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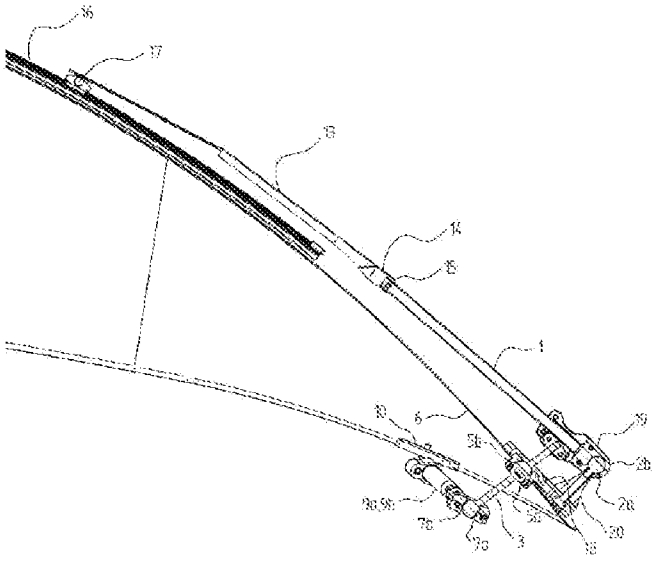
(73)	Proprietor	PODBIKE AS, Heiamyrå 1, 4031 STAVANGER, Norge
(72)	Inventor	Per Hassel Sørensen, Flørlibakken 13, 4307 SANDNES, Norge
(74)	Agent or Attorney	HÅMSØ PATENTBYRÅ AS, Postboks 9, 4068 STAVANGER, Norge

(54)	Title	**Windscreen wiper assembly**
(56)	References Cited:	FR 2488558 A1, CN 203419106 U, DE 19914121 A1, KR 101866454 B1, GB 639535 A, FR 2534537 A1

(57) Abstract

A windscreen wiper for a double-curved windscreen for a vehicle comprising: an wiper arm (1) connected to a wiper blade attachment, the wiper arm having a longitudinal axis; a windscreen wiper rotation mechanism to which the wiper arm is connected for moving the windscreen wiper blade across the double-curved windscreen, a part of the the windscreen wiper rotation mechanism adapted to be fixed relative to the windscreen, wherein the windscreen wiper rotation mechanism includes a first rotary joint having a central point, around which the wiper arm has full rotational freedom, whereby the wiper arm, upon being moved by the windscreen wiper rotation mechanism, may substantially follow the curvature of the double-curved windscreen. There is also disclosed a windscreen wiper assembly as well as a velomobile including such as windscreen wipe assembly.



WINDSCREEN WIPER ASSEMBLY

The present invention relates to a windscreen wiper assembly for a double-curved windscreen. The invention also relates to a velomobile including such a windscreen wiper assembly.

Existing windscreen wipers for velomobiles are functional only for flat or nearly flat windscreens. In addition, the wiping action is actuated manually using a handle directly attached to the windscreen wiper shaft. This shaft is a single axis pivot directly connected to windscreen wiper arm located on the outside of the vehicle.

For some velomobiles where the front windshield is at a distance from the rider, the operating handle cannot be located directly on the wiper shaft. This can be solved by providing an electrically operated wiper; however, this adds weight and may cause extra wear on the windshield that is normally made of polymer for weight reason.

Document FR 2488558 A1 describes a windscreen wiper device for a vehicle comprising a wiper arm with a longitudinal axis, a wiper blade and a wiper rotation mechanism including a universal joint-like rotation mechanism which allows the wiper arm to rotate about its longitudinal axis in addition to the rotational movement of the windshield. However, the rotation mechanism does not provide full freedom of rotation for the wiper arm.

The invention has for its object to remedy or to reduce at least one of the drawbacks of the prior art, or at least provide a useful alternative to prior art.

The object is achieved through features, which are specified in the description below and in the claims that follow.

For a heavily double-curved windscreen surface, resembling that of an aircraft canopy, there is a need for a wiper mechanism that can better curve, or follow, the heavily double-curved shape of the windscreen surface in operation. By letting the windscreen wiper twist in two axes it is possible to follow the surface curvature of the double-curved windscreen surface. However, to do so will normally require advanced mechanical gears, which may increase mass and size of the windscreen wiper rotation mechanism. For a mainly

human-powered velomobile, a windscreen wiper rotation mechanism should preferably be light and provide minimum air drag.

The present applicant has realised that by accepting some deviation from optimum path, it becomes possible to make a suitable twisting windscreen wiper rotation mechanism for a double-curved windscreen that requires few extra parts and is very light.

In a first embodiment, the invention relates to a windscreen wiper assembly for a double-curved windscreen for a vehicle, the windscreen wiper assembly comprising:
- a wiper arm connected to a wiper blade attachment, the wiper arm having a longitudinal axis;
- a windscreen wiper rotation mechanism to which the wiper arm is connected for moving the windscreen wiper blade attachment across the double-curved windscreen, a portion of the windscreen wiper rotation mechanism adapted to be fixed relative to the windscreen, wherein the windscreen wiper rotation mechanism includes a first rotary joint having a central point, around which the wiper arm has full rotational freedom, whereby the wiper arm, upon being moved by the windscreen wiper rotation mechanism, may substantially follow the curvature of the double-curved windscreen.

