movement of the upper casing element 41 which is also provided with an internal spherical seat, not shown.

[0037] The arrangement of the support part 21 with its extensions 22a, 22b, and 25a providing the spherical seats 22, 25 relative to the movable upper and lower casing elements 41, 42 provide a support and stiffness in all three directions during dynamic and impact situations. The result is a smaller mirror system offering the customer a unique external rear view mirror weight as well as aero and vehicle fuel efficiency benefit.

[0038] Although modifications and changes may be suggested by those skilled in the art, it is the intention of the application to embody within the patent warranted hereon all changes and modifications as reasonably and probably come within the scope of this contribution to the art. The features of the present invention which are believed to be novel are set forth in detail in the appended claims. The features disclosed in the description, the figures as well as the claims could be essential alone or in every combination for the realization of the invention in its different embodiments.

Reference Signs

[0039]

10	base assembly
11	attachment part
12	foot
13	spherical seat
14	carrier part
15	cable exist
20	frame means
21	support part
22	spherical seat
22a	extension
22b	extension
23	fixation part
24	cable exit
25	spherical seat
25a	extension
26	shoulder
27	screw hole
28	rim
30	articulation assembly
32	fixed part
34	moveable part
35	attachment means
36	control system
40	casing
41	upper casing element
42	lower casing element
44	attachment part
44a	part ring
44b	cut-out
45	attachment boss
46	base part
47	spherical seat
48	spherical seat
49	bezel
50	camera
60	head assembly

Claims

1. External rear vision device for a motor vehicle having a fixed base assembly (10) provided for arrangement on the motor vehicle and a moveable head assembly (60) attached to the base assembly (10) via an articulation assembly (30), said articulation assembly (30) having a fixed part (32) rigidly attached to the fixed base assembly (10) and a moveable part (34) rigidly attached to the head assembly (60), and said articulation assembly (30) comprising two

articulation axes, the direction vectors of said articulation axes being independent of each other, **characterized by** a foot (12) of the base assembly (10) providing a spherical seat (13) for a casing (40), in particular a lower casing element (42), of the head assembly (60), and
frame means (20) providing at least one spherical seat (22, 25) for the casing (40), with the frame means (20) being rigidly attached to the fixed part (32) or comprised by the fixed part (32).

2. External rear vision device according to claim 1, **characterized in that**
the base assembly (10) comprises an attachment part (11) for the attachment to the motor vehicle, with
the attachment part (11) carrying a control system (36) for or of the articulation assembly (30), and/or
the attachment part (11) guiding cables from the interior of the motor vehicles to the interior of the foot (12), and/or
the attachment part (11) closing the foot (12) at its end opposite its spherical seat (13).

3. External rear vision device according to claim 1 or 2, **characterized in that**
the base assembly (10) comprises a carrier part (14) for the attachment of the fixed part (32) of the articulation assembly (30) and/or of a fixation part (23) of the frame means (20), with the carrier part (14) extending from the spherical seat (13) of the base assembly (10), and/or the carrier part (14) guiding the cables from inside the foot (12) through a cable exit (15) into the head assembly (60).

4. External rear vision device according to claim 3, **characterized in that**
the carrier part (14) is at least partly arranged within the fixation part (23), and/or
the carrier part (14) is attached to the fixation part (23) by a screw or clip connection and/or by a bayonet attachment.

5. External rear vision device according to one of the preceding claims, **characterized in that**
the frame means (20) comprises a support part (21) supporting the fixed part (32) of the articulation assembly (20), preferably by at least partly encompassing the fixed part (32), with the support part (21) in particular having a ring shape, and/or by a clips or snap connection.

6. External rear vision device according to one of the preceding claims, **characterized in that**
the frame means (20) comprises a first spherical seat (22) for the lower casing element (42) and a second spherical seat (25) for an upper casing element (41) of the casing (40), with preferably the first and second spherical seats (22, 25) of the frame means (20) being provided by extensions (22a, 22b, 25a) arranged at opposite ends of the fixation part (23) and/or on the side of support part (21) facing away from the fixed part (32) of the articulation means (30).

7. External rear vision device according to claim 6, **characterized in that**
the first spherical seat (22) is provided by a first extension (22a) facing away from the fixed part (32) of the articulation means (30) and a second extension (22b) facing towards the moveable part (34) of the articulation means (30), with preferably the support part (21) and the first and second extensions (22a, 22b) form a part of a ring with a cut-out providing a rim (28) facing towards the moveable part (34) of the articulation means (30).

8. External rear vision device according to one of the claims 3 to 7, **characterized in that**
the fixation means (23) is provided with a cable exit (24), with
the cable exit (24) of the fixation means (23) being aligned with the cable exit (15) of the carrier part (14), and/or
the cable exit (24) of the fixation means (23) being arranged on the side of the fixation means (23) facing away from the fixed part (32) of the articulation means (30), and/or cables exiting the cable exit (24) of the fixation means (23) being connected to at least one camera (50) and/or at least one light unit at least partly arranged within the head assembly (60).

9. External rear vision device according to one of the preceding claims, **characterized in that**
the lower casing element (42) has a first spherical seat (47) cooperating with the spherical seat (13) of the foot (12) and/or a second spherical seat (48) cooperating with the first spherical seat (22) of the frame means (20), with preferably the first and second spherical seats (47, 48) of the lower casing element (42) being provided by a base part (46) of the lower casing element (42).

10. External rear vision device according to one of the preceding claims, **characterized in that**
the lower casing element (42) has an attachment part (44) fixed to the moveable part (34) of the articulation assembly (30), with
preferably the attachment part (44) extending substantially perpendicularly to the base part (46) of the lower casing

element (42), and/or
preferably the attachment part (44) and the frame means (20) being arranged on opposite sides of the unit provided by the fixed and the moveable parts (32, 34) of the articulation means (30), and/or
preferably the attachment part (44) encompassing the moveable part (34) at least partly, and/or
preferably the attachment part (44) and the moveable part (34) being connected via a clips, plug and/or snap connection.

11. External rear vision device according to claim 10, **characterized in that**
the attachment part (44) is provided with a part ring (44a) for partly encompassing the moveable part (34) of the articulation assembly (30), with
preferably the part ring (44a) is provided by a cut-out (44b) determined by the part ring provided by the support part (21) and the first and second extensions (22a, 22b).

12. External rear vision device according to claim 10 or 11, **characterized in that**
the unit is an actuator for a reflective element, in particular in form of mirror element, being attached to the attachment part (44).

13. External rear vision device according to one of the preceding claims, **characterized in that**
the lower casing element (42) carries the upper casing element (41) and/or the camera (50), and/or
a bezel (49) is attached to the lower and upper casing elements (41, 42), with the bezel (49) preferably surrounding the reflective element.

