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Wynn et al.

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[54] **WINDSCREEN WIPERS**

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[52] **U.S. Cl.** **15/250.22**

[51] **Int. Cl.**[2] **B60S 1/44**

[58] **Field of Search**..... 15/250.22, 250.04, 250 A, 15/250.36, 250.42

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[57] **ABSTRACT**

A windscreen wiping device comprises a fast-rotating blade which is invisible to a person behind the screen. Means operate only when the blade is rotating to urge the blade against the screen. These means are preferably constituted by (a) a blade configuration which develops an air flow and (b) a cam connection between a driven hub and a blade carrier.

4 Claims, 5 Drawing Figures

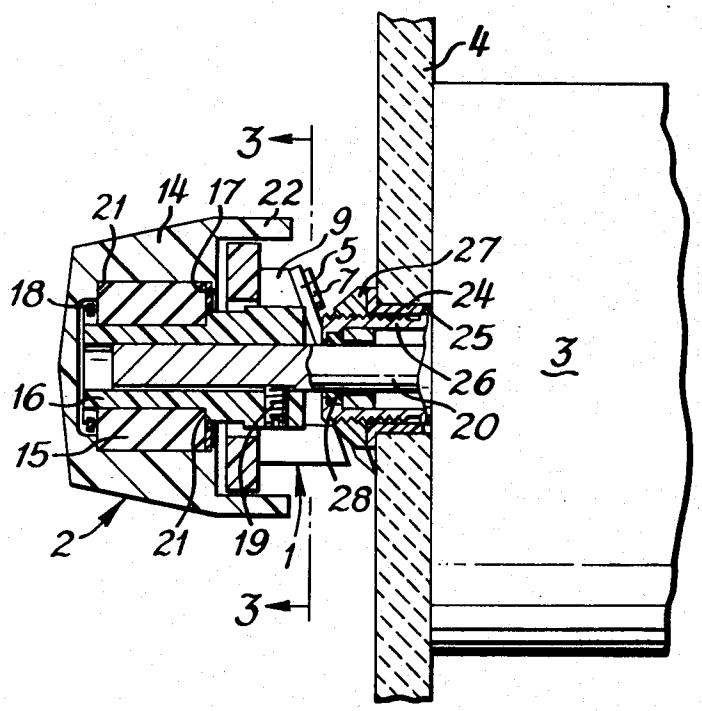


Fig. 1

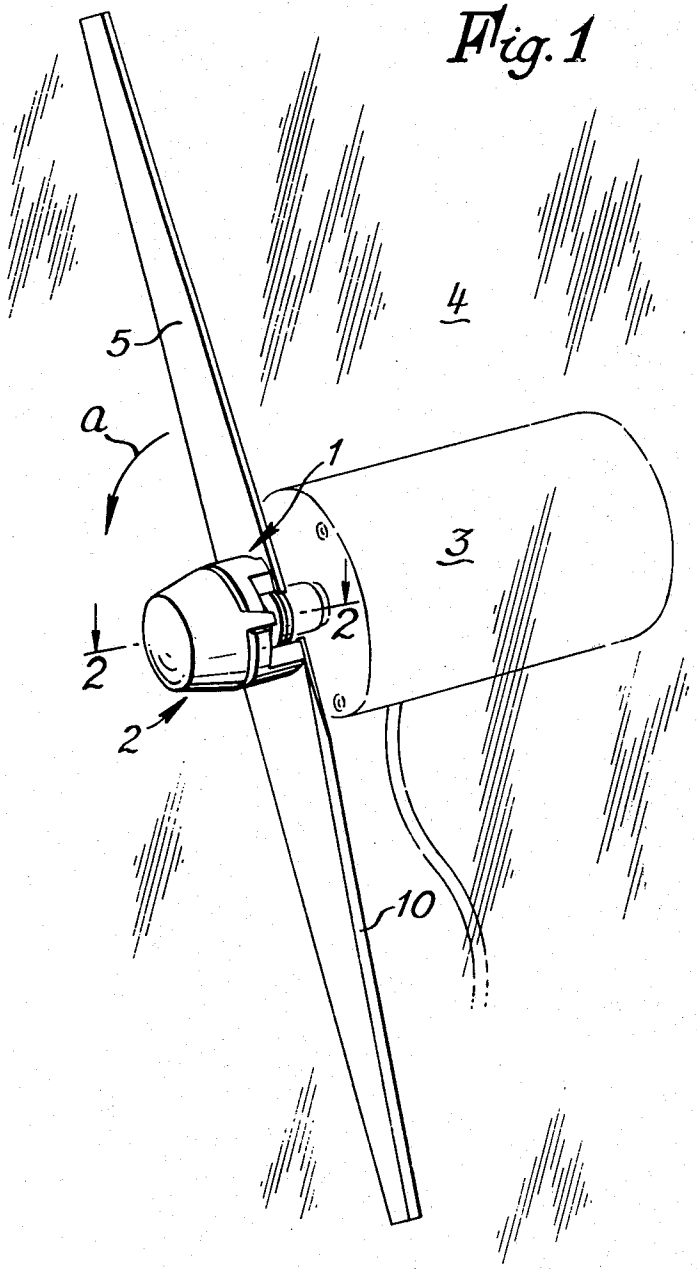


Fig. 2

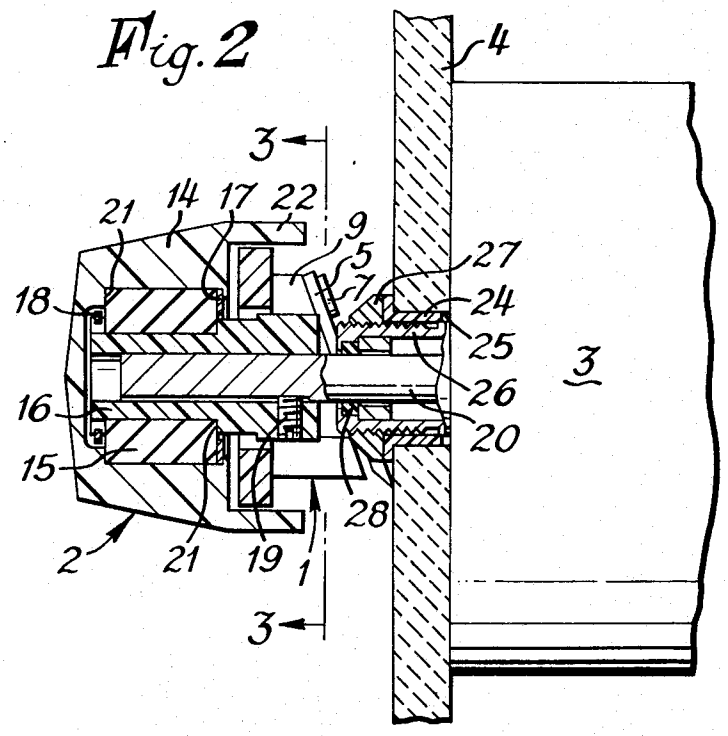


Fig. 3

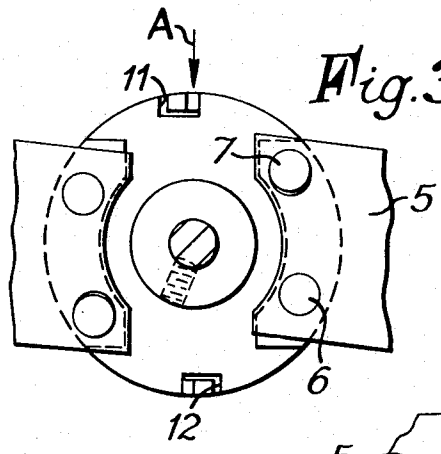
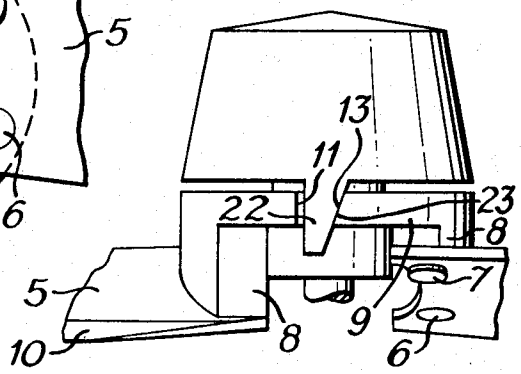


