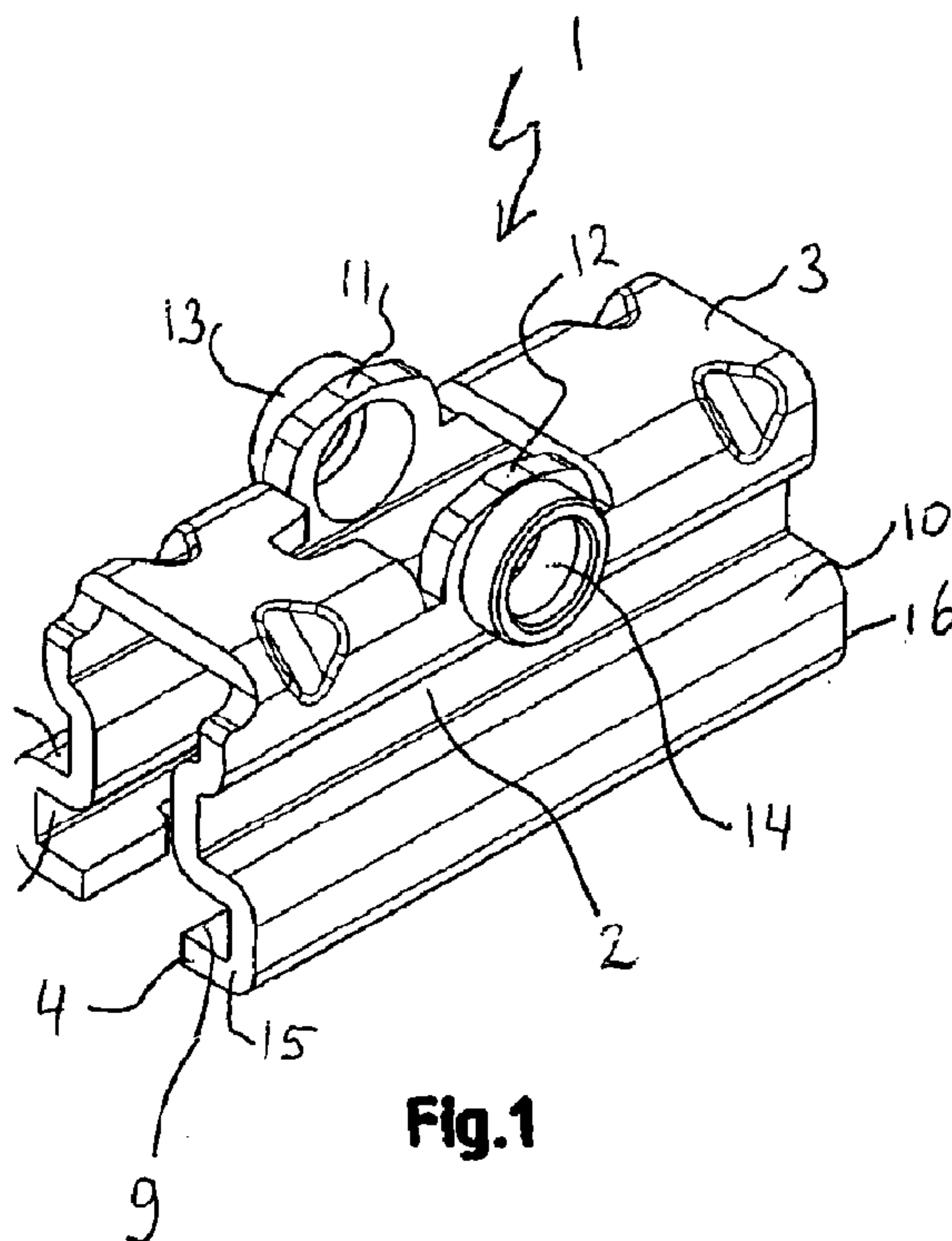




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 (71) Demandeur/Applicant:  
 FEDERAL-MOGUL S.A., BE  
 (72) Inventeur/Inventor:  
 BOLAND, XAVIER, BE  
 (74) Agent: SMART & BIGGAR

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(57) **Abrégé/Abstract:**

A windscreen wiper device, particularly for automobiles, comprising an elastic, elongated carrier element, as well as an elongated wiper blade (7) of a flexible material, which can be placed in abutment with a windscreen to be wiped, which wiper blade (7) is of the flat blade type and includes at least one groove (19), in which groove (19) a longitudinal strip (20) of the carrier element is disposed, and wherein said windscreen wiper device comprises a connecting device (1) for detachably connecting said wiper blade (7) to an oscillating arm near one end thereof around a pivot axis, wherein said connecting device (1) is fixated to said flexible material of said wiper blade (7) by deformation of said connecting device (1) in order to block any lateral movement between said longitudinal strip (20) and said wiper blade (7) at the location of their interconnection and between said connecting device (1) and said wiper blade (7) at the location of their interconnection.