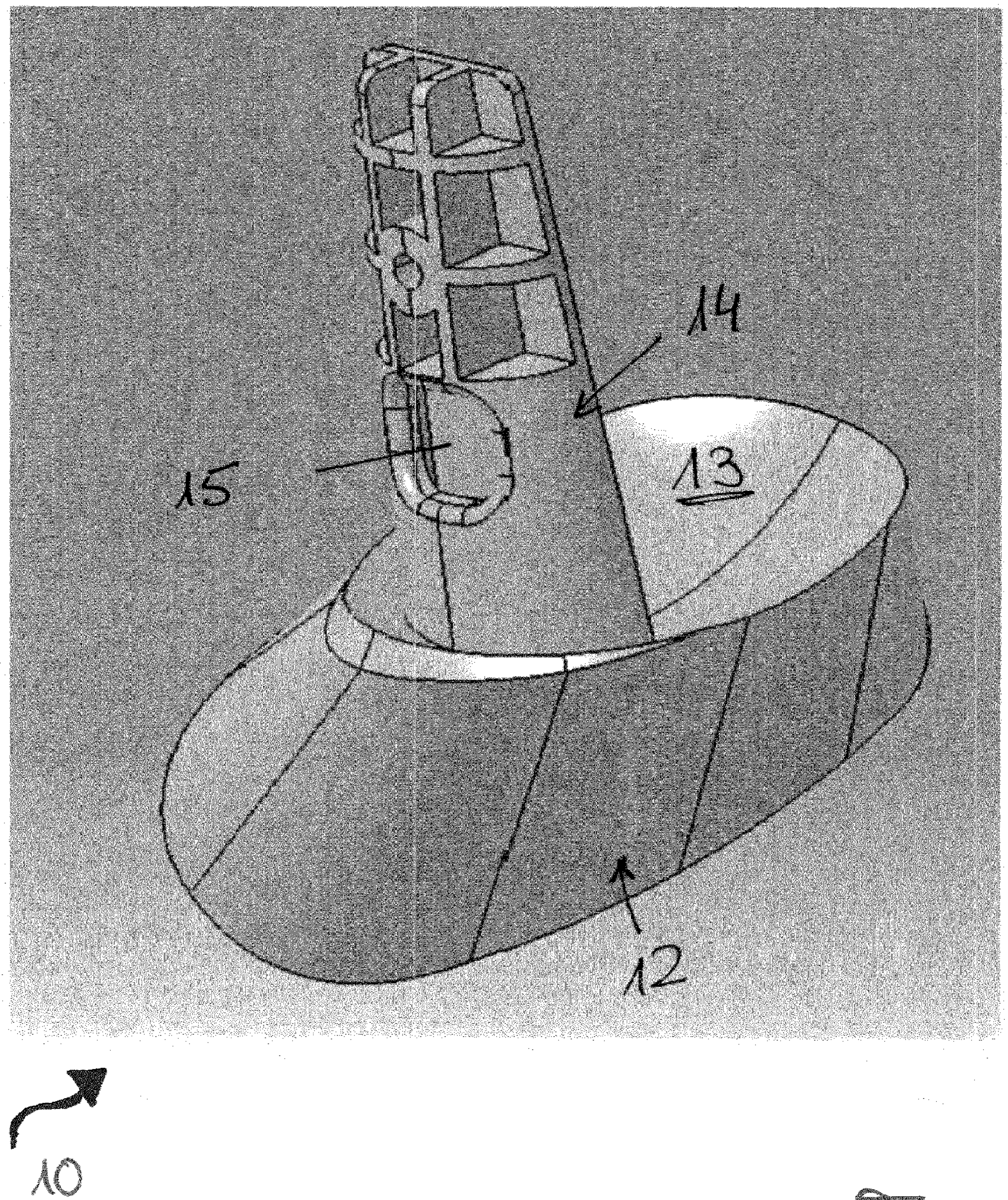


Fig. 1

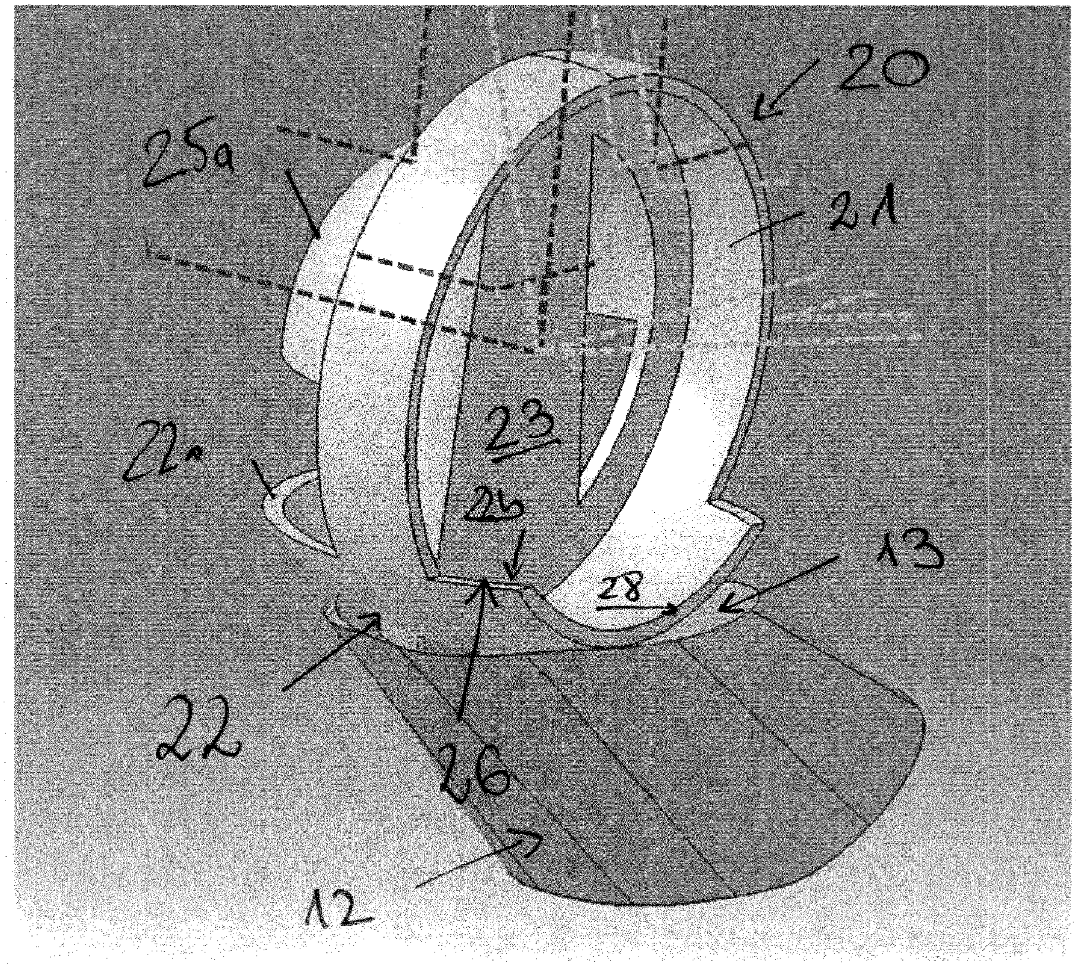


Fig. 2a

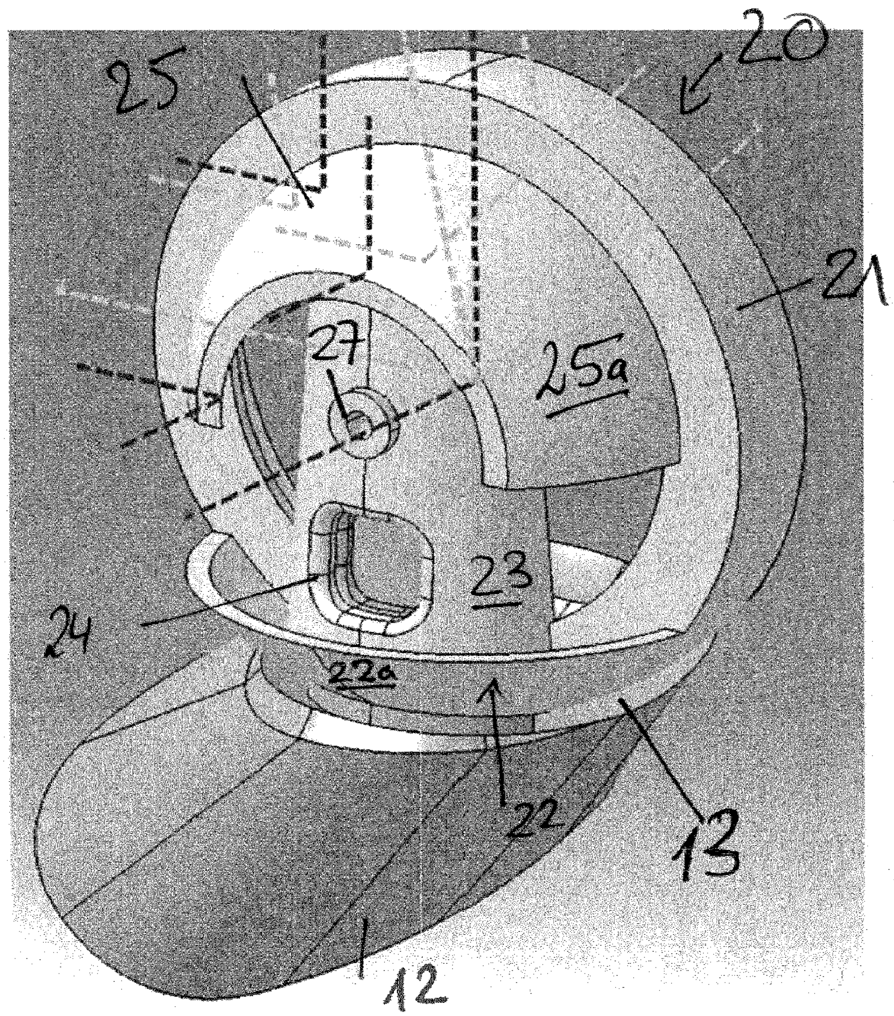


Fig. 2b

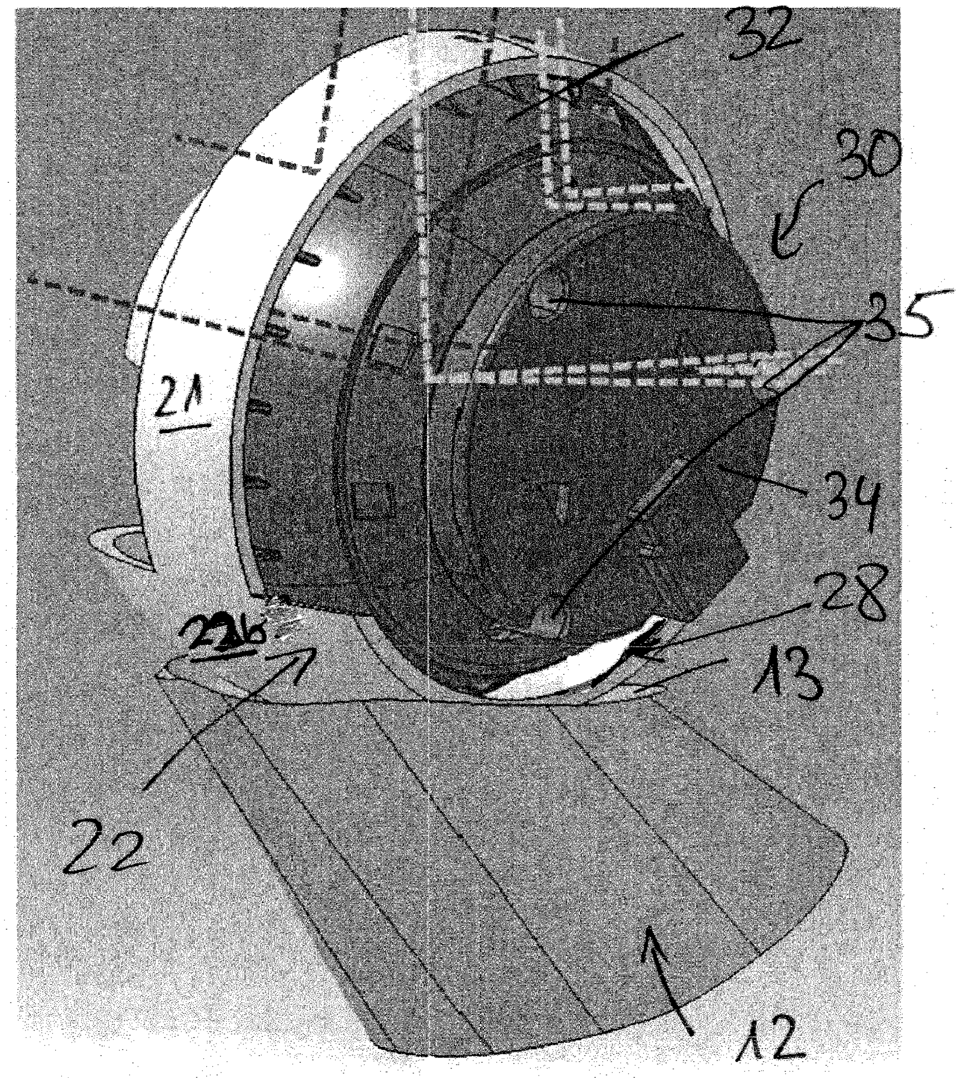


Fig. 3a

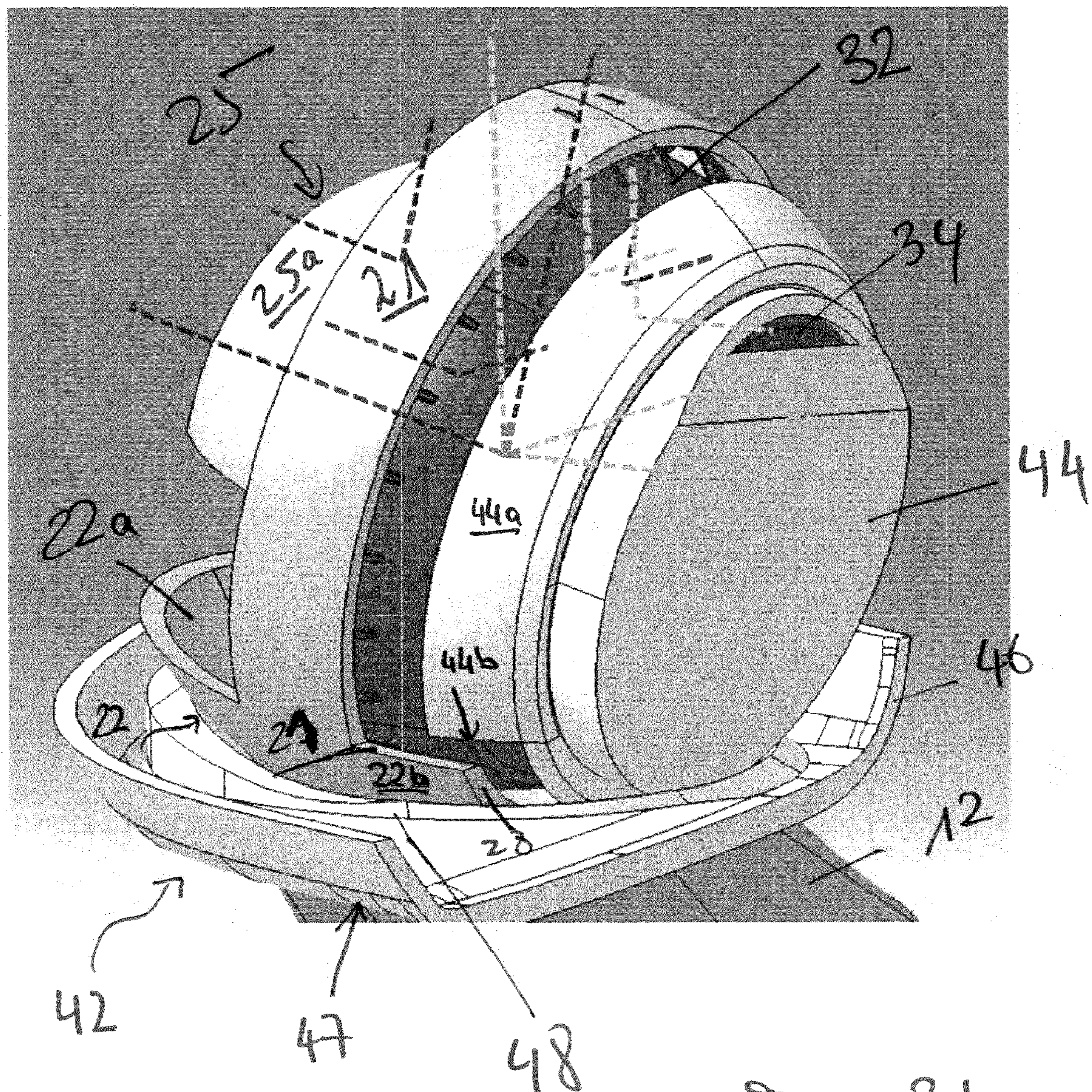


Fig. 3b

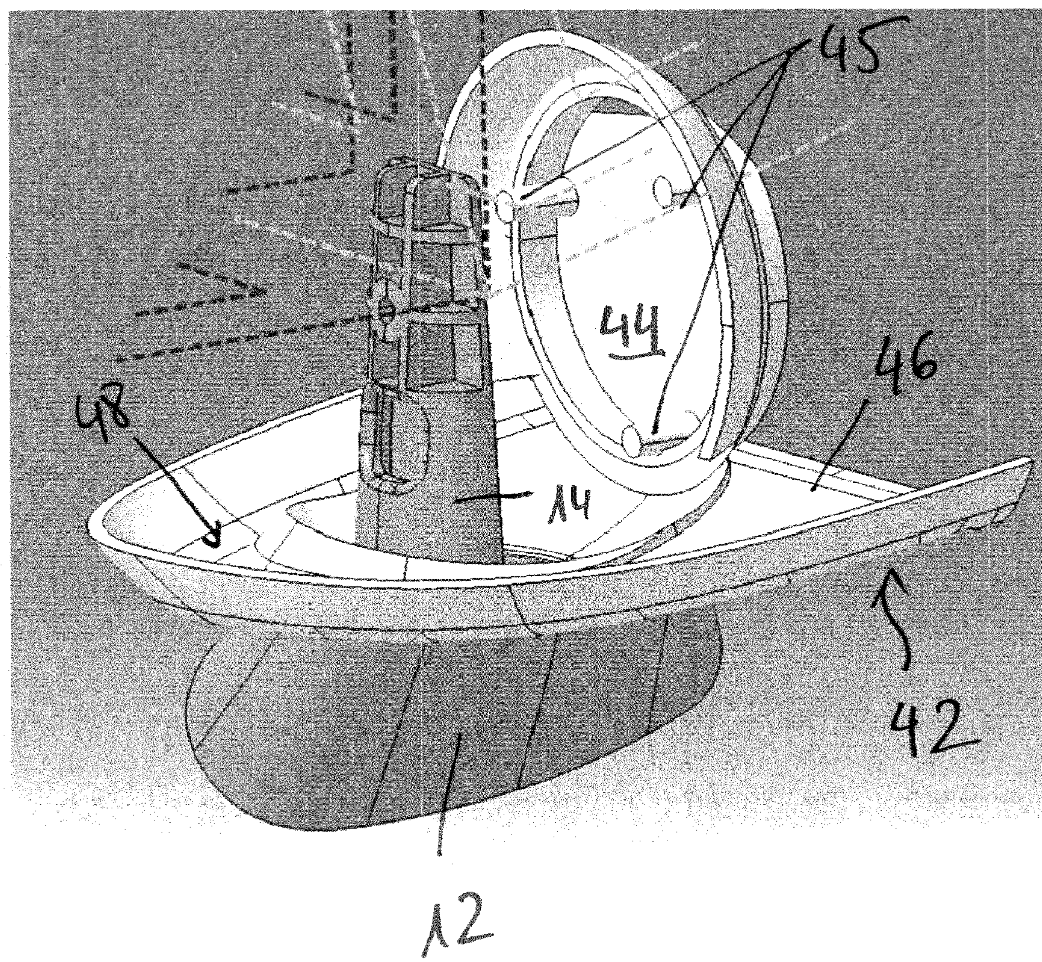


Fig. 4a

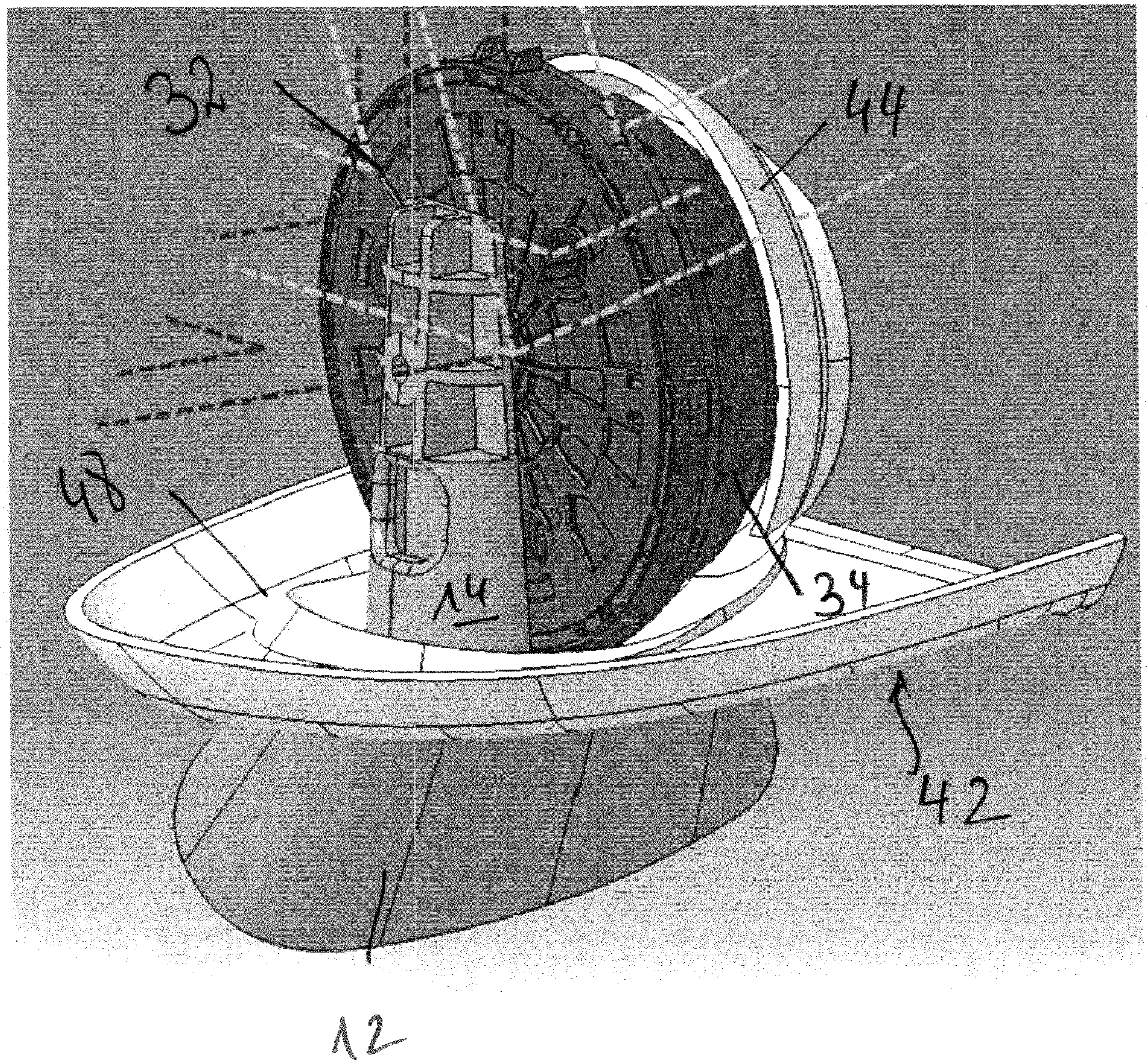


Fig. 4b

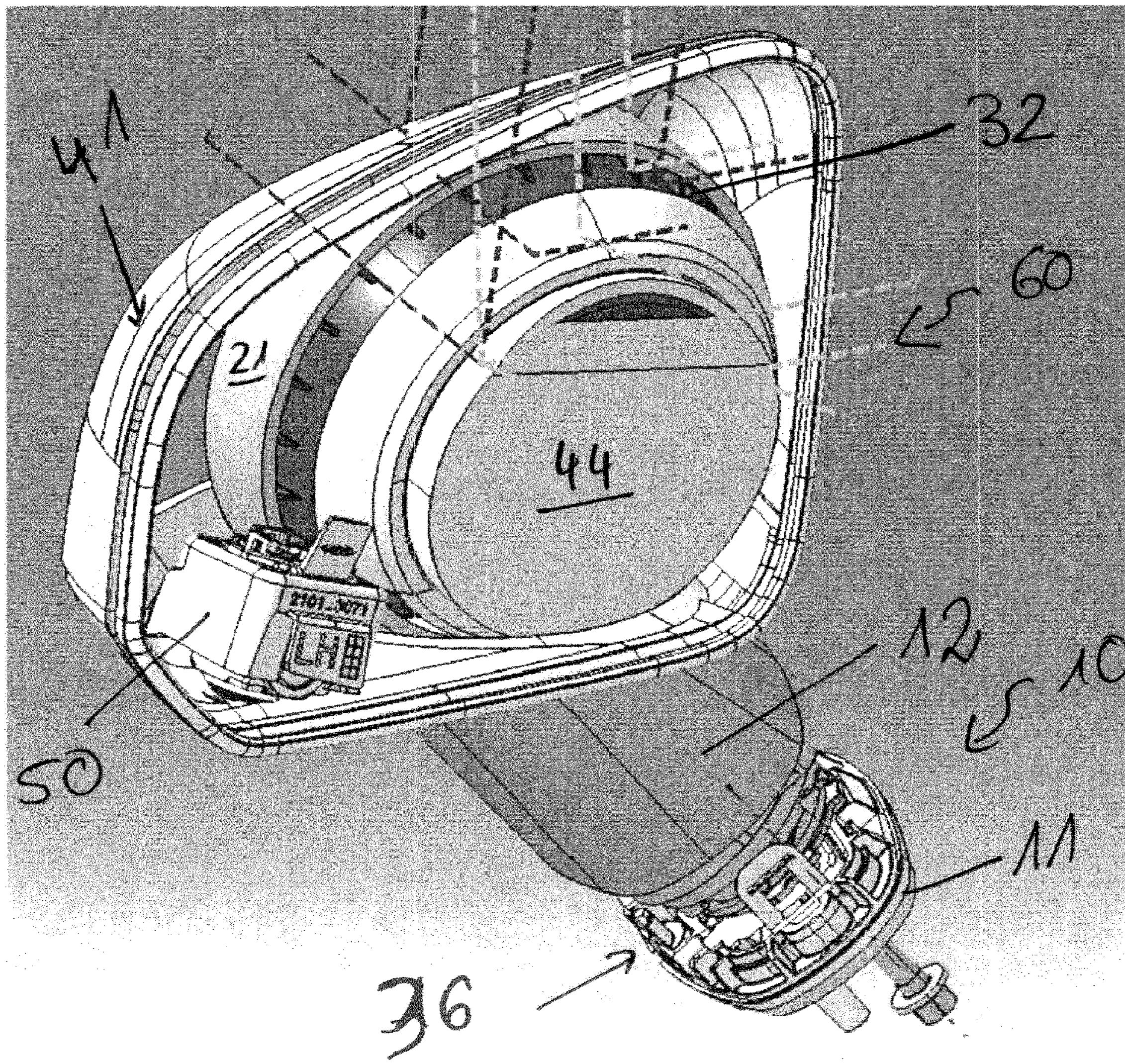


Fig. 5a

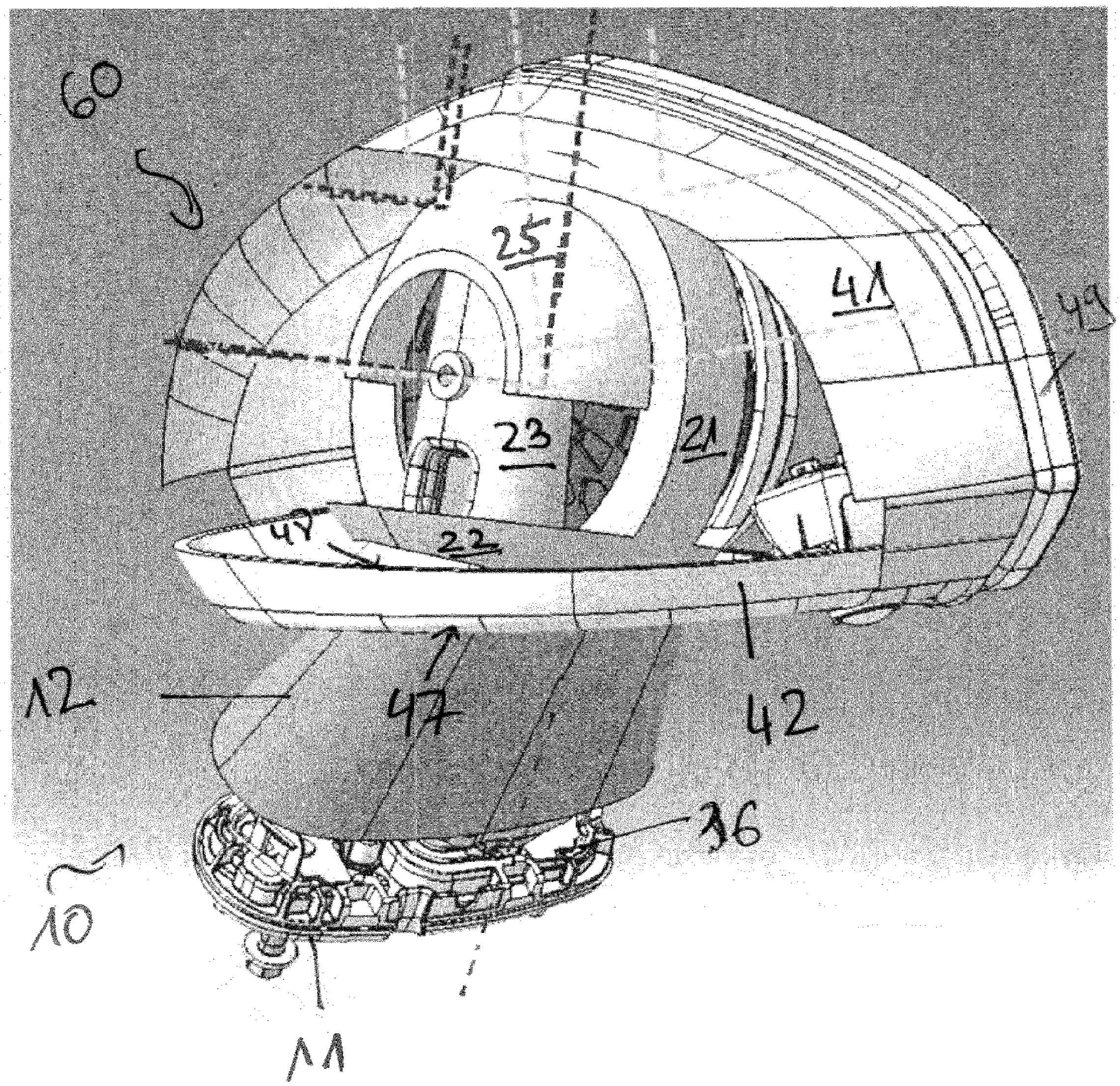


Fig. 5b

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 16 19 8759

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	FR 2 605 567 A1 (MITTELHAEUSER BERNHARD [DE]) 29 April 1988 (1988-04-29) * figure *	1-13	INV. B60R1/072 B60R1/066