It should be noted that by “full rotational freedom” is meant that this rotary joint in itself allows full rotational freedom, but that the angular movement of the wiper arm may be limited or restricted in one or more directions in use, as will be exemplified below.

In one embodiment, the windscreen wiper rotation mechanism may comprise a movable shaft, and where the wiper arm may be connected to the first rotary joint via the movable shaft, where the movable shaft may be connect to the wiper arm by means of a pivot connection at an upper portion of the movable shaft, whereby the windscreen wiper rotation mechanism may be pivotal relative to the longitudinal axis of the wiper arm. In practice, the pivot connection may be useful for allowing the movement of the arm to deviate from the curve of movement for the wiper arm defined by the first rotary joint. E.g. if the first rotary joint is a ball joint, the surface over which wiper arm is movement curve is defined will be that of a sphere. By letting the arm pivot relative to the shaft, deviation from a perfect sphere is enabled, which may be very beneficial for optimizing the fit of the windscreen wiper blade to a double-curved windscreen, in particular where the curvature of the windscreen deviates from that of a sphere in one or both curving directions. In certain embodiments, the pivot connection may allow pivoting of 45° upwardly and downwardly or-

thogonally to the shaft, implying that the angle between the shaft and the wiper arm may attain any angle between 45° and 135° in use.

In one embodiment, the wiper blade attachment may be connected to the wiper arm in a hinged and spring-loaded connection, whereby the spring is adapted to bias a wiper blade, attached to the wiper blade attachment, towards the double-curved windscreen in use. This will also contribute to a better fit and thus better wiping functionality. The biasing function may be used in addition to the pivot joint between the shaft and the arm discussed above, or preferably in combination with the pivot connection.

In one embodiment, the movable shaft may extend from the upper portion at the pivot connection, through the first rotary joint, and to a lower portion where the shaft is movably connected to an actuator assembly, whereby the actuator assembly is adapted to initiate rotation of the wiper arm by moving the lower portion of the shaft. The actuator assembly forms a part of the windscreen wiper rotation mechanism. As will be discussed in more detail below, the actuator assembly may be human-powered or it may be powered by electricity, such as by a battery already present in the vehicle, or by gas or hydraulics. In one embodiment, the actuator assembly may includes a pneumatic spring, the pneumatic spring having a first end connected to the lower portion of the shaft and second end connectable to the vehicle, the pneumatic spring, upon being compressed, may be adapted to move the wiper arm to a first position, and wherein the pneumatic spring, upon being released to an uncompressed state, may be adapted to move the wiper arm to a second position. This offers a simple and reliable way of activating and controlling the movement of the wiper arm, where the extreme positions of the wiper arm will be defined by the stroke length of the pneumatic spring, and where the pneumatic spring will always return the wiper arm to its idle, starting position when no force is applied. In an alternative embodiment, the actuator assembly may include a linear, electric actuator, whereby simple electric windscreen wiping may be provided without driver involvement. It should also be noted that in its simplest form, the windscreen wiper assembly according to the invention may be operated manually without any actuator assembly.

In one embodiment, the rotation mechanism may further comprise a second rotary joint to which the wiper arm is also connected, the second rotary joint having a central point around which the wiper arm has full rotational freedom, the central point of the second rotary joint being provided at a fixed distance offset from the central point of the first rotary joint both vertically and horizontally relative to the longitudinal axis of the wiper arm. In a preferred embodiment, the central points of both the first and second rotary joints may be

provided substantially at the longitudinal centre of the double-curved windscreen in use. In an even more preferred embodiment, the central point of the first rotary joint may be located in or near the plane of the windscreen, whereas the central point of the second rotary joint may be located slightly above the plane of the windscreen closer to the “bottom” om the windscreen than the first central point.

In one embodiment, the full rotational freedom of the first rotary joint may be provided by means of ball joint. The ball joint may be protected by an elastomeric jacket, such as a bellow, surrounding the joint. Ball joints are readily available off-the-shelf in a variety of sizes at a low cost and provide full rotational freedom in two planes while preventing translational freedom. In an alternative embodiment, the full rotational freedom may be provided letting the shaft extend through a hole in the double-curved windscreen, where the hole in the double-curved windscreen is lined with elastomer (rubber) to which the shaft is connected, e.g. by means of glue, where the central point of the rotary joint is then constituted by a central point on the shaft. It yet an alternative embodiment the first rotary joint, and also other rotary joints mentioned herein, may be replaced by another type of joint offering similar rotational freedom, such as a universal joint. However, in a preferred embodiment, both the first and second rotary joints are ball joints.

In one embodiment, the actuator assembly may be connected to a lower portion of the shaft via a third rotary joint and may further be connectable to the vehicle via a fourth rotary joint. This also provides rotational freedom for the actuator assembly relative to the shaft, allowing it to rotate both relative to the shaft and relative to the vehicle, which may be particularly useful if the actuator assembly is human-powered. One or both of the third and fourth rotary joints may also be ball joints.

In use, a wiper blade will be connected to the wiper blade attachment. In one embodiment the wiper blade may be connected to the wiper blade attachment by means of a pivot joint, whereby wiper blade may pivot relative to the wiper blade attachment around an axis substantially normal to the length axis of the wiper blade attachment, so as to optimize the fit between the wiper blade and the double-curved windscreen.