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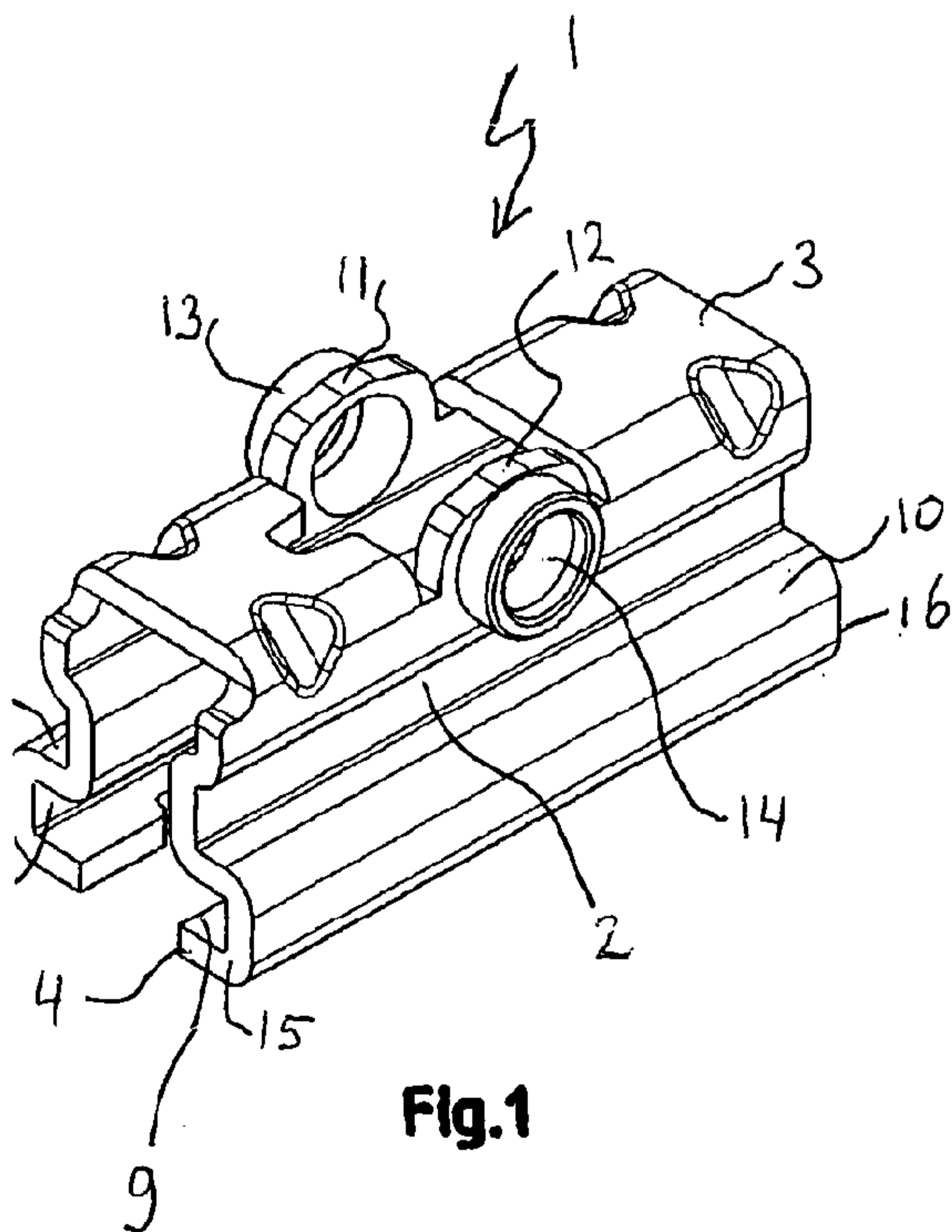
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- (71) **Applicant** (for all designated States except US): **FEDERAL-MOGUL S.A.** [BE/BE]; Avenue Champion, B-6790 Aubange (BE).
- (72) **Inventor; and**
- (75) **Inventor/Applicant** (for US only): **BOLAND, Xavier** [BE/BE]; 304, Route de Luxembourg, B-6700 Arlon (BE).
- (74) **Agent:** **HOOIVELD, Arjen Jan Winfried;** Sweelinckplein 1, NL-2517 GK Den Haag (NL).
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(54) **Title:** A WINDSCREEN WIPER DEVICE**Fig.1**