A	US 2015/224930 A1 (FOOTE KEITH D [US] ET AL) 13 August 2015 (2015-08-13) * figures 15-18 *	1-13	
A	DE 10 2008 026039 A1 (WILKE & CO METALLWARENFABRIK [DE]) 10 December 2009 (2009-12-10) * figure 1 *	1-13	

TECHNICAL FIELDS SEARCHED (IPC)
B60R

The present search report has been drawn up for all claims

1

Place of search	Date of completion of the search	Examiner
Berlin	24 February 2017	Kyriakides, Leonidas

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 16 19 8759

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

24-02-2017

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 2605567 A1	29-04-1988	DE 3636161 A1	28-04-1988
		FR 2605567 A1	29-04-1988
		GB 2197829 A	02-06-1988
		IT 1222984 B	12-09-1990
		JP S63184539 A	30-07-1988
US 2015224930 A1	13-08-2015	NONE	
DE 102008026039 A1	10-12-2009	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 2492145 B1 **[0002] [0003]**

RÉPUBLIQUE FRANÇAISE

INSTITUT NATIONAL
DE LA PROPRIÉTÉ INDUSTRIELLE

PARIS

(11) Nº de publication : **2 503 647**
(A n'utiliser que pour les commandes de reproduction).

A1

DEMANDE DE BREVET D'INVENTION

(21) **Nº 81 07272**

---

(54) **Dispositif de commande à distance d'un miroir de rétroviseur pour véhicule.**

(51) Classification internationale (Int. Cl.³). B 60 R 1/06.

(22) Date de dépôt .... 10 avril 1981.