In a second embodiment, the invention relates to a velomobile with a double-curved windscreen, the velomobile comprising a windscreen wiper assembly according to the first aspect of the invention. It is also contemplated that invention may be used on other types of vehicles and even vessels, such as e.g. manned mini submarines, that also have canopy-type windows.

In the following is described an example of a preferred embodiment illustrated in the accompanying drawings, wherein:

Fig. 1 shows, in a cross-sectional side view, a windscreen wiper assembly according to the invention attached to a double-curved window of a velomobile;

Fig. 2 shows, in a perspective side view, details of the shaft of the rotation mechanism;

Fig. 3 shows, in partially transparent side view, the wiper arm of the windscreen wiper assembly;

Fig. 4 shows, in a perspective side view, an actuator assembly as included in a windscreen wiper assembly according to invention

Fig. 5 shows, in a perspective side view, a windscreen wiper assembly according to the invention.

In the following, the reference numeral 100 is used to denote a windscreen wiper assembly according to the invention. It should be noted that the drawings are shown simplified and schematic, and that the various features therein are not necessarily drawn to scale.

Fig. 1 shows one embodiment of a windscreen wiper assembly 100 according to the invention. The figure is a longitudinal cross-section through the centre of a double-curved windscreen 6 of a vehicle. A wiper arm 1 is connected to a first rotary joint 5a, b via a shaft 3, where the first rotary joint is a ball joint in the shown embodiment. A ball/sphere 5a of the ball joint is provided approximately in the middle of the shaft 3 in a socket 5b. The socket 5b is provided in a through-going hole in the double-curved windscreen 6 so that the central point of the ball joint is located approximately in the middle of the plane of the double-curved windscreen. In alternative embodiments, the first rotary joint could also be located below or above the plane of the double-curved windscreen 6. The socket 5b of the first rotary joint is provided in a windscreen bracket 18 which is used to fix the windscreen wiper assembly 100 to the double-curved windscreen 6 near the through-going hole. At its upper end, the shaft 3 is connected to the wiper arm 1 via a pivot joint 4a, 4b provided in an arm connector 19 at the distal end of the wiper arm 1, as will be explained in more detail below. The pivot joint 4a, 4b allows some pivoting of the shaft 3 relative to the longitudinal axis of the wiper arm 1. The wiper arm connector 19 is further connected to the windscreen bracket 18 via a second shaft 20, the second shaft 20 being rigidly con-

nected to the windscreen bracket 18 and offset from the first shaft 3 along the longitudinal centre of the double-curved windscreen as seen in Fig. 1. The second shaft 20 is rotatably connected to the arm connector 19 in a second rotary joint 2a, 2b, which is also being provided in the form of a ball joint in the shown embodiment, where a ball 2a of the ball joint is connected to the top of the second shaft 20, while a socket 2b for ball 2a is integrated into the arm connector 19. The second shaft 20 in the shown embodiment has the shape of a cone with its widest part at the windscreen bracket 18, narrowing towards the ball 2a at the arm connector 19, whereby the central point of the second ball joint 2a, 2b is also located above the central point of the first ball joint 5a, 5b in a direction normal to the surface of the double-curved windscreen 6.

The shaft 3 is shown in more detail in Fig. 2. At its upper portion, the shaft 3 is provided with a head with axle pins 4a protruding in opposite directions orthogonal to the length of the shaft 3. In its mid portion, the shaft is provided the ball 5a of the first ball joint, while at its lower portion the shaft 3 is provided with a ball 7a of a third ball joint, as will be explained in more detail below, the third ball joint defining a connection between the lower portion of the shaft 3 and an actuator assembly for initiating the movement of the shaft 3 and thereby the movement of the whole wiper arm 1. The shaft 3 will normally be connected to the head and ball parts via threaded connections, though other connections, such as wedge connections, may also be used.

Fig. 3 shows an enlarged view of the wiper arm 1 with the arm connector 19 at its distal end. The arm connector 19 is shown partly transparent for the sake of clarity. The arm connector 19 is formed with two axle holes 4b adapted to mate with the axle pins 4a of the head of the shaft 3 as shown in Fig. 2. The axle pins 4a and holes 4b constitute a pivot connection allowing the wiper arm 1 to pivot relative to the windscreen 6 and windscreen bracket 18 in the longitudinal direction of the wiper arm. The arm connector 19 is also formed with a socket 2b for the second ball bearing 2. The arm connector is constituted by two parts screwed, bolted or otherwise connected together around the ball 2a and shaft head.

In use, the wiper arm 1 will follow the curvature of the first ball joint 5a, 5b, and the second ball joint 2a, 2b, and its arrangement in the arm connector 19 rotatably supports the arm connector19 while also restricting the angular movement of the wiper arm 1. The pivot joint 4a, 4b allows the wiper arm 1 to pivot relative to the shaft 3 so as to deviate from the spherical path defined by the first ball joint 5a, 5b. In the shown embodiment, an upper bore in the arm connector 19, just below the socket 2b of the second ball joint, comes into

contact with the upper portion of the second shaft 20, just below the ball 2a, when the arm connector 19 moves from side to side, and therefore limits/restricts the sideways movement of the wiper arm 1.