(57) **Abstract:** A windscreen wiper device, particularly for automobiles, comprising an elastic, elongated carrier element, as well as an elongated wiper blade (7) of a flexible material, which can be placed in abutment with a windscreen to be wiped, which wiper blade (7) is of the flat blade type and includes at least one groove (19), in which groove (19) a longitudinal strip (20) of the carrier element is disposed, and wherein said windscreen wiper device comprises a connecting device (1) for detachably connecting said wiper blade (7) to an oscillating arm near one end thereof around a pivot axis, wherein said connecting device (1) is fixated to said flexible material of said wiper blade (7) by deformation of said connecting device (1) in order to block any lateral movement between said longitudinal strip (20) and said wiper blade (7) at the location of their interconnection and between said connecting device (1) and said wiper blade (7) at the location of their interconnection.

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**A WINDSCREEN WIPER DEVICE**

5 The present invention relates to a windscreen wiper device,  
particularly for automobiles, comprising an elastic,  
elongated carrier element, as well as an elongated wiper  
blade of a flexible material, which can be placed in  
abutment with a windscreen to be wiped, which wiper blade is  
10 of the flat blade type and includes at least one groove, in  
which groove a longitudinal strip of the carrier element is  
disposed, and wherein said windscreen wiper device comprises  
a connecting device for detachably connecting said wiper  
blade to an oscillating arm near one end thereof around a  
15 pivot axis. Usually, a mounting head is provided for  
transferring a reciprocal movement to the oscillating arm.  
Said wiper blade particularly comprises a spoiler at a side  
thereof facing away from a windscreen to be wiped. The  
invention particularly relates to a connecting device made  
20 in one piece, also called a "one piece connector base". More  
in particular, said oscillating arm may be connected to said  
base with the interposition of a joint part, in practice  
also called a "spacer".

25 Such a windscreen wiper device and such a wiper blade are  
generally known. This prior art wiper blade is designed as a  
so-called "flat blade" or "yokeless blade", wherein no use  
is made of several yokes pivotally connected to each other,  
but wherein the wiper blade is biased by the carrier  
30 element, as a result of which it exhibits a specific  
curvature. In practice said wiper blade often comprises a  
spoiler at a side thereof facing away from the windscreen to  
be wiped. The spoiler is also called an "air deflector".

The object of the invention is to provide an improved windscreen wiper device.

5 In order to accomplish that objective, a windscreen wiper device of the type referred to in the introduction is characterized according to the invention in that said connecting device is fixated to said flexible material of said wiper blade by deformation of said connecting device in  
10 order to block any lateral movement between said longitudinal strip and said wiper blade at the location of their interconnection and between said connecting device and said wiper blade at the location of their interconnection. In use, during each oscillatory movement of said oscillatory  
15 arm, said wiper blade at the location outside said connection device would normally suffer from the so-called "fishtailing phenomenon", wherein said wiper blade on opposite sides of said connecting device vibrates in an uncontrollable manner parallel to a windscreen to be wiped.  
20 Obviously, this "fishtailing phenomenon" results in deteriorated wiping properties, with all negative consequences involved, particularly at high speeds. According to the invention said connecting device is clamped onto the flexible material of the wiper blade, wherein a  
25 controlled and predetermined pressure is applied by said connecting device onto said wiper blade. Experimental results have shown that the "fishtailing phenomenon" is avoided at least to a large extend, so that the wiping properties are improved.