Fig. 4



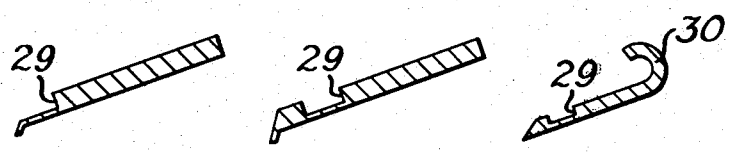


Fig. 5

WINDSCREEN WIPERS

This invention relates to a windscreen wiping device for improving the vision through a transparent screen during rain or at other times when the vision is interfered with through a deposit of fluid falling on the surface of the screen. The invention is particularly applicable to windscreens of ships and transport vehicles.

According to the present invention there is provided a windscreen wiping device comprising at least one wiping blade, drive means for rotating the blade at a wiping speed such that it becomes invisible and means operative only when the blade is rotating for urging the blade into contact with the screen.

The blades will preferably be transparent so as not to hinder vision when stationary and resiliently flexible to accomodate irregularities of the screen.

The urging of the blades against the screen in use can be achieved by so forming the blades that they generate air flow in the relevant direction on rotation. A further method is to provide a cam connection between a drive hub and a carrier for the blades which on rotation serves to urge the carrier and the blades against the screen.

A preferred feature of the invention is that the edge of the or each blades which leads on rotation contacts and clears liquid from the screen. The leading edge interposes itself, wedge fashion, between the liquid and the screen. This in contrast to known devices wherein the blade wipes and spreads the liquid over the screen. However, for convenience, the devices of this invention are referred to as windscreen wiping devices.

The invention and further features thereof will be more fully understood by the following description of a particular embodiment made with reference to the accompanying drawings wherein:

FIG. **1** is a view of the wiper device in position on a windscreen;

FIG. **2** is a section on the line **2:2** of FIG. **1**;

FIG. **3** is a section on the line **3:3** of FIG. **2**;

FIG. **4** is a view taken along the arrow A in FIG. **3**; and

FIG. **5** is a schematic section showing various alternative blade configurations.

The device shown in the drawings comprises two basic assemblies a blade assembly **1** and a hub assembly **2.** The device is driven by a motor **3** positioned behind the transparent screen **4** to be wiped. Each assembly is so designed that, once finally assembled, it cannot be taken apart without total or partial destruction of one or more components; this ensures that it becomes apparent if either has been tampered with after leaving the manufacturers works. The principal components are plastic.

The blade assembly **1** comprises two identical flat transparent wiping blades **5.** The radially inner end part of each blade **5** is secured by two drive fit pins, a short shoulder pin **6** and a long shoulder pin **7** to a rearwardly extending lug **8** of a blade mounting ring. The surface of each lug **8** to which the blade is pinned is inclined. In consequence the blade surfaces are inclined so that on rotation an air flow is generated which forces the blades **5** against the screen. Each blade **5** is held firmly against the mounting ring **9** by the short shouldered pin **6** driven into the latter. The blade **5** is prevented from rotating about the short shouldered pin **6** by the long shouldered pin **7** which although a clearance fit in the

blade **5** is a drive fit in the ring **9.** This clearance permits a controlled amount of movement of the blade wiping edge generally at right angles to the window surface. This movement is provided to facilitate "bedding-in" of the blade edges and provides some allowance for non-alignment of the two blades edges due to manufacturing tolerances. The blade material used is flexible and tough enough to withstand severe bending without fracture and soft enough to avoid scratching the glass during operation. A suitable material is a polycarbonate resin.