(33) (32) (31) Priorité revendiquée :

(41) Date de la mise à la disposition du public de la demande .... B.O.P.I. — « Listes » nº 41 du 15-10-1982.

---

(71) Déposant : MANZONI Stéphane, résidant en France.

(72) Invention de : Stéphane Manzoni.

(73) Titulaire : *Idem* (71)

(74) Mandataire : Cabinet Beau de Loménie,
55, rue d'Amsterdam, 75008 Paris.

2ᵉ demande divisionnaire déposée le 11 mars 1982, nº 82 04120.

D Vente des fascicules à l'IMPRIMERIE NATIONALE, 27, rue de la Convention — 75732 PARIS *CEDEX 15*

Dispositif de commande à distance d'un miroir de rétroviseur pour véhicule.

La présente invention a pour objet un dispositif de commande à distance d'un miroir de rétroviseur pour véhicule.

Il est connu d'utiliser des rétroviseurs dans lesquels le miroir, commandé à distance, est monté de façon mobile à l'intérieur de son boîtier ainsi que les moyens d'articulation et de commande par moteur électrique ou par un organe actionné manuellement.

Toutefois, ces rétroviseurs ne donnent pas entière satisfaction en ce qui concerne la protection intérieure des organes mécaniques contre la poussière et les intempéries.

Il est connu d'utiliser un dispositif comprenant un organe de support solidaire de la carrosserie du véhicule et s'étendant à l'intérieur du boîtier par une ouverture, ledit organe présentant un premier axe autour duquel est montée pivotante une entretoise sur laquelle est monté pivotant, suivant un deuxième axe perpendiculaire au premier axe, le boîtier portant le miroir, un moyen de commande de déplacement disposé suivant le second axe étant prévu entre l'organe de support et l'entretoise et un autre moyen de commande de déplacement étant disposé de façon décalée par rapport au second axe entre l'entretoise et le boîtier.

Dans ce dispositif, le miroir étant assujetti au boîtier et non mobile à l'intérieur de celui-ci, on obtient une étanchéité parfaite contre la poussière et les intempéries. Un soufflet de conception très simple assure l'obturation de l'ouverture ménagée dans le boîtier afin de permettre les débattements angulaires de celui-ci.

Conformément à la présente invention, l'organe de support est constitué d'un bras en deux parties reliées entre elles par un organe d'effacement à crabotage, l'une des parties du bras étant fixée sur la carrosserie du véhicule et l'autre partie s'étendant à l'intérieur du boîtier comportant deux paliers d'axe vertical dans lesquels sont montées deux broches sur lesquelles est articulée l'entretoise qui présente deux tourillons disposés suivant un axe horizontal et engagés dans des paliers prévus sur le boîtier.

Le mécanisme ainsi monté dans le boîtier permet de réaliser une forme de celui-ci présentant une épaisseur relativement faible.

Enfin, un tel rétroviseur peut être monté indifféremment sur la portière ou sur le gousset de portière d'un véhicule.

D'autres caractéristiques et avantages de l'invention seront mieux compris à la lecture de la description qui va suivre d'un mode de réalisation et en se référant aux dessins annexés, sur lesquels :

- la figure 1 est une vue en élévation d'un mode de réalisation d'un rétroviseur suivant l'invention, le miroir étant enlevé;

- la figure 2 est une vue en coupe suivant la ligne II-II de la figure 1;

- la figure 3 est une vue en coupe suivant la ligne III-III de la figure 1;

- la figure 4 est une vue en coupe suivant la ligne IV-IV de la figure 1;

- la figure 5 est une vue en coupe suivant la ligne V-V de la figure 1;

- la figure 6 est une vue en plan du rétroviseur et en coupe partielle suivant la ligne VI-VI de la figure 1;

- la figure 7 est une vue en coupe longitudinale d'un mode de réalisation d'un moyen de commande de déplacement;

- la figure 8 est une vue en coupe suivant la ligne VIII-VIII de la figure 7;

- la figure 9 est une vue en coupe suivant la ligne IX-IX de la figure 7; et

- les figures 10, 10a sont des vues en coupe montrant le détail d'un mode de réalisation de paliers.

Aux figures 1 à 6, on a représenté un mode de réalisation d'un rétroviseur d'un véhicule automobile plus particulièrement destiné à être monté sur le gousset d'une portière.

Le dispositif comprend un organe de support dont une partie 1 présente une plaque 1a destinée à être fixée sur la portière du véhicule et l'autre partie 2 s'étend à l'intérieur d'un boîtier 3 de rétroviseur à travers une ouverture 4 du boîtier qui porte sur sa face avant un miroir 5 monté au moyen d'un jonc porte-miroir 6.

La partie 1 de l'organe de support est reliée à la partie 2 par un axe 7 dont la tête 7a, présentant une forme hexagonale, est solidaire de la partie 2 de l'organe de support, ledit axe 7 étant monté rotatif dans la partie 1 de l'organe de support qui présente au moins un organe de crabotage 8 engagé dans un logement 8a de la partie 2 sous l'action d'un ressort 9 en appui d'un côté contre la partie 1 du support et de l'autre côté contre une rondelle 10 engagée dans une gorge de l'axe 7 (figures 1 et 6). La partie 2 de l'organe de support, disposée à l'intérieur du boîtier, présente deux alésages 11, 11a dans lesquels sont montées pivotantes par l'une de leurs extrémités des broches 12, 12a solidaires à leur autre extrémité d'une entretoise 13 (figure 4).

L'entretoise 13 est ainsi articulée suivant un premier axe vertical XX_1 sur la partie 2 de l'organe de support et elle est munie à ses deux extrémités de tourillons 14, 14a (figure 5) qui sont engagés dans des logements cylindriques ou paliers 15, 15a prévus à l'intérieur du boîtier 3. Les tourillons 14, 14a et les paliers 15, 15a sont disposés suivant un même axe, de telle sorte que le boîtier 3 est monté pivotant sur l'entretoise 13 suivant un deuxième axe horizontal YY_1.

Sur l'entretoise 13, est fixé, au moyen de vis 16a, un moyen de commande 16 du déplacement de l'entretoise par rapport à l'organe de support 2.

Ce moyen de commande 16 qui sera décrit plus en détail ultérieurement comporte une tête mobile 17 présentant une rotule 18 munie de deux tétons 19, 19a, ladite rotule étant disposée dans un logement prévu entre un bras 2a solidaire de l'organe de support et une plaque 20 fixée sur le bras 2a au moyen de vis 21 (figures 1 et 3). La rotule 18 est disposée suivant l'axe YY_1 pour faire pivoter l'entretoise autour de l'axe XX_1 par rapport à l'organe de support 1, 2. De la même manière, un moyen de commande 22 est fixé au moyen de vis 22a sur le fond du boîtier 3 et présente une tête mobile 23 (figures 1, 2 et 5) comportant une rotule 24 munie de deux tétons comme ci-dessus, ladite rotule étant disposée dans un logement sphérique prévu entre un bras 13a solidaire de l'entretoise 13 et une plaque 25 fixée sur le bras au moyen de vis 26.

Aux figures 7, 8, 9, on a représenté un mode de réalisation des moyens de commande de déplacement 16 et 22 qui comprennent chacun un carter 27 dans lequel est fixé un moteur électrique 28 dont l'arbre de sortie porte un pignon 29 qui engrène avec un pignon 30 calé sur un axe 31 monté rotatif dans le carter et qui est conformé pour constituer une vis sans fin 32 engrenant avec une roue tangente 33 qui est solidaire en rotation d'une tige 34 à filet hélicoïdal ou tige filetée dans laquelle est engagée la partie médiane de deux étriers élastiques 35, 35a solidaires d'un fourreau 36 disposé autour de la tige 34 et dont la tête 17 ou 23 porte une rotule 18 ou 24 munie de tétons 19, 19a.

Le dispositif fonctionne de la manière suivante : lorsqu'on alimente le moteur 28, on entraîne en rotation, par les pignons 29, 30, la vis 32 et la roue tangente 33, la tige 34, par son filet hélicoïdal ou tige filetée, entraînant en translation les étriers 35, 35a et le fourreau 36.

En conséquence, si on actionne le moyen de commande 16, on déplace l'entretoise 13 par rapport à l'organe de support 1, 2, de telle sorte que l'entretoise et le boîtier 3, portant le miroir 5, se déplacent autour de l'axe vertical XX_1 suivant un mouvement gauche-droite.

D'autre part, en actionnant le moyen de commande 22, on déplace le boîtier 3 portant le miroir 5 autour de l'axe YY_1 suivant un mouvement ciel-terre.

Suivant un autre mode de réalisation représenté aux figures 10, 10a, dans sa partie médiane l'entretoise 59 présente deux tourillons 63, 63a qui sont montés pivotants dans des logements 64, 64a du boîtier ouverts d'un côté où ils sont maintenus par une lame élastique 65, notamment en acier, en appui contre des organes de support 66, 66a solidaires du boîtier 54.

De cette manière, le boîtier 54 est monté pivotant suivant un axe horizontal YY_1 sur l'entretoise 59.

Bien que l'on ait décrit et représenté des moyens de commande utilisant des moteurs électriques, il est bien évident que le déplacement des organes du rétroviseur peut être obtenu par tout autre moyen mécanique et notamment par un câble qui est actionné de l'intérieur du véhicule par un organe de commande manuelle.

Bien entendu, diverses modifications pourront être apportées par l'homme de l'art aux dispositifs qui viennent d'être décrits uniquement à titre d'exemples non limitatifs sans sortir du cadre de l'invention.