To move the wiper arm 1, a force needs to be applied to the lower portion of the shaft 3. Force is applied by means of an actuator assembly, and in the shown embodiment, the actuator assembly connects to the lower portion of the shaft 3 in a third ball joint 7a, 7b. The lower portion of the shaft 3 defines the ball 7a of the third ball joint, while the socket portion 7b is connected to the outgoing shaft of a manually operated pneumatic spring/ piston 9b. In alternative embodiments, the actuator assembly can include a linear actuator 9a powered by a battery on the vehicle or by hydraulics or gas. In the shown embodiment, a force to compress the pneumatic piston 9b comes from a wire that may be pulled by the driver of the vehicle. Pulling the wire, through a guide 12, compresses the pneumatic spring 9b and simultaneously moves the shaft 3 thereby also the wiper arm 1 to a first position. Since the pneumatic piston 9b has a limited, and fixed stroke length, this also limits the movement of the wiper arm 1. The return movement of the wiper arm 1 to its idle starting position is power by the compressed gas in the pneumatic spring 9b extending the piston rod, and thus moving the shaft 3, and thereby wiper arm 1, back to its starting, idle position. The proximal end of the pneumatic spring, i.e. the end not connected to the shaft 3, is fixed to a position in the vehicle, normally along a side wall on the inside of the vehicle as indicated in Fig. 1, by means of a piston bracket 10. In the shown embodiment, the piston bracket 10 connects to the pneumatic spring 9b in a fourth rotary joint, where this fourth rotary joint also is a ball joint in the shown embodiment, though details of this fourth rotary joint are not visible in the drawings.

As seen in Figs. 1 and 5, a wiper arm attachment 13 is connected to the distal end of the wiper arm 1. The connection between the wiper arm 1 and wiper arm attachment 13 includes a hinge 15 and a spring 14 adapted to bias the wiper arm attachment 13 downwardly relative to the longitudinal axis of the wiper arm 1, so as to push a wiper blade 16, connected to the wiper blade attachment 13, towards the double-curved windscreen 6 in use. In the shown embodiment, the wiper blade 16 is connected to the wiper blade attachment at a pivot joint 17 allowing the wiper blade to rotate relative to the wiper blade attachment 13 in use around an axis substantially normal to the length axis of the wiper blade attachment.

It should be noted that the above-mentioned embodiments illustrate rather than limit the invention, and that those skilled in the art will be able to design many alternative embodi-

ments without departing from the scope of the appended claims. In the claims, any reference signs placed between parentheses shall not be construed as limiting the claim. Use of the verb "comprise" and its conjugations does not exclude the presence of elements or steps other than those stated in a claim. The article "a" or "an" preceding an element does not exclude the presence of a plurality of such elements.

The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage.

Claims

1. Windscreen wiper assembly (100) for a double-curved windscreen (6) for a vehicle, the windscreen wiper assembly (100) comprising:
- a wiper arm (1) connected to a wiper blade attachment (13), the wiper arm (1) having a longitudinal axis;
- a windscreen wiper rotation mechanism to which the wiper arm (1) is connected for moving the windscreen wiper blade attachment (13) across the double-curved windscreen (6), a portion of the windscreen wiper rotation mechanism adapted to be fixed relative to the double-curved windscreen (6), characterized in that the windscreen wiper rotation mechanism includes a first rotary joint (5a, b) having a central point, around which the wiper arm (1) has full rotational freedom, whereby the wiper arm (1), upon being moved by the windscreen wiper rotation mechanism, may substantially follow the curvature of the double-curved windscreen (6).

2. Windscreen wiper assembly according to claim 1, wherein the windscreen wiper rotation mechanism comprises a movable shaft, and wherein the wiper arm is connected to the first rotary joint via the movable shaft , the movable shaft being connect to the wiper arm by means of a pivot connection at an upper portion of the movable shaft, whereby the wiper arm is pivotal relative to the shaft around an axis normal to the shaft and to the longitudinal axis of the wiper arm.

3. Windscreen wiper assembly according claim 1 or 2, where in the wiper blade attachment is connected to the wiper arm in a hinged and spring-loaded connection, whereby the spring is adapted to bias a wiper blade, attached to the wiper blade attachment, towards the double-curved windscreen in use.

4. Windscreen wiper assembly according to claim 2 or 3, wherein the movable shaft extends from the upper portion at the pivot connection, through the first rotary joint, and to a lower portion where the shaft is movably connected to an actuator assembly, the actuator assembly forming a part of the windscreen wiper rotation mechanism, whereby the actuator assembly is adapted to initiate rotation of the wiper arm by moving the lower portion of the shaft.

5. Windscreen wiper assembly according to claim 4, where the actuator assembly includes a pneumatic spring, the pneumatic spring having a first end connected to the lower portion of the shaft and second end connectable to the vehicle, the

pneumatic spring, upon being compressed, is adapted to move the wiper arm to a first position, and wherein the pneumatic spring, upon being released to an uncompressed state, being adapted to move the wiper arm to a second position.

6. Windscreen wiper assembly according to claim 4, wherein the actuator assembly includes a linear, electric actuator.

7. Windscreen wiper assembly according to any one of the claims 2-6, wherein the windscreen wiper rotation mechanism further comprises a second rotary joint to which the wiper arm is also connected, the second rotary joint having a central point around which the wiper arm has full rotational freedom, the central point of the second rotary joint being provided at a fixed distance offset from the central point of the first rotary axis both vertically and horizontally relative to the longitudinal axis of the wiper arm.

