DOUBLE PIVOT VEHICLE MIRROR ASSEMBLY

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ABSTRACT

A mirror assembly especially designed for commercial vehicles including a support arm, a mirror head pivotally affixed to the support arm by first and second hinges having a pivot axis. The axes extend horizontally and transverse to the direction of vehicle travel. The first hinge allows a pivoting of the mirror head about its pivot axis only in a first direction A and the second hinge permits a pivoting of the mirror head only in a second direction B which is opposite to the direction A. By this means, it is possible that the two hinges can be simple and rugged in construction.
DOUBLE PIVOT VEHICLE MIRROR ASSEMBLY

[0001] The present invention concerns a mirror assembly for a vehicle, in particular for a commercial vehicle.

[0002] The support arm of rearview mirrors in commercial vehicles, like a city bus, is commonly extended forward from the chassis at an essentially horizontal level when the mirror head hangs downward from the forward end of a support arm, they are known as "horn-mirrors," especially when applied to buses. Horn-mirrors provide better aerodynamics and simple fabrication as well as an advantageous field of view which encompasses a wide arc.

[0003] If, as in the case of "low-floor" buses, a part of the support arm and/or the mirror extend into a safety zone, this zone normally covers a span from the ground level to about 2 meters above, the mirror must be adjusted so as to height for the protection of both mirror and persons as may be waiting within a said safety zone.

[0004] EP 0 895 897 B1 proposes a single hinge attachment so that the mirror can be swiveled about a single horizontal axis, transverse to the direction of vehicle travel to move from its operational position in which the mirror is at least partially within the limits of the safety zone. Following the swiveling, the mirror would find itself in a position of no harm, and above the safety zone limits.

[0005] Since the mirror presents a danger of impact, both in forward and reverse travel, it becomes necessary, that the hinge of EP 0 895 897 B1 be capable of swinging in two directions of rotation, in order to protect persons in the safety zone from severe mirror impact. For example, upon a bus start-up from a bus-stop or during a backward maneuver. Likewise, the mirror must remain fixed in position of operation during normal travel, even when subjected at times to shaking and to strong wind forces. In such a case, EP 0 895 897 B1 proposes the use of friction fittings.

[0006] Hinges which permit swinging in both directions, and enable a simultaneous attainment of a fixed position are expensive.

[0007] Accordingly, an object of the present invention is to enable a stable securement of a vehicle mirror in its operational position and, at the same time, to assure a pivoting about an axis allowing two directions of rotation.

SUMMARY OF THE INVENTION

[0008] The construction designed to carry out the invention will hereinafter be described, together with other features thereof.

[0009] The above objective is accomplished in accordance with the present invention by providing a mirror assembly having a support arm, a mirror head, and two hinges connecting the support arm and the mirror head. The first hinge allows a pivoting of the mirror head about its axle of rotation only in one direction, and the second hinge permits a pivoting of the mirror head about its axle of rotation only in a second direction of rotation, which is opposite to the first. Preferably, each hinge pivots only in one direction. In this way, the construction of both hinges is less complex. The first and/or second hinge may incorporate a detent which limits rotation in either the first or the second direction. Such a detent can, for example, be made mechanically or be provided with a friction fit. Thus, a desired second detent can also be the detent inherent in the other hinge arrangement. The large lever arms, which result therefrom, assure, with relatively small support forces, sufficiently high resistance torques. In this way, completion of a pivoting opposite to the allowable direction of turning is provided.

[0010] The first and/or second hinge can include a torsion spring. The springs, in a constructive, simple, and economical manner provide a pivoting in the allowable direction and otherwise affix the mirror head securely in its operational position. Further, the springs allow the mirror head to return accurately to its operational position, following a safety displacement.

[0011] In a particularly advantageous embodiment, upon a pivoting of the mirror head about the axis of one hinge, the hinge connection between the mirror head and the carrier arm is released. In this way, for example, the axis of the first hinge prevents a further pivoting about the axis of the second hinge counter to the second rotational direction beyond the limited operational positioning. In the case of a pivoting in the second rotational direction, to the contrary, the connection of the first hinge releases itself.