30

It is noted that the present invention is not restricted to the use of only one longitudinal strip forming the elastic carrier element that is particularly located in a central

longitudinal groove of the wiper blade. Instead, said carrier element may also comprise two longitudinal strips, wherein said strips are disposed in opposite longitudinal grooves of the wiper blade. Further, the present invention is not restricted to automobiles, but also refers to other fast vehicles, such as trains and the like.

Preferably, said connecting device is fixated to said flexible material of said wiper blade by plastic deformation of said connecting device. Instead or in addition thereto, deformation of said flexible material of said wiper blade upon introduction of said longitudinal strip inside said groove when the connecting device is already mounted thereon, ensures said fixation.

15

In a preferred embodiment of a windscreen wiper device in accordance with the invention said connecting device has an at least substantially U-shaped cross-section having legs and a base, wherein said legs have inwardly bent edges at their outer ends, wherein opposite sides of said wiper blade rest in respective slits formed by said inwardly bent edges and outwardly bent parts of said legs. Hence, a controlled and predetermined pressure can be applied by said legs of connecting device onto said wiper blade sandwiched between them.

25

In another preferred embodiment of a windscreen wiper device according to the invention said connecting device is deformed at the location of said inwardly bent edges and outwardly bent parts of said legs. Said deformation is advantageously achieved through a pinching operation being a well-controllable and reliable operation. In the alternative or in addition thereto a melting operation is carried out at

30

these locations, which melting operation is particularly carried out by ultrasonic heating. Locally melting said connecting device has the result that locally inwardly extending protrusions are formed, wherein opposite  
5 protrusions exert a clamping force so that said connecting device is clamped onto the flexible material of said wiper blade, as if it were a pinching operation. Said pinching operation is advantageously applied in case said connecting device is made of metal (preferably steel), whereas said  
10 melting operation is particularly applied when said connecting device is made of a plastic material.

In another preferred embodiment of a windscreen wiper device in accordance with the invention said connecting device is  
15 deformed near outer ends of said connecting device.

Particularly, said connecting device is deformed at near said outer ends of said connecting device on opposite sides of said connecting device.

20 In another preferred embodiment of a windscreen wiper device according to the invention said legs are provided near said base with a pair of opposite protrusions having co-axial through holes. Said through holes are particularly arranged to receive connection means, for example in the form of a  
25 pivot pin, on the oscillating arm. For example, said oscillating arm may be provided with an extension comprising a pivot pin being able to pivot around said pivot axis, as well as a L-shaped shoulder acting as securing means for securing said connecting device on the pivot pin, wherein  
30 said L-shaped shoulder projects out in the direction of said pivot pin and across said wiper blade and at the free end of which is disposed a leg facing said windscreen to be wiped, and wherein said connecting device comprises a transverse

through hole for receiving said pivot pin. Accordingly, the wiper blade may then be connected to the oscillating arm on the basis of a so-called "sidelock system". The oscillating arm is provided with said pivot pin or joint pin to be  
5 inserted in said co-axial through holes. Said pivot pin protrudes in a direction towards the wiper blade and has a pivot axis extending in a direction of the oscillating movement of the oscillating arm. Preferably, said protrusions have a round cross-section.

10

A windscreen wiper device according to the invention comprises a mounting head fixed for rotation to a shaft, wherein said shaft is rotatable alternately in a clockwise and in a counter-clockwise sense carrying said mounting head  
15 into rotation. Said oscillating arm is connected to said mounting head fixed for rotation to said shaft driven by a small motor. In use, the shaft rotates alternately in a clockwise and in a counter-clockwise sense carrying the mounting head into rotation also, which in turn draws said  
20 oscillating arm into rotation and by means of said connecting device moves said wiper blade. Further, a windscreen wiper device in accordance with the invention comprises a connecting piece positioned on both ends of said wiper blade and connected to an end of said longitudinal  
25 strip.

The present invention also relates to a method for fixating

- a connecting device for detachably connecting an  
30 elongated wiper blade of the flat blade type and made of a flexible material to an oscillating arm near one end thereof around a pivot axis, to

- said flexible material, wherein said wiper blade includes at least one groove, in which groove a longitudinal strip of the carrier element is disposed, characterized in that

5 said connecting device is fixated to said flexible material of said wiper blade by deformation of said connecting device in order to block any lateral movement between said longitudinal strip and said wiper blade at the location of their interconnection and between said connecting device and  
10 said wiper blade at the location of their interconnection.