8. Windscreen wiper assembly according to any one of the preceding claims, wherein the first rotary joint is a ball joint.

9. Windscreen wiper assembly according to claim 7 or 8, wherein the second rotary joint is a ball joint.

10. Windscreen wiper assembly according to any one of the claims 4-9, wherein the actuator assembly is connected to the lower portion of the shaft via a third rotary joint and further connectable to the vehicle via a fourth rotary joint.

11. Windscreen wiper assembly according to claim 10, wherein one or both of the third and fourth rotary joints is/are ball joint(s).

12. Windscreen wiper assembly according to any one of the preceding claims, the windscreen wiper assembly further comprising a wiper blade connected to the wiper blade attachment.

13. Windscreen wiper assembly according to claim 12, wherein the wiper blade is connected to the wiper blade attachment via a pivot joint allowing the wiper blade to pivot relative to the wiper blade attachment around and axis substantially normal to the length axis of the wiper blade attachment in the.

14. Velomobile with a double-curved windscreen (6), the velomobile comprising a windscreen wiper assembly (100) according to claim 1.

15. Velomobile according to claim 14, wherein the central point of the first rotary joint is located in or near the plane of the double-curved window.

P a t e n t k r a v

1. Frontruteviskersammenstilling (100) for en dobbelkrum frontrute (6) for et kjøretøy, hvor frontruteviskersammenstillingen (100) omfatter:
- en viskerarm (1) forbundet til et viskerbladfeste (13), hvor viskerarmen (1) har en lengdeakse;
- en frontrutevisker-rotasjonsmekanisme som viskerarmen (1) er forbundet til for å bevege frontruteviskerbladfestet (13) over den dobbeltkrumme frontruten (6), hvor et parti av frontrutevisker-rotasjonsmekanismen er tilpasset til å være faststående i forhold til den dobbeltkrumme frontruten (6),
k a r a k t e r i s e r t v e d at frontrutevisker-rotasjonsmekanismen innbefatter et første rotasjonsledd (5a, b) som har et sentralt punkt, rundt hvilket viskerarmen (1) har full rotasjonsfrihet, hvorved viskerarmen (1), ved bevegelse av frontrutevisker-rotasjonsmekanismen, i det vesentlige kan følge den dobbeltkrumme frontrutens (6) krumning.

2. Frontruteviskersammenstilling ifølge krav 1, hvor frontrutevisker-rotasjonsmekanismen omfatter en bevegelig aksel, og hvor viskerarmen er forbundet til det første rotasjonsleddet via den bevegelige akselen, idet den bevegelige akselen er forbundet til viskerarmen ved hjelp av en dreieforbindelse ved et øvre parti av den bevegelige akselen, hvorved viskerarmen er dreibar i forhold til akselen rundt en akse som står normalt på akselen og på viskerarmens lengdeakse.

3. Frontruteviskersammenstilling ifølge krav 1 eller 2, hvor viskerbladfestet er forbundet til viskerarmen i en hengslet og fjærbelastet forbindelse, hvorved fjæren er tilpasset til i bruk å forbelaste et viskerblad, festet til viskerbladfestet, mot den dobbeltkrumme frontruten.

4. Frontruteviskersammenstilling ifølge krav 2 eller 3, hvor den bevegelige akselen strekker seg fra det øvre partiet ved dreieforbindelsen, gjennom det første rotasjonsleddet, og til et nedre parti hvor akselen er bevegelig forbundet til en aktuatorsammenstilling, idet aktuatorsammenstillingen danner en del av frontrutevisker-rotasjonsmekanismen, hvorved aktuatorsammenstillingen er tilpasset til å igangsette rotasjon av viskerarmen ved å bevege det nedre partiet av akselen.

5. Frontruteviskersammenstilling ifølge krav 4, hvor aktuatorsammenstillingen innbefatter en pneumatisk fjær, hvor den pneumatiske fjæren har en første ende forbundet til det nedre partiet av akselen, og andre ende som kan forbindes til kjøretøyet, idet den pneumatiske fjæren, når den trykkes sammen, er tilpasset til

å bevege viskerarmen til en første posisjon, og hvor den pneumatiske fjæren, når den frigjøres til en ikke-sammentrykket tilstand, er tilpasset til å bevege viskerarmen til en andre posisjon.

6. Frontruteviskersammenstilling ifølge krav 4, hvor aktuatorsammenstillingen innbefatter en lineær, elektrisk aktuator.

7. Frontruteviskersammenstilling ifølge hvilket som helst av kravene 2-6, hvor frontrutevisker-rotasjonsmekanismen videre omfatter et andre rotasjonsledd som viskerarmen også er forbundet til, hvor det andre rotasjonsleddet har et sentralt punkt rundt hvilket viskerarmen har full rotasjonsfrihet, idet det sentrale punktet av det andre rotasjonsleddet er anordnet i en fast avstand forskjøvet fra det sentrale punktet av den første rotasjonsaksen både vertikalt og horisontalt i forhold til viskerarmens lengdeakse.

8. Frontruteviskersammenstilling ifølge hvilket som helst av de foregående krav, hvor det første rotasjonsleddet er et kuleledd.