REVENDICATIONS

1. Dispositif de commande à distance d'un miroir de rétroviseur pour véhicule fixé sur un boîtier renfermant un mécanisme de commande comprenant un organe de support solidaire de la carrosserie du véhicule et s'étendant à l'intérieur du boîtier par une ouverture, ledit organe présentant un premier axe (XX_1) autour duquel est montée pivotante une entretoise sur laquelle est monté pivotant suivant un deuxième axe (YY_1) perpendiculaire au premier axe (XX_1) le boîtier portant le miroir, un moyen de commande de déplacement disposé suivant le second axe (YY_1) étant prévu entre l'organe de support et l'entretoise et un autre moyen de commande de déplacement étant disposé de façon décalée par rapport au second axe (YY_1) entre l'entretoise et le boîtier, caractérisé en ce que l'organe de support est constitué d'un bras en deux parties (1, 2) reliées entre elles par un organe d'effacement à crabotage (7, 8, 9), l'une des parties (1) du bras étant fixée sur la carrosserie du véhicule et l'autre partie (2) s'étendant à l'intérieur du boîtier (3) comportant deux paliers (11, 11a) d'axe vertical dans lesquels sont montées deux broches (12, 12a) sur lesquelles est articulée l'entretoise (13) qui présente deux tourillons (14, 14a) disposés suivant un axe horizontal et engagés dans des paliers (15, 15a) prévus sur le boîtier (3).

2. Dispositif suivant la revendication 1, caractérisé en ce que les paliers prévus sur le boîtier sont constitués chacun par un logement (64) ouvert d'un côté et dans lequel est maintenu un tourillon (15, 63) de l'entretoise (13, 59) sous l'action d'une lame élastique (65) dont les deux extrémités sont en appui contre deux organes de support (66, 66a) solidaires du boîtier (3, 54).

3. Dispositif suivant la revendication 1, caractérisé en ce que les moyens de commande (16, 22) de déplacement sont constitués chacun d'un carter (27) fixé sur l'entretoise ou sur le boîtier et dans lequel est disposé un moteur électrique (28) entraînant en rotation par un moyen de transmission (30, 31, 32, 33) une tige (34), à filet hélicoïdal dans lequel est engagée la partie médiane d'au moins

un étrier élastique (35, 35a), qui est solidaire d'un fourreau (36) disposé autour de la tige et dont une extrémité est montée de façon articulée au moyen d'une rotule (18, 24) sur l'organe de support ou sur l'entretoise.

4. Dispositif suivant la revendication 1, caractérisé en ce que les moyens de commande de déplacement des organes sont constitués chacun d'un câble de commande dont l'une des extrémités est reliée au boîtier (3, 54) ou à l'entretoise (13, 59) et dont l'autre extrémité est reliée à un organe de manoeuvre manuel disposé dans le véhicule.

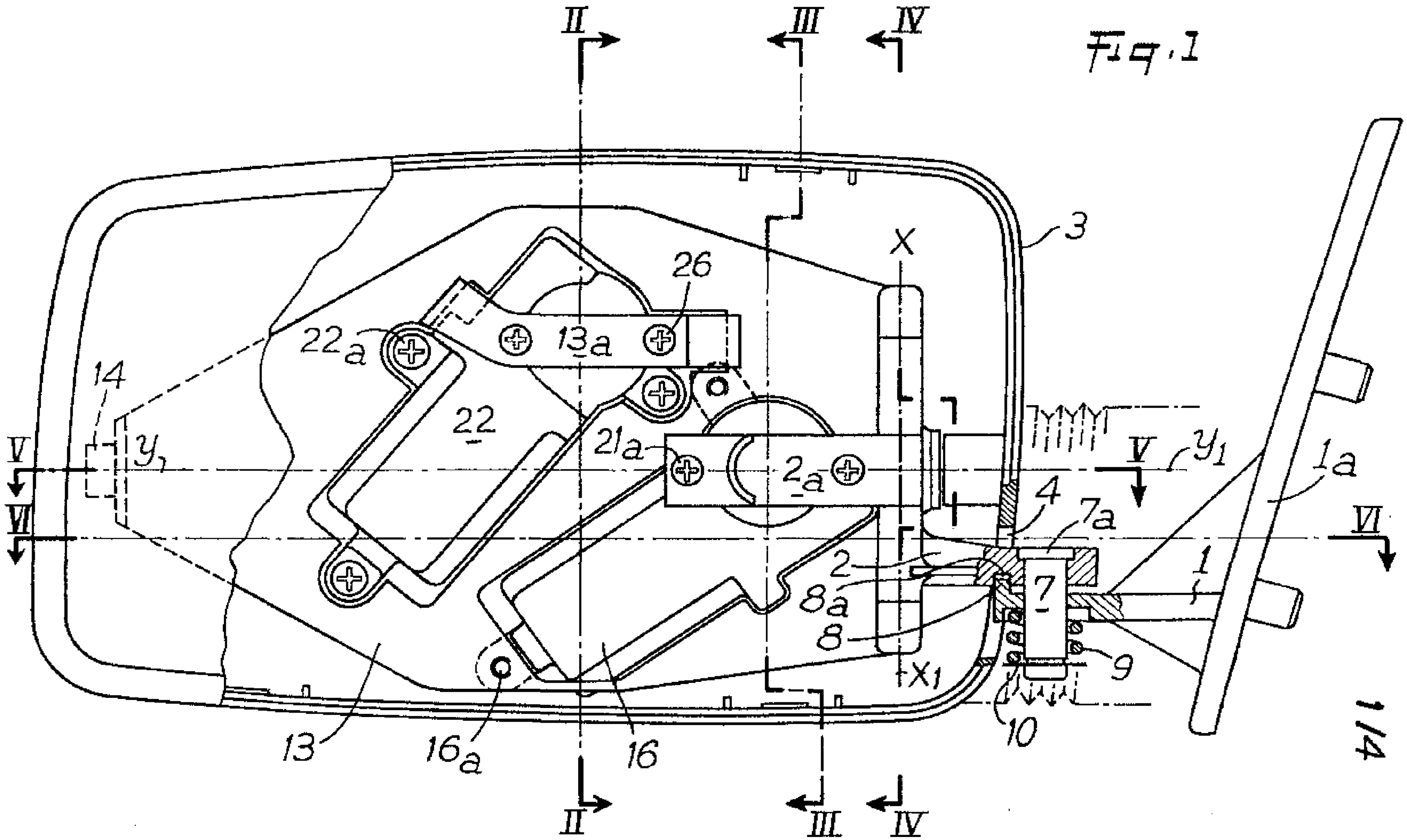


Fig. 1

1/4

2503647

Fig.2

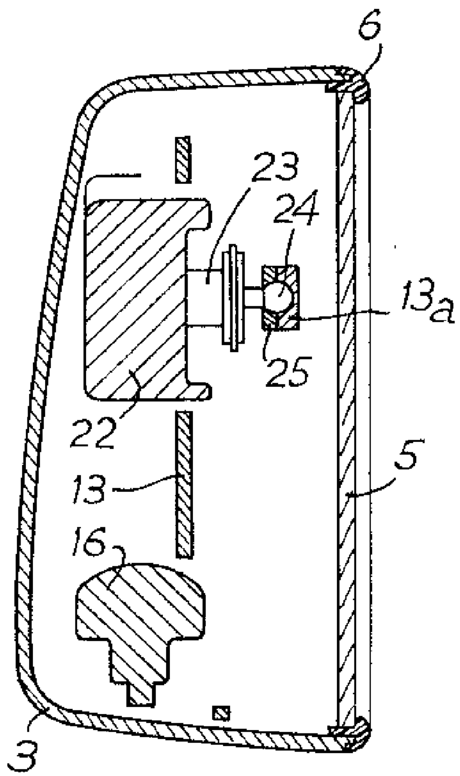


Fig.3

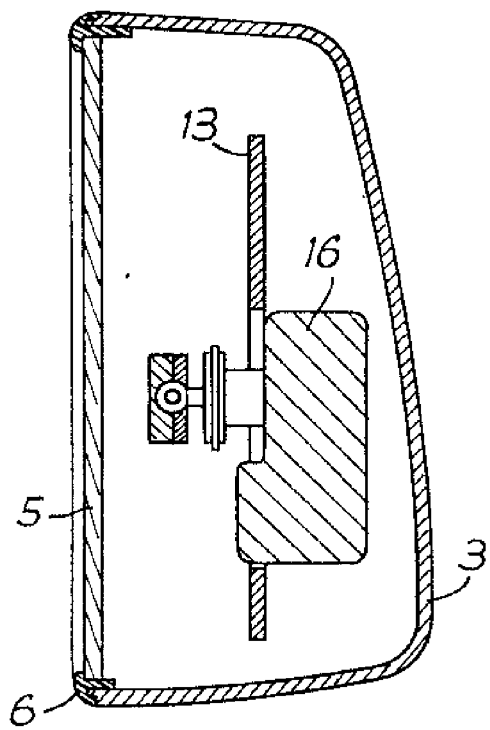
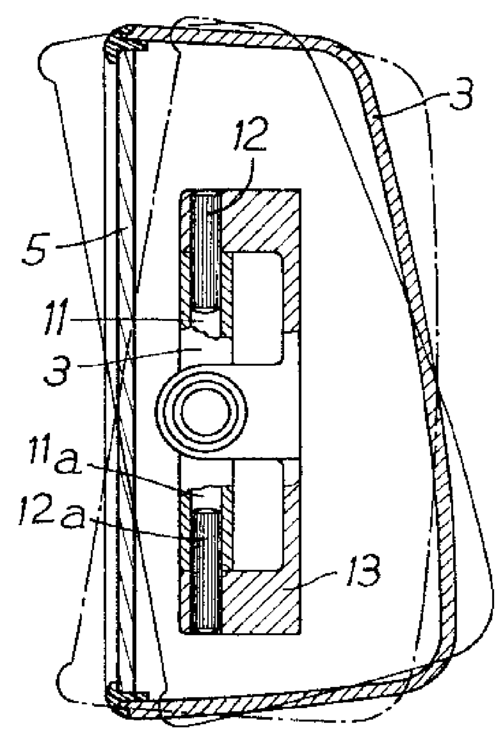