[0012] In a preferable manner, the support arm and/or the head of the mirror can be enhanced with a bearing structure, preferably of metal construction. If this is coated, for example, with a material, such as plastic, and the coating can be applied by spraying, the result is a light, aerodynamically favorable, and uniformly stable assembly of the mirror, and vibration of the mirror is reduced. Particularly preferable, the first and/or the second hinge can be hinged and reliably attached to this structure.

[0013] In another advantageous embodiment, the support arm comprises a first and a second part. Between the said first and second support arm part, a third hinge is present, the axis of rotation of which extends itself vertically during the mounting of the mirror. This allows an additional pivot direction of the mirror assembly to the side or to the front of the vehicle. The overall dimensioning allows an advantageous reduction of length for, as an example, loading on a ship, parking, or the like. This extra pivoting can be effected by a motor, or may be manual.

[0014] The mirror head is usually an elongated structure having a first end of the mirror head pointing towards the vehicle and a second end pointing away from the vehicle. According to a preferred embodiment of the invention either the first or second hinge is attached to the mirror head at a position between the first end of the mirror head and the second end of the mirror head. This arrangement reduces the space required for the mirror head upon pivoting. Due to this placement of the hinges, the mirror head acts, in the case of a pivoting in the first direction of rotation, a weight compensation and generates an inherent torque about the first axle of rotation because of gravity. In this manner a pivoting in the first direction of rotation at the constructively identical first and second hinges requires a lesser release torque. Therefore, the first hinge is already released upon small torques, while the second hinge is only released at higher torques, and thus withstands torques induced by wind forces, for example.
DESCRIPTION OF THE DRAWINGS

[0015] The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings forming a part thereof, wherein an example of the invention is shown and wherein:

[0016] FIG. 1 is a side elevation illustrating a commercial vehicle with a mirror assembly in accordance with the present invention.

[0017] FIG. 2 is a side elevation illustrating a mirror assembly in accord with an embodiment of the present invention illustrating the operational position (solid line) and two deviate positions (dotted line);

[0018] FIGS. 3A to 3C are side views illustrating the carrier arm of the mirror assembly in the position indicated in FIG. 2;

[0019] FIG. 4 is an enlarged view illustrating a hinge and detent according to the invention.

DESCRIPTION OF A PREFERRED EMBODIMENT

[0020] Referring now in more detail to the drawings, the invention will now be described in more detail.

[0021] As is shown in FIG. 1, a mirror assembly, designated generally as A, in accord with the present invention is illustrated installed on a vehicle. The mirror assembly includes a support arm 1 and a mirror head 2. Mirror head 2 of the assembly, is illustrated in a position which has not been pivoted, and at least partially extends into safety zone 6 above the ground. Since mirror head 2, in accordance with the invention, is pivotal in alternate positions above the safety zone, damage is avoided even in the case of an impact against an obstruction within the safety zone. Especially traumatic damage to persons, who are within the said safety zone, such as, bus passengers, can be avoided.

[0022] FIG. 2 illustrates, in a side profile view, a mirror assembly in accordance with an embodiment of the present invention in an operating condition (solid lines) and two alternate positions (dotted lines). The mirror head comprises a first hinge 3 having a first axle 31 of rotation and a second hinge 4 having a second axle 41 of rotation. The mirror head 2 is pivotal about the first axle 31 of rotation in a first direction A and about the second axle 41 of rotation in a second direction B.

[0023] The support arm 1 encompasses a bearing structure 14, preferably made of metal and an aerodynamic coating 13, preferably of plastic. The support arm, as can best be seen in FIG. 3, is designed in two parts. A first part 11 and a second part 12 are connected by means of a hinge 5 having an axle 51 of rotation which extends vertically when the mirror head is mounted. In this way, a pivoting of the mirror assembly laterally or to the front of the vehicle is provided.

[0024] The mirror head 2 includes a carrier arm 24 (FIG. 3A), preferably made of metal, and an aerodynamic coating 25, such as a plastic. A first mirror 21 can be adjusted by manual or motorized means in the mirror head 2. Further, a second mirror 22 and a third mirror 23 are provided, which function as a main mirror, as a wide-scope mirror, i.e., for blind-spot surveillance.