9. Frontruteviskersammenstilling ifølge krav 7 eller 8, hvor det andre rotasjonsleddet er et kuleledd.

10. Frontruteviskersammenstilling ifølge hvilket som helst av kravene 4-9, hvor aktuatorsammenstillingen er forbundet til det nedre partiet av akselen via et tredje rotasjonsledd, og videre kan forbindes til kjøretøyet via et fjerde rotasjonsledd.

11. Frontruteviskersammenstilling ifølge krav 10, hvor det ene av eller både det tredje og fjerde rotasjonsleddet er kuleledd.

12. Frontruteviskersammenstilling ifølge hvilket som helst av de foregående krav, hvor frontruteviskersammenstillingen videre omfatter et viskerblad forbundet til viskerbladfestet.

13. Frontruteviskersammenstilling ifølge krav 12, hvor viskerbladet er forbundet til viskerbladfestet via et dreieledd som tillater viskerbladet å dreie i forhold til viskerbladfestet, rundt og akse i det vesentlige normalt på viskerbladfestets lengdeakse i det.

14. Velomobil med en dobbeltkrum frontrute (6), hvor velomobilen omfatter en frontruteviskersammenstilling (100) ifølge krav 1.

15. Velomobil ifølge krav 14, hvor det sentrale punktet av det første rotasjonsleddet er plassert i eller nær det dobbeltkrumme vinduets plan.