Fig.4



2/4

2503647

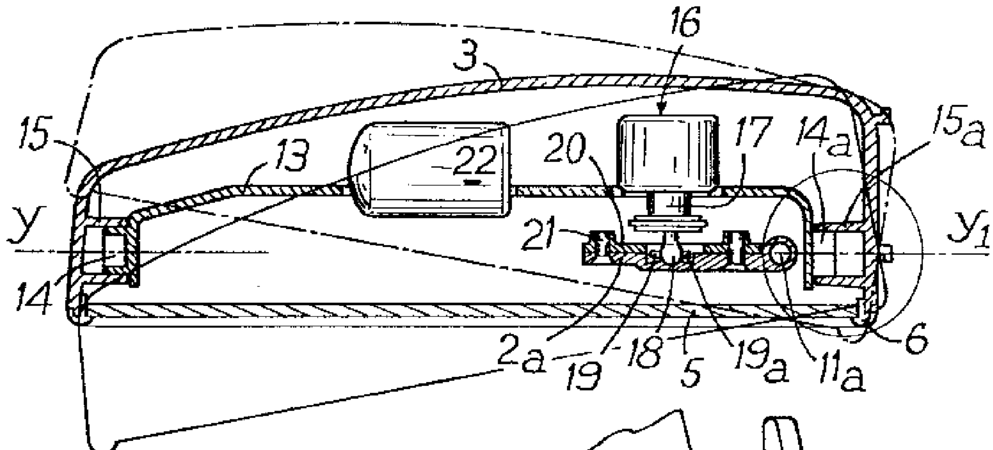


Fig. 5

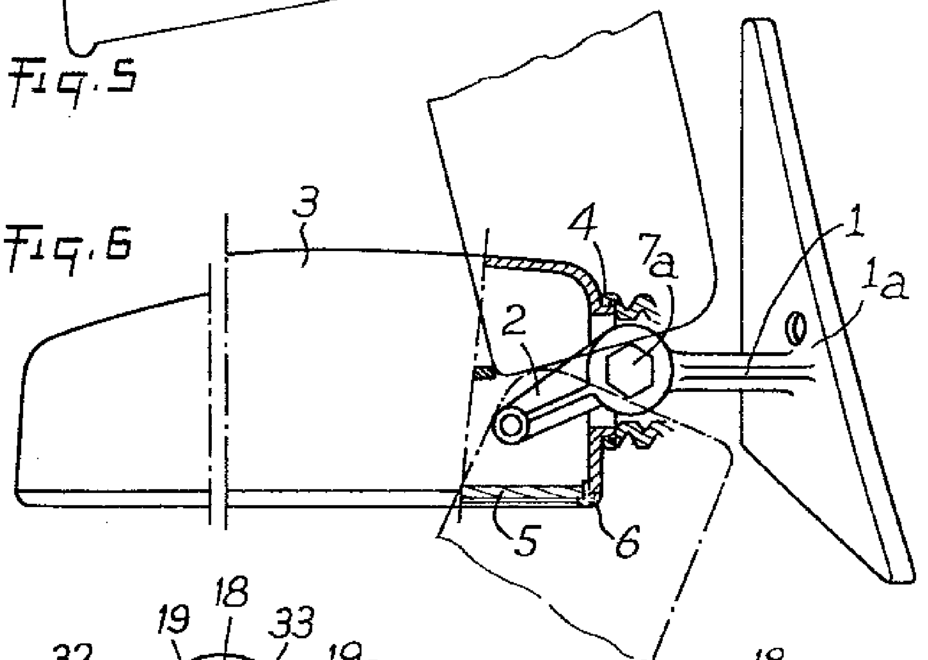


Fig. 6

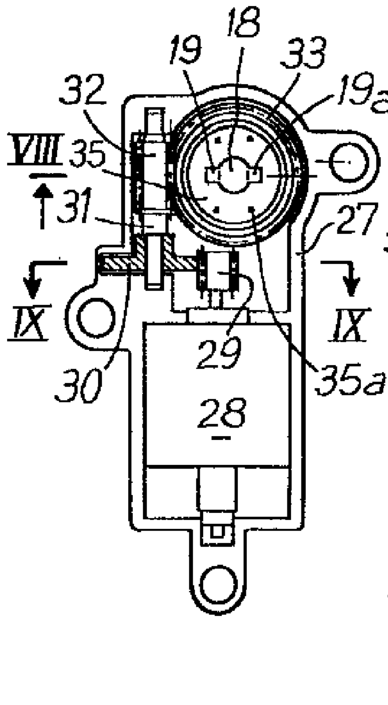


Fig. 7

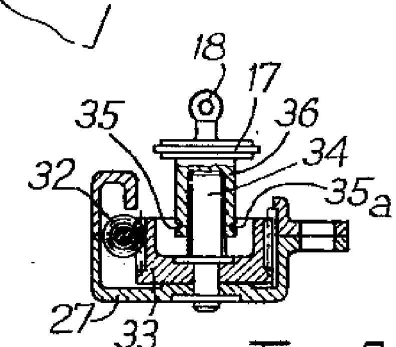


Fig. 8

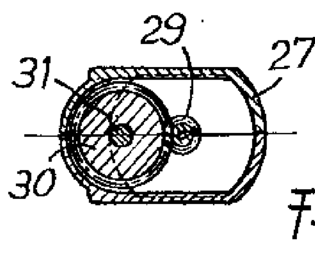


Fig. 9

Fig.10

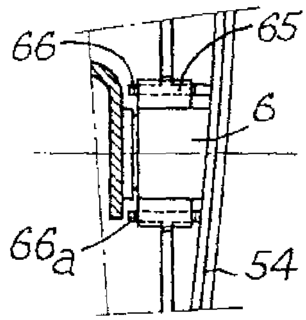
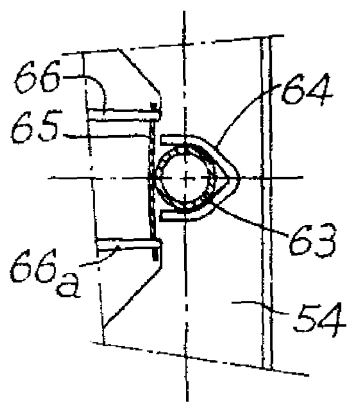


Fig.10a



Patent Translate

Powered by EPO and Google

Notice

This translation is machine-generated. It cannot be guaranteed that it is intelligible, accurate, complete, reliable or fit for specific purposes. Critical decisions, such as commercially relevant or financial decisions, should not be based on machine-translation output.

ABSTRACT FR2503647

DEVICE FOR REMOTELY CONTROLLING A MIRROR MIRROR FOR A VEHICLE FIXED ON A BOX COMPRISING A CONTROL MECHANISM. IT INCLUDES A SOLIDARITY SUPPORT ORGAN OF THE BODY OF THE VEHICLE AND EXTENDING INSIDE THE HOUSING 3 BY AN OPENING, THIS BODY HAVING A FIRST AXIS XX AROUND WHICH IS RIGGING A SPACER 13 ON WHICH IS MOUNTED SWIVEL FOLLOWING A SECOND YY AXIS PERPENDICULAR TO THE FIRST AXIS XX THE HOUSING 3 CARRYING THE MIRROR, A MEANS OF DISPLACEMENT CONTROL 16 ARRANGED FOLLOWING THE SECOND AXIS YY BEING PROVIDED BETWEEN THE SUPPORT MEMBER 2 AND THE SPACER 13 AND ANOTHER MEANS OF CONTROL 22 OF MOVEMENT BEYOND ARRANGED IN RELATION TO THE SECOND AXIS YY BETWEEN THE SPACER 13 AND THE HOUSING 3.

Notice

DESCRIPTION FR2503647

Device for remote control of a mirror mirror for

vehicle. The present invention relates to a device for

remote control of a rear view mirror mirror for a vehicle.

It is known to use mirrors in which

the mirror, controlled remotely, is movably mounted to the

his shoemaker as well as the means of articulation and

control by electric motor or by a manually operated member.

However, these mirrors are not entirely satisfactory.

faction with regard to the internal protection of organs mechanical against dust and weather.

It is known to use a device comprising a support member secured to the vehicle body and extending inside the casing through an opening, said member having a first axis about which is pivotally mounted a spacer

on which is pivotally mounted, along a second axis perpendicular to

to the first axis, the housing carrying the mirror, a displacement control means disposed along the second axis being provided between the support member and the spacer and another displacement control means being disposed offset relative to

the second axis between the spacer and the casing.

In this device, the mirror being secured to the casing and not movable inside thereof, it provides a perfect seal against dust and weather. A bellows of very simple design ensures the closure of the opening in the casing to allow angular movements thereof. According to the present invention, the support member is constituted by an arm in two parts interconnected by an erasing member interconnection, one of the parts of the arm being fixedde on the body of the vehicle and the other part extending inside the casing having two bearings of vertical axis in which are mounted two pins on which is articulated the spacer which has two pins arranged along an axis

horizontal and engaged in bearings provided on the shoemaker.

The mechanism thus mounted in the casing allows for a form thereof having a relatively small thickness. Finally, such a rearview mirror can be mounted indifferently on the door or on the gusset door of a vehicle. Other features and advantages of the invention

will be better understood by reading the following description

of an embodiment and with reference to the accompanying drawings, in which: - Figure 1 is an elevational view of an embodiment of a rear view mirror according to the invention, the mirror being removed; - Figure 2 is a sectional view along the line II-II of Figure 1; - Figure 3 is a sectional view along the line III-III of Figure 1; - Figure 4 is a sectional view along the line IV-IV of Figure 1; - Figure 5 is a sectional view along the line V-V of Figure 1; -. Figure 6 is a plan view of the mirror and partial section along the line VI-VI of Figure 1; FIG. 7 is a longitudinal sectional view of an embodiment of a displacement control means; - Figure 8 is a sectional view along line VIIIVIII of Figure 7; - Figure 9 is a sectional view along the line IX-IX of Figure 7; and - Figures 10, 10a are sectional views showing the

detail of an embodiment of bearings.

In Figures 1 to 6, there is shown an embodiment of a rear view mirror of a motor vehicle more particularly

intended to be mounted on the gusset of a door.

The device comprises a support member of which a part 1 has a plate la intended to be fixed on the door of the vehicle and the other part 2 extends inside a box 3 mirror through an opening 4 of the boot maker who is wearing his

front face of a mirror 5 mounted by means of a mirror-holder rod 6.

The part 1 of the support member is connected to the part 2 by an axis 7 whose head 7a, having a hexagonal shape, is integral with the part 2 of the support member, said axis 7 being rotatably mounted in the part 1 of the support member which has at least one interconnection member 8 engaged in a housing 8a of the part 2 under the action of a spring 9 bearing one side against the part 1 of the support and the another side against a washer 10 engaged in a groove of the axis 7 (Figures 1 and 6). Part 2 of the support member, disposed inside the casing, has two bores 11, 11a in which are pivotally mounted at one end of the pins 12, 12a secured to their other end

a spacer 13 (Figure 4).