[0025] As can best be seen in FIGS. 3A to 3C, the support arm 14 and the mirror head are attached together by means of the first and second hinge 3 and 4. For the sake of clarity, in these illustrations, only carrier arm 24 of support arm and carrier arm 24 attached to mirror head 2 is presented.

[0026] FIG. 3A shows the mirror assembly in its operational position. In FIG. 3A the carrier arm 24 holds by friction to the rotational axles 31, 41 of the first and second hinges 3, 4 by frictional engagement. In this way, an operational position is reliably maintained. The connection can be carried out by means of friction mating or flexibly projected parts, and the like. Advantageously, axles 31, 41 of rotation are snapped into or onto respective hinge 3 and 4, i.e., carrier arm 24 of mirror head 2 frictionally grips axles 31, 41 of rotation.

[0027] Hinges 3, 4 include, respectively, a torsion spring, for example, possibly a characteristically shaped steel spring. The end of the spring is rigidly fixed to the carrier arm and its second end attached at frictionally engaged mirror head 2 on carrier arm 24. In this way, a resistance to the pivoting is provided. In a similar manner, the spring can be fixed rigidly with the carrier arm 24 of the mirror head 2 and support itself in snapped-in mirror head 2 on carrier arm 24 of the support arm 14.

[0028] A detent 44 provides a mechanism by which carrier arm 24 temporarily stays in place relative to the hinge until it is released by force. For this purpose, hinge slot 46 narrows to a throat 48 reduced in comparison to axles 31, 41, so that the axles snap in and out of the throat. While snapped in the throat, the axles are frictionally gripped and held in place until released by snapping outward.

[0029] Besides the friction engagement of the mirror head 2, the two springs also fix the mirror head in its operating position. Since the axle rotation of the respective other hinge, acting as part of the detent, prevents a pivoting counter to the desired direction of rotation, it is possible that the hinge can be constructed very simply and robustly by means of the springs. As a whole, the coaction of the two hinges 3, 4, the torsion springs, which provide resistance to undesired pivoting, the axles 31, 41 of rotation, which function as a detent, and the self-engaged locking of the axle 31, 41 of rotation, enables a constructively simple and secure fixation of the mirror head 2 in its operational position. Nevertheless the mirror head 2 can be released from this position by an impact due to collision, after which the mirror head assumes one of its alternate positions.

[0030] If a collision with an obstruction (for example in a case of maneuvering in reverse gear) exerts a sufficiently large directed force against the mirror head 2, (FIGS. 3A-3C) to the left, i.e., in the forward direction, then the friction grip in second hinge 4 releases. Upon release, mirror head 2 swings about first axle 31 of rotation in the first direction of rotation A against the resistance of the wire spring in first hinge 3, as shown in FIG. 3B. The torsion spring in first hinge 3 obstructs a swinging because of too little force and supports in such a manner the friction grip holding the operational position. Simultaneously, it initiates a retraction torque about first axle 31 of rotation, which returns mirror head 2, after its alternate movement, at least partially back into its proper operational position.

[0031] If the above action is reversed and a collision with an obstruction upon a forward moving of the bus (for
instance upon the startup from a bus station) exerts a substantial rearward directed force against the mirror head 2 (FIGS. 3A to 3C) to the right, that is, counter to the forward driving direction, then the frictional grip in first hinge 3 is released. When released, the mirror head pivots around second axle 41 of rotation in the second turning direction B against the resistance of the torsion spring in second hinge 4, as shown in FIG. 3C. The torsion spring in second hinge 4 obstructs a pivoting under forces which are too small and provides reliability of the frictional grip and maintenance in the operational position. At the same time, the spring initiates a retraction torque about first axle of rotation 41, which returns the mirror head 2, after its deviate movement, at least partially, into the proper operational position.