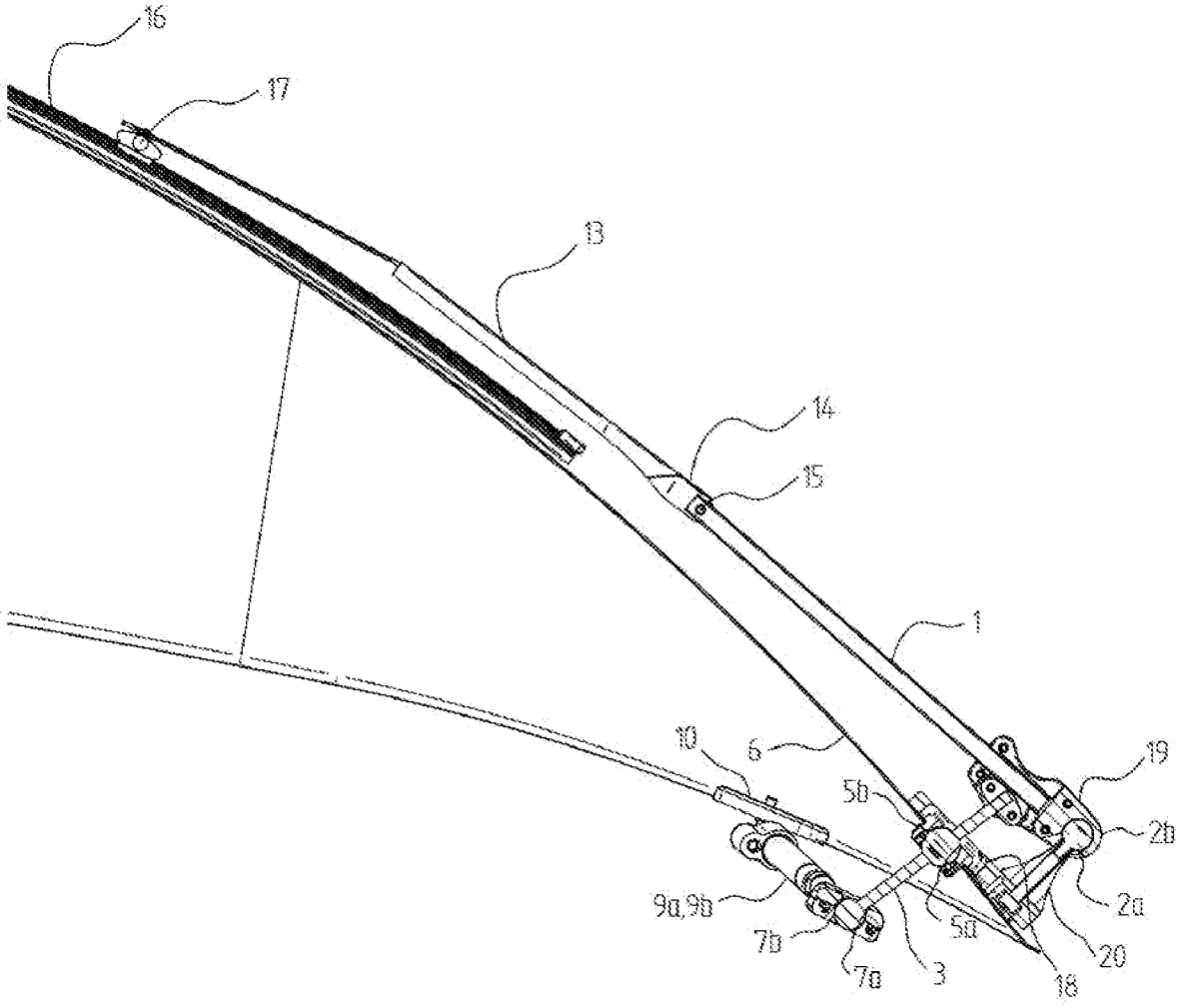


Fig .1

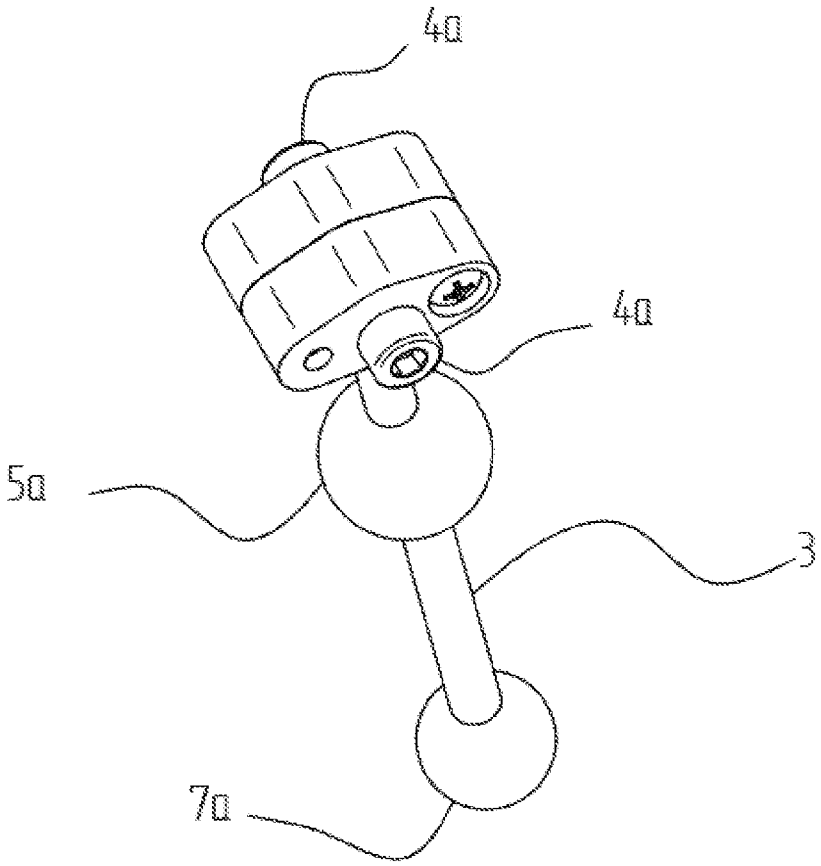


Fig. 2

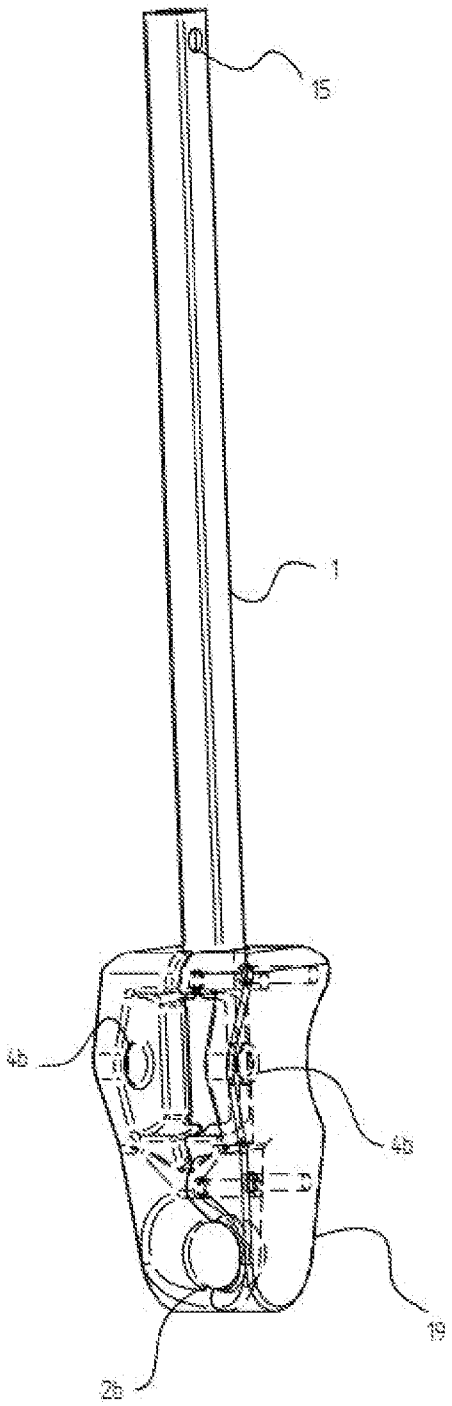