The edges of the blades **5** in contact with the glass surface during operation i.e. the leading edges in rotation in the direction of arrows (a) are chamfered at **10** to a near feather edge. This feature facilitates easy removal of water from the glass surface and reduces the effect of the physical impact if any part of the body is inadvertently brough into contact with the rotating blades. The blades edges **10** are parallel with each other and in the same plane but are not aligned. Because of this non-alignment the blade assembly does not tip about the blade edges when rotating.

On an axis at right angles to the blade axes, two slots **11** and **12** are cut in the periphery of the mounting ring **9.** Considering the direction of rotation, the leading surfaces **13** (see FIG. **4**) of the slots are ideally helically formed about the central axis. In practice, the relevant surface being relatively short are flat but angled.

The hub assembly **2** comprises a plastic outer member **14**; four cylindrical rubber vibration dampers **15,** a plastic hub centre **16** a plastic ring **17** preventing axial movement of the rubber vibration dampers **15,** a plastic ring **17** preventing axial movement of the hub centre, and a socket head grub screw **19** locking the assembly to motor shaft **20.** The blade mounting ring **9** is a loose swivel fit on the hub centre **16.** In the hub outer member **14** and hub centre **16** there are two pairs of diametrically opposed axially aligned grooves **21** of circular shape. The rubber vibration dampers **15,** as can well be seen in FIG. **2,** fit snugly into these grooves **21** so that the hub outer member **14** is concentric with the axis of the hub centre **16** but isolated from it completely by rubber. The latter permits rotary, axial and angular limited resiliently flexing movement of the hub outer member **14** relative to the hub centre **16.**

On the periphery of the hub outer member **14** are two diametrically opposed rearwardly extending driving dogs **22** which fit loosely into the two slots **11** and **12** in the blade mounting ring **9.** Thus each dog **22** has a surface **23** inclined from the axial.

A plastic bush **24** lines a hole **25** in the screen **4.** An externally threaded sleeve **26** supporting the motor **3** is received in the bush **24** and is secured by nut **27.** A seal **28** seals the motor. After the motor **3** has been thus fitted to the windscreen **4** the blade assembly **1** and hub assembly **2** are slipped onto the motor shaft and locked thereon by grub screw **19,** the blade mounting ring **9** being very loose fit over the hub centre **16.** The hub centre is locked to the motor shaft so that when both blade leading edges are just touching the surface of screen **4** there is a longitudinal gap of **1.5**mm to **2.0**mm between the front faces of ring **9** and the rear face of hub outer member **14.** The gap can be bigger if necessary to ensure that there is clearance bwtween the end of sleeve **26** and the hub centre **16.**

When stationary, the blade assembly **1** is free to rest in a position such that the blade edges **10** are wholly or

partially clear of the screen surface. When the motor is switched on, the blade edges **10** are pressed against the glass by two means. The air flow over the blades **5** creates one axial component, and the resistance to rotating of the blade assembly due to inertia during acceleration, air resistance and finally blade drag over the glass, creates another by virtue of the angled faces **13** of the two slots **11** and **12** in the blade mounting ring sliding over the mating faces **23** of the driving dogs **22** of the hub. Once the blade edges are rotating against the screen, any water falling thereon is lifted off by the chamfered edges of the blades and thrown clear of the window.

Provision can be made for pumping out fresh water, a degreasing or de-icing liquid through or adjacent to the motor retaining nut **27.** An additional method of forcing the blades against the screen is to design the motor such that the rotor or armature has a controlled amount of axial float. The complete unit of motor hub assembly and blade assembly can then be mounted such that with the rotor or armature axially displaced from it normal running position the blade assembly is clear of the glass when the motor is stationary. Following switching on the motor, the axial component of the magnetic field acting on the rotor or armature will tend to bring the rotor or armature into line with the stator or field windings therebye bringing the wiper blades into contact with the glass.

An alternative method to using driving dogs for mounting the blade assembly is to attach the blades to a simple flat ring. Between the flat ring and the hub is a ring of plat elastic material attached to the hub in two or more equi-spaced positions and similarly attached to the blade ring at positions evenly positioned between those attaching it to the hub. Alternatively, instead of a single rubber ring, separate low rate springs of various material may be used. The flat elastic ring or alternative low rate springs retain the blade mounting ring concentric with the hub but permit the blades to move axially towards the glass during rotation but ensure they are free from the glass when the motor is stationary.