[0032] In the described embodiments of the invention mirror head 2 is an elongated structure and in operational position of the mirror assembly has a first end 15a pointing towards the vehicle and a second end 15b pointing away from the vehicle. First hinge 3 is attached to a mirror head 2 between first and second ends 15a, 15b of the mirror head. The second hinge 4 is attached to first end of the mirror head 2. Due to this placement of the hinges 3, 4, mirror head 2 and carrier arm 24, respectively, acts as a weight compensation and generate inherent torque about the first axle 31 of rotation, in the case of a pivoting in the first direction of rotation A. In this manner, pivoting in first direction of rotation A at constructively equal first and second hinge 3, 4, requires a lesser release torque. It is possible that first and second hinges 3, 4 can advantageously be built like one another, so that first hinge 3 is already released upon small torques, while second hinge 4 only releases at higher torques, and thus withstands, e.g., torques induced by wind forces.

[0033] The design of releasable fastenings in hinges 3, 4, themselves, is very simple due to the shape-fit and the one-way releasing support of the springs, which is kinematical and design wise very simple. Alternately, however, even mirror head 2 can be built as a two-piece structure, wherein the two parts can commonly be pivoted around second hinge 4 and only a forward part can rotate about first hinge 3. If one examines FIG. 3C, in such a case, reference number 2 designates the forward mirror head part, and reference number 24 another mirror head part. Both parts being capable in common of pivoting about, in this case, the non-releasable second hinge 4 in rotation direction B. The forward part is capable of pivoting about an non-releasable rotational hinge designated with 3. Also, the kinematical pivoting, i.e. common pivoting in first direction A and separate pivoting of the forward part in the second rotational direction is possible.

[0034] While a preferred embodiment of the invention has been described using specific terms, such description is for illustrative purposes only, and it is to be understood that changes and variations may be made without departing from the spirit or scope of the following claims.

What is claimed is:

1. A mirror assembly, especially for commercial vehicles, comprising:

- a support arm,
- a mirror head pivotally carried by said support arm;
- a first hinge and a second hinge for pivotally carrying said mirror head;
- a first axle of rotation provided by said first hinge extending generally horizontal and transverse to the direction of travel,
- a second axle of rotation provided by said second hinge displaced from and extending generally parallel to said first axle of said first hinge,
- said mirror head pivoting about said first axle only in a first direction, and said mirror head pivoting about said second axle only in a second direction which is opposite to said first direction.

2. The vehicle mirror assembly of claim 1 including a carrier arm carried by said support arm said carrier arm being pivotally carried by said first and second hinges.

3. The vehicle mirror assembly of claim 1 wherein said mirror head includes a first mirror, a second mirror, and a third mirror.

4. The vehicle mirror assembly of claim 1 wherein said first and second hinges include a spring for resisting rotation about said first and second swivel axes in said first and second directions, respectively.

5. The vehicle mirror assembly of claim 1 wherein said first and second hinges include a detent which limits rotation about said first axle.

6. The vehicle mirror assembly of claim 5 wherein said detent of said first and second hinges include the axle of the respective other hinge.

7. The vehicle mirror assembly of claim 6 wherein the fit of one of said first and second hinge is released upon a pivoting of the mirror head about the axle of the respective other hinge axe.

8. The vehicle mirror assembly of claim 1 wherein said support arm includes a first arm and a second arm wherein between the first and the second support arm a third hinge is disposed, and said third hinge having a third swivel axle of rotation extending generally vertically in the vehicle mirror general assembly.

9. The vehicle mirror assembly of claim 6 wherein the mirror head has a first end pointing towards the vehicle, a second end pointing away from the vehicle, and one of said first and second hinges is disposed between said first and second ends of the mirror head.

10. The vehicle mirror assembly of claim 9 wherein the other of said first and second hinges is disposed at said first end of the mirror head pointing towards the vehicle.

11. The vehicle mirror assembly of claim 1 in combination with a commercial vehicle wherein the mirror assembly is mounted on the vehicle so that the mirror head has an operational position, wherein said mirror head projects at least partially into a safety zone which extends from the ground to above said projection, and said mirror head can be pivoted about one of said first and second axes to a generally non-operational position above the safety zone.