Fig. 3

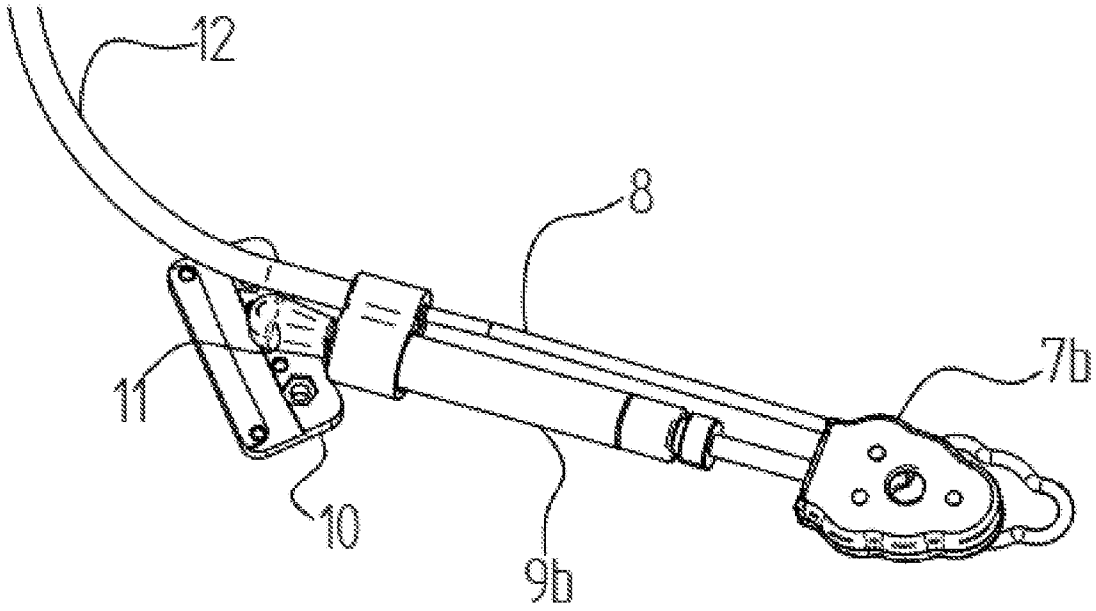


Fig. 4

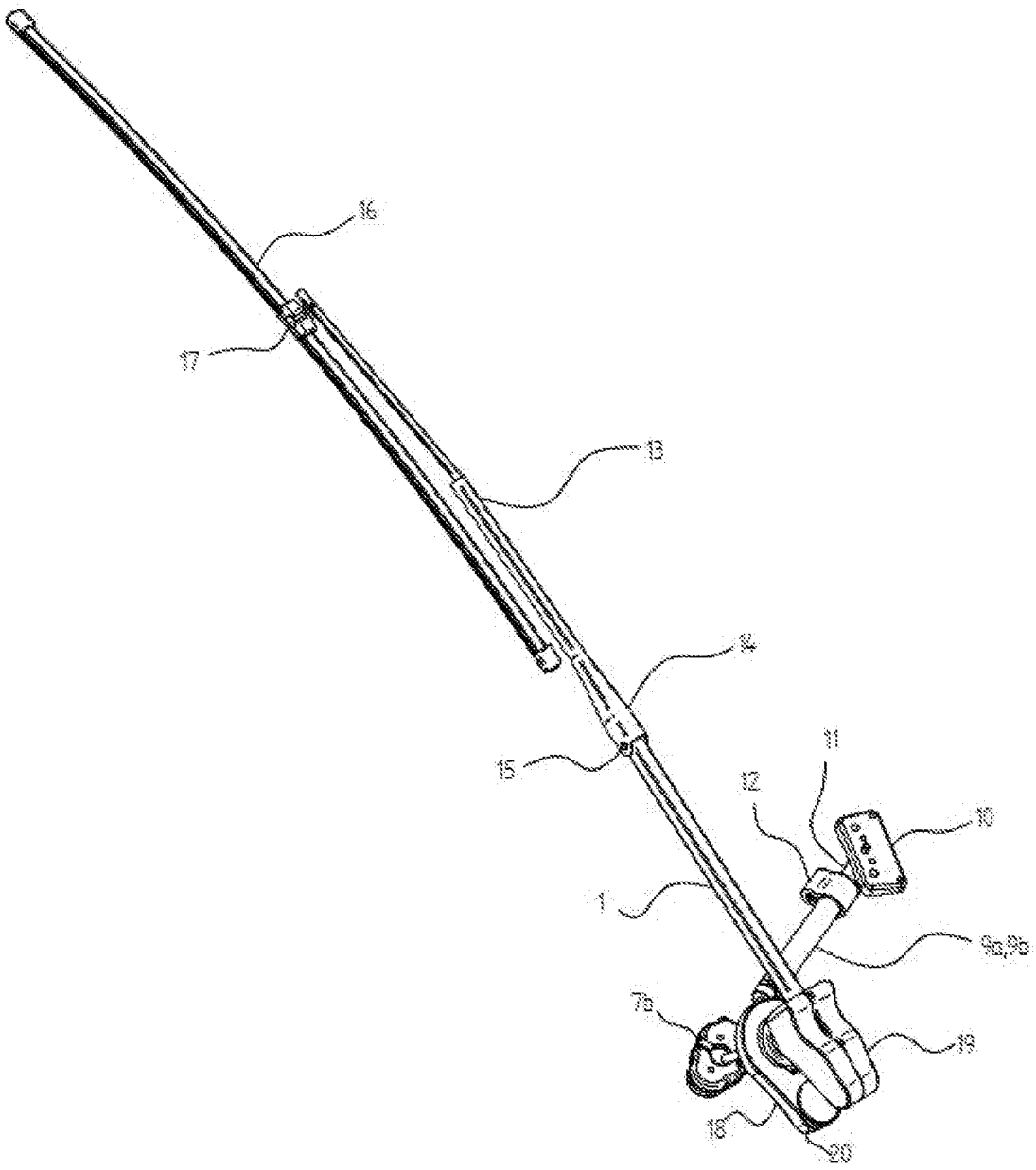


Fig. 5