Instead of the blades being mounted as described with reference to the drawings they can be loosely attached directly to the blade hub so that the blades have restricted movement about their individual axes or about axes parallel and adjacent to the latter. This will also permit some movement of the outer tip of each blade relative to the inboard end in a plane containing the main axis of rotation. The advantage in so mounting the blade is that being able to move independently of the other, each blade is able to make proper contact with the glass independently of the other regardless of manufacturing discrepancies.

So as to avoid having windows drilled to accomodate the unit, the latter can be mounted outside the window on a cantilever attached to some part of the bulkhead, adjacent to the window. The drive to the device can be direct from the motor as already described or indirectly by means of a flexible belt, flexible shafting or rigid shafting and gears or any combination of these methods. External mounting facilitates the device being swung out of the main line of sight when not required.

One blade only can be used. The advantages are that less power is absorbed and due to the imbalance the unit can be self parking i.e: when stationary the single blade can hang vertically downwards or project vertically upwards. Three equispaced blades are an advantageous arrangement giving good stability.

Where air is available, the device can be driven by air as an alternative to an electric motor. The method proposed is to have two or more jets rigidly or loosely attached to the blades and expelling air in a plane parallel with the window and at right angles to their supply pipes radiating from a hollow central shaft through which the air would be ducted. It is necessary that the blade assembly should have freedom to move along towards the window hence the provision for only loosely attaching the jets and their supply system to the blades.

Instead of the air being expelled in a plane exactly parallel with the window, the jets could be directed so that a component of the thrust would force the blades against the window.

If the blades are mainly flat as illustrated in FIGS. **1** to **4,** there is a tendency for the water removed to be thrown forward from where it can be blown back into the window. FIG. **5** shows three configurations which reduce this tendency. A deep slot **29** as illustrated or ridge parallel to and behind the leading edge tends to collect the water and centrifuge it from the tips of the blade. Alternatively the trailing edge of the blade can be shaped as at **30** as to serve the same purpose. Cutting a deep slot into the blade just behind the wiping edge has the additional advantage of ensuring good contact of the wiping edge with the glass because of the increased flexibility.

What we claim is:

1. A device for continuously removing liquid from a windscreen, comprising:

drive means for rotating a blade at a wiping speed such that the blade becomes effectively invisible; a blade support guidance and rotation hub attached to said drive means for being rotated thereby;

a carrier for a blade, said carrier being connected to said hub and being positioned over the windscreen, means supporting said carrier for free rotation along with said hub and for free axial movement of said carrier toward and away from the windscreen;

a cam connection between said hub and said blade carrier, comprising driving dogs on said hub extending rearwardly toward said carrier; one surface of each said dog being inclined from said axial movement of said carrier, slots correspondingly spaced around and shaped to said dogs on said carrier into which said dogs extend and a cooperating wall that defines each said slot cooperating and engaging with said inclined surface of the respective one of said dog;

at least one blade of unitary construction connected to said carrier to be rotated thereby and to move and shift therewith; the entire said blade being formed of a transparent material; said blade having an integrally formed leading edge which is on the front of said blade with respect to the motion of said blade; said blade being so disposed and arranged that during rotation thereof said integrally formed blade leading edge contacts the windscreen to scrape liquid therefrom;

whereby when said hub is rotated, said carrier and said blade are urged axially against the windscreen and said walls defining said slots ride up said dogs, while when rotation of said hub is ceased, said blade carrier returns automatically to the inopera-

tive position of said blades wherein said walls of said slots ride down said dogs and said blade thereby moves away from the windscreen.

2. The device of claim **1** wherein said blade is formed of a polycarbonate resin.

3. The device of claim **1** wherein said blade is so shaped, disposed and arranged that rotation thereof causes said blade to generate an air flow and this forces said blade against the windscreen.

4. The device of claim **1** wherein said leading edge of said blade is in a chamfered form, leading to said leading edge.

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