The spacer 13 is thus articulated along a first vertical axis XX1 on the part 2 of the support member and is provided at its two ends with journals 14, 14a (Figure 5) which are engaged in cylindrical housings or bearings 15 , 15a provided inside the casing 3. The pins 14, 14a and the bearings 15, 15a are arranged along the same axis, so that the battier 3

is pivotally mounted on the spacer 13 along a second horizontal axis

zontal YY1.

On the spacer 13, is fixed, by means of screws 16a, a control means 16 of the displacement of the spacer relative to

the support member 2.

This control means 16 which will be described in more detail later includes a movable head 17 having a ball 18 provided with two pins 19, 19a, said ball being disposed in a housing provided between an arm 2a integral with the support member and a plate 20 fixed to the arm 2a by means of screws 21 (Figures 1 and 3). The ball 18 is disposed along the axis YY1 to pivot the spacer about the axis XX1 relative to the support member 1, 2. In the same way, a control means 22 is fixed by means of screws 22a on the bottom of the casing 3 and has a movable head 23 (FIGS. 1, 2 and 5) comprising a ball joint 24 provided with two nipples as above, said ball being disposed in a spherical housing provided between an arm 13a integral with the spacer 13 and a

plate 25 fixed on the arm by means of screws 26.

FIGS. 7, 8 and 9 show an embodiment of the displacement control means 16 and 22 which each comprise a housing 27 in which is fixed an electric motor 28 whose output shaft carries a pinion 29 which meshes with a pinion 30 set on an axle 31 rotatably mounted in the housing and which is shaped to constitute a worm 32 meshing with a tangential wheel 33 which is integral in rotation with a rod 34 with helical thread or threaded rod in which is engaged the middle part of two elastic stirrups 35, 35a integral with a sleeve 36 disposed around the rod 34 and whose head 17 or 23 carries a ball 18 or 24

provided with nipples 19, 19a.

The device operates in the following manner: when the motor 28 is supplied, the screws 32, 32 and the tangent wheel 33, in rotation, drive the rod 34 by means of its helicoidal thread or threaded rod, by means of the pinions 29, 30 in translation stirrups 35, 35a and the

sheath 36.

Consequently, if the control means 16 is actuated, the spacer 13 is moved relative to the support member 1, 2, so that the spacer and the casing 3, carrying the mirror 5, move around of the vertical axis XX1 following a left-right movement. On the other hand, by actuating the control means 22, the casing 3 carrying the mirror 5 is moved around the following axis YY1

a heaven-earth movement.

According to another embodiment shown in FIGS. 10, 10a, in its median part the spacer 59 has two journals 63, 63a which are pivotally mounted in housings 64, 64a of the casing open on one side where they are held by a elastic blade 65, in particular made of steel, bearing against organs

support 66, 66a secured to the housing 54.

In this way, the casing 54 is pivotally mounted

along a horizontal axis YY "on the spacer 59.

Although it has been described and shown control means using electric motors, it is obvious that the movement of the mirror bodies can be obtained by any other mechanical means and in particular by a cable that is actuated

from inside the vehicle by a manual control device.

Of course, various modifications may be made by those skilled in the art to the devices that have just been described as non-limiting examples without departing from the framework of the invention.

Notice

CLAIMS FR2503647

R E V E N D I C A T IO N S

1.
Device for remote control of a mirror

visor for a vehicle mounted on a casing containing a control mechanism comprising a support member secured to the vehicle body and extending inside the casing through an opening, said member having a first axis (XX1) around which is mounted pivoting a spacer on which is pivotally mounted along a second axis (YY1) perpendicular to the first axis (XX1) the housing carrying the mirror, displacement control means arranged according to

the second axis (YY1) being provided between the support member and the

measuring device and another displacement control means being arranged offset from the second axis (YY) between the spacer and the casing, characterized in that the support member consists of a two-part arm (1 , 2) interconnected by an interconnecting erasing member (7, 8, 9), one of the arm portions (1) being attached to the vehicle body and the other extending part (2) inside the casing (3) having two bearings (11, 11a) of vertical axis in which are mounted two pins (12, 12a) on which is articulated the spacer (13) which has two pins (14, 14a).) arranged along a horizontal axis and engaged

in bearings (15, 15a) provided on the casing (3).

2.
Device according to claim 1, characterized in that the bearings provided on the casing are each constituted by a housing (64) open on one side and in which is held a pin (15, 63) of the spacer (13, 59) under the action of an elastic blade (65) whose two ends bear against two

support (66, 66a) secured to the casing (3, 54).

3.
Device according to Claim 1, characterized in that the displacement control means (16, 22) consist each of a casing (27) fixed on the spacer or on the casing and

wherein an electric motor (28) is disposed

transmission means (30, 31, 32, 33) a rod (34), helicoidal thread in which is engaged the middle portion of at least

Z50364?

an elastic yoke (35, 35a), which is integral with a sleeve (36) disposed around the shank and one end of which is hingedly mounted by means of a ball joint (18, 24) on the support member

or on the spacer.

4.
Device according to Claim 1, characterized in that the means for controlling the displacement of the members each consist of a control cable whose one end is connected

housing (3, 54) or spacer (13, 59) and the other end of which mity is connected to a manual maneuvering device

vehicle.

(19) RÉPUBLIQUE FRANÇAISE

INSTITUT NATIONAL
DE LA PROPRIÉTÉ INDUSTRIELLE

PARIS

(11) N° de publication : **2 605 567**
(à n'utiliser que pour les commandes de reproduction)

(21) N° d'enregistrement national : **87 14428**

(51) Int Cl⁴ : B 60 R 1/06.

(12) DEMANDE DE BREVET D'INVENTION A1

(22) **Date de dépôt :** 20 octobre 1987.

(30) **Priorité :** DE, 24 octobre 1986, n° P 36 36 161.5.

(43) **Date de la mise à disposition du public de la demande :** BOPI « Brevets » n° 17 du 29 avril 1988.

(60) **Références à d'autres documents nationaux apparentés :**

(71) **Demandeur(s) :** *MITTELHAUSER Bernhard.* — DE.

(72) **Inventeur(s) :** Bernhard Mittelhäuser.

(73) **Titulaire(s) :**

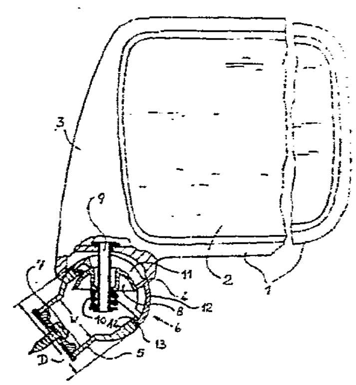
(74) **Mandataire(s) :** Cabinet Flechner.

(54) **Rétroviseur à rotule pour des véhicules automobiles.**

(57) Rétroviseur de véhicule automobile.

La partie supérieure 2 de la sphère 6 qui est repoussée de l'intérieur par la pièce de pression 8, peut être reliée par encliquetage à la partie inférieure de la sphère qui est montée sur l'embase 5.

Industrie automobile.



FR 2 605 567 - A1

Rétroviseur à rotule pour des véhicules automobiles.

L'invention concerne un rétroviseur de véhicule automobile, notamment un rétroviseur extérieur, comprenant un boîtier de réception du miroir, qui est monté au moyen d'une rotule à une embase servant à la fixation sur le véhicule, la sphère creuse de la rotule, qui se trouve sur l'embase, étant repoussée de l'intérieur par une pièce de pression montée sur le boîtier.

Cette pièce de pression, qui est le plus souvent soumise à la tension d'un ressort, permet d'assurer une pression bonne et suffisante entre la sphère d'une part, et le coussinet se trouvant sur le boîtier, d'autre part. Afin de pouvoir monter cette pièce de pression avec le ressort de pression qui en fait partie, il faut introduire ces pièces dans l'embase creuse. Il va de soi qu'un montage de ce type n'est possible que si l'embase a un grand diamètre intérieur, et si de plus, la sphère de la rotule n'a qu'un diamètre efficace relativement petit. Mais un dimensionnement de ce type va à l'encontre de l'exigence d'une bonne liaison de frottement de l'articulation et d'une embase étroite. On souhaite de grands diamètres de la sphère pour obtenir de bonnes valeurs de frottement et, en outre, des embases étroites et pas trop disgracieuses pour la fixation au véhicule automobile.

L'invention vise à perfectionner le rétroviseur ci-dessus, de manière à pouvoir choisir une sphère de grande dimension pour l'articulation et, en outre, une embase étroite, tout en permettant l'assemblage du rétroviseur.

Pour résoudre ce problème, il est prévu, suivant l'invention, que la partie supérieure de la sphère, qui est repoussée de l'intérieur par la pièce de pression, peut être reliée à la partie inférieure de la sphère, qui est montée sur l'embase. De préférence, cette liaison s'effectue par ce que l'on appelle un clipsage ou un encliquetage. Il est prévu une liaison par complémentarité de forme, par exemple par languette et rainure. Cette liaison est réalisée par le fait que lorsque l'on presse les deux parties de la sphère l'une vers l'autre, il se produit une certaine déformation élastique, les deux parties de la sphère coopérant par complémentarité de forme étant alors aussi maintenues. Le cas échéant, cette complémentarité de forme peut être supprimée par des déformations convenables ; mais les forces nécessaires à cet effet sont bien plus grandes que les contraintes qui se produisent dans le fonctionnement du rétroviseur, pour empêcher ainsi tout desserrage intempestif.

Grâce à l'invention, on peut choisir un diamètre efficace de la sphère, qui est bien plus grand que la largeur de l'embase. Grâce à la subdivision de la sphère creuse, on ne dépend plus du choix des largeurs ou des cavités ménagées à l'intérieur de l'embase.

D'autres détails de l'invention ressortiront du dessin qui représente un exemple de réalisation de l'invention.

Le dessin est une vue en élévation dans la direction de la surface du miroir d'un rétroviseur extérieur d'un véhicule automobile, la partie inférieure étant