Said method particularly comprises the following steps

- said connecting device having an at least substantially U-shaped cross-section with legs and a  
15 base, is mounted onto said wiper blade such that opposite sides of said wiper blade rest in respective slits formed by inwardly bent edges at outer ends of said legs and outwardly bent parts of said legs,
- said longitudinal strip is subsequently inserted  
20 inside said groove of said wiper blade,
- said connecting device is finally deformed at the location of said inwardly bent edges and outwardly bent parts of said legs and at the location of said base near outer ends of said connecting device on  
25 opposite sides of said connecting device.

In case the connecting device is made in one piece, before mounting said connecting device, said wiper blade is stressed outwardly in longitudinal direction thereof,  
30 wherein said wiper blade is subsequently released after said connecting device is mounted.



The invention will now be explained more in detail with reference to figures illustrated in a drawing, wherein

- 5 - figures 1 and 2 are a perspective, schematic view of a preferred embodiment of a connecting device according to the invention, with and without deformation, respectively;
- 10 - figure 3 is a schematic sideview of the connecting device of figures 1 and 2, but now connected to a wiper blade;
- figure 4 is an exploded view and an assembled view of the wiper blade and the connecting device, as shown in figures 1, 2 and 3 showing the stepwise mounting of the connecting device; and
- 15 - figure 5 is an exploded view of the connecting device, a joint part and an oscillating arm.

Figures 1 and 2 show a preferred variant of a connecting device (1), also called "connector base", according to the invention. As depicted, said connecting device (1) has an U-shaped cross-section having legs (2) and a base (3), wherein  
20 said legs (2) have inwardly bent edges (4) at their outer ends. Opposite sides (5,6) of a wiper blade (7) rest in respective slits or grooves (8,9) formed by said inwardly bent edges (4) and outwardly bent parts (10) of said legs  
25 (2), wherein reference is made to figure 3. Said legs (2) are provided near said base (3) with a pair of opposite protrusions (11,12) having co-axial through holes (13,14). An oscillating arm is provided with a pivot pin or joint pin  
30 (not shown) to be inserted in said co-axial through holes (13,14). Said pivot pin protrudes in a direction towards the wiper blade (7) and has a pivot axis extending in a direction of the oscillating movement of the oscillating

arm. In the alternative as shown in figure 5, use is made of a joint part to be snapped or clicked on said protrusions (11,12), wherein an oscillating arm is connected to said joint part through a so-called "bayonet connection".

5

As shown in figure 2, said connecting device (1) is finally plastically deformed at the location of said inwardly bent parts (10) of said legs (2) near outer ends (15,16) of said connecting device (1) and on opposite sides (17,18) of said  
10 connecting device (1) (the wiper blade (7) being not shown in figure 2).

The windscreen wiper device according to the invention in figure 4 is built up of the elastomeric (rubber) wiper blade  
15 (7) of the flat blade type (shown in figure 3) comprising a central longitudinal groove (19), wherein a longitudinal strip (20) made of spring band steel is fitted in said longitudinal groove (19). Said strip (20) forms a flexible carrier element for the rubber wiper blade (7), as it were,  
20 which is thus biased in a curved position (the curvature in operative position being that of a windscreen to be wiped). As shown, both ends or extremities (21) of said wiper blade (7) are not equipped with so-called "end caps", but said extremities are cut under an oblique angle with the  
25 longitudinal plane of said wiper blade 2 (parallel to the windscreen to be wiped). Said rounded shape of said extremities (21) ensures that no noise is generated which is normally due to contact between an A-pillar of a vehicle and an end cap. The windscreen wiper device is furthermore built  
30 up of the connecting device (1) of figures 1 through 3 made of metal for connecting an oscillating wiper arm thereto (not shown). The oscillating wiper arm is pivotally connected to the connecting device (1) about a pivot axis

near one end. The preferred embodiment of figures 3 and 4 according to the invention comprises a spoiler or "air deflector" (22) which is made in one piece with the rubber wiper blade (7) and which extends along the entire length thereof.

Although not shown in figure 1, but fully understood by a skilled person, said oscillating arm is connected to a mounting head fixed for rotation to a shaft driven by a small motor. In use, the shaft rotates alternately in a clockwise and in a counter-clockwise sense carrying the mounting head into rotation also, which in turn draws said oscillating arm into rotation and by means of said connecting device (1) moves said wiper blade (7).

15

As shown in figure 4, first said connecting device (1) having the U-shaped cross-section seen in figures 1 through 3 is mounted onto said wiper blade (7), such that the opposite sides (5,6) of said wiper blade (7) rest in the respective slits (8,9) formed by the inwardly bent edges (4) at outer ends of said legs (2) and the outwardly bent parts (10) of said legs (2). This step is designated with A in figure 4. Said longitudinal strip (20) is subsequently inserted inside said groove (19) of said wiper blade (7). This further step is designated with B in figure 4. Said connecting device (1) is subsequently deformed at the location of said inwardly bent edges and outwardly bent parts (10) of said legs (2) near the outer ends (15,16) of said connecting device (1) on opposite sides (17,18) of said connecting device (1). This is done by a pinching operation. The locations of pinching are designated with arrows P. In the alternative or in addition thereto, a melting operation is carried out at these locations in order to locally melt

30

material of said connecting device (1) to create a clamping force as if it were a pinching operation. This next step is designated with C in figure 4. Finally, the free ends or extremities (21) of the wiper blade (7) are cut to arrive at  
5 a dedicated shape thereof. This final step is designated with D in figure 4. The wiper blade (7) is then ready for use, after snapping a joint part onto the connector base (1), wherein reference is made to figure 5.

10 When said connecting device (1) is fixated to the rubber material of the wiper blade (7) through deformation, said wiper blade (7) is sandwiched between said legs (2) in the sense that said legs (2) engage said wiper blade (7) on opposite sides (5,6) thereof. In assembled position, that is  
15 when the deformation has taken place, the legs (2) of the connecting device (1) exert a controllable, predetermined pressure on the rubber material of the wiper blade (7). Thus, any lateral movement between said longitudinal strip (20) and said wiper blade (7) at the location of their  
20 interconnection and between said connecting device (1) and said wiper blade (7) at the location of their interconnection is blocked.

In use, during each oscillatory movement of the oscillatory  
25 arm, said wiper blade (7) at the location outside said connection device (1) would normally suffer from the so-called "fishtailing phenomenon", wherein said wiper blade (7) on opposite sides (17,18) of said connecting device (1) vibrates in an uncontrollable manner parallel to a  
30 windscreen to be wiped. Obviously, this "fishtailing phenomenon" results in deteriorated wiping properties, with all negative consequences involved, particularly at high speeds. Hence, said longitudinal strip (20) is allowed to

exhibit a curvature at the location of the interconnection of said connecting device (1) and said wiper blade (7). Experimental results have shown that the "fishtailing phenomenon" is now avoided according to the invention at least to a large extend.

With reference to figure 5 a joint part (23) is detachably connected to said connecting device (1) by engaging protrusions (11,12) of said connecting device (1), at the location of said pivot axis, in co-axial recesses (24) provided in said joint part (23). As shown, said protrusions (11,12) extend outwards on either side of said connecting device (1). The joint part (23) comprises a resilient tongue (25) extending outwardly, while the oscillating arm (26) has a U-shaped cross-section at the location of its connection to said joint part (23), so that the tongue (25) engages in an identically shaped hole (27) provided in a base of said U-shaped cross-section. The connecting device (1) with the wiper blade (7) is mounted onto the oscillating arm as follows. The joint part (23) being already clipped onto the connecting device (1) is pivoted relative to the connecting device (1), so that said joint part (23) can be easily slid on a free end of the oscillating arm (26). During this sliding movement the resilient tongue (25) is initially pushed in against a spring force and then allowed to spring back into said hole in said oscillating arm, thus snapping, that is clipping the resilient tongue (25) into the hole (27) of the oscillating arm (26). This is a so-called bayonet-connection. The oscillating arm (26) together with the joint part (23) may then be pivoted back in a position parallel to the wiper blade (7) in order to be ready for use. By subsequently pushing in again said resilient tongue (23) against the spring force (as if it were a push button),

the connecting device (1) and the joint part (23) together with the wiper blade (7) may be released from the oscillating arm (26). Dismounting the connecting device (1) with the wiper blade (7) from the oscillating arm (26) is thus realized by sliding the connecting device (1) and the joint part (23) together with the wiper blade (7) in a direction away from the oscillating arm (26).

The invention is not restricted to the variants shown in the drawing, but it also extends to other preferred embodiments that fall within the scope of the appended claims.

For example, a skilled person would easily recognise that said rubber wiper blade (7) is not necessarily made in one piece, as shown in figures 3, 4 and 5. Instead thereof said wiper blade (7) is made of two parts, whether or not co-extruded, namely an upper holding part and a lower wiping part containing a wiping lip, wherein said upper holding part holds said lower wiping part.

**CLAIMS**

1. A windscreen wiper device, particularly for automobiles, comprising an elastic, elongated carrier element, as well as an elongated wiper blade (7) of a flexible material, which can be placed in abutment with a windscreen to be wiped, which wiper blade (7) is of the flat blade type and includes at least one groove (19), in which groove (19) a longitudinal strip (20) of the carrier element is disposed, and wherein said windscreen wiper device comprises a connecting device (1) for detachably connecting said wiper blade (7) to an oscillating arm near one end thereof around a pivot axis, **characterized in that** said connecting device (1) is fixated to said flexible material of said wiper blade (7) by deformation of said connecting device (1) in order to block any lateral movement between said longitudinal strip (20) and said wiper blade (7) at the location of their interconnection and between said connecting device (1) and said wiper blade (7) at the location of their interconnection.
2. A windscreen wiper device according to claim 1, wherein said connecting device (1) is fixated to said flexible material of said wiper blade (7) by plastic deformation of said connecting device (1).
3. A windscreen wiper device according to claim 1 or 2, wherein said connecting device (1) has an at least substantially U-shaped cross-section having legs (2) and a base (3), wherein said legs (2) have inwardly bent edges (4) at their outer ends, wherein opposite sides (5,6) of said wiper blade (2) rest in respective

slits (8,9) formed by said inwardly bent edges (4) and outwardly bent parts (10) of said legs (2).

4. A windscreen wiper device according to claim 3, wherein  
5 said connecting device (1) is deformed at the location of said inwardly bent edges (4) and outwardly bent parts (10) of said legs (2).
5. A windscreen wiper device according 3 or 4, wherein  
10 said connecting device (1) is deformed by a pinching operation.
6. A windscreen wiper device according to claim 3, 4 or 5,  
15 wherein said connecting device (1) is deformed by a melting operation.
7. A windscreen wiper device according to claim 4, 5 or 6,  
20 wherein said connecting device (1) is deformed near outer ends (15,16) of said connecting device (1).
8. A windscreen wiper device according to claim 7, wherein  
25 said connecting device (1) is deformed at near said outer ends (15,16) of said connecting device (6) on opposite sides (17,18) of said connecting device (1).
9. A windscreen wiper device according to any of the  
30 preceding claims 1 through 8, wherein said legs (2) are provided near said base (3) with a pair of opposite protrusions (11,12) having co-axial through holes (13,14).
10. A method for fixating



- a connecting device (1) for detachably connecting an elongated wiper blade (7) of the flat blade type and made of a flexible material to an oscillating arm near one end thereof around a pivot axis, to
  - 5 - said flexible material, wherein said wiper blade (7) includes at least one groove (19), in which groove (19) a longitudinal strip (20) of the carrier element is disposed, **characterized in that**
- 10 said connecting device (1) is fixated to said flexible material of said wiper blade (7) by deformation of said connecting device (1) in order to block any lateral movement between said longitudinal strip (20) and said wiper blade (7) at the location of their interconnection and between said connecting device (1)
- 15 and said wiper blade (7) at the location of their interconnection.
11. A method according to claim 10, comprising the following steps
- 20 - said connecting device (1) having an at least substantially U-shaped cross-section with legs (2) and a base (3), is mounted onto said wiper blade (7) such that opposite sides (5,6) of said wiper blade (7) rest in respective slits (8,9) formed by inwardly bent edges (4) at outer ends of said legs (2) and
  - 25 outwardly bent parts (10) of said legs (2),
  - said longitudinal strip (20) is subsequently inserted inside said groove (19) of said wiper blade (7),
  - 30 - said connecting device (1) is finally deformed at the location of said inwardly bent edges (4) and outwardly bent parts (10) of said legs (2) and at the location of said base (3) near outer ends (15,16) of

said connecting device (1) on opposite sides (17,18)  
of said connecting device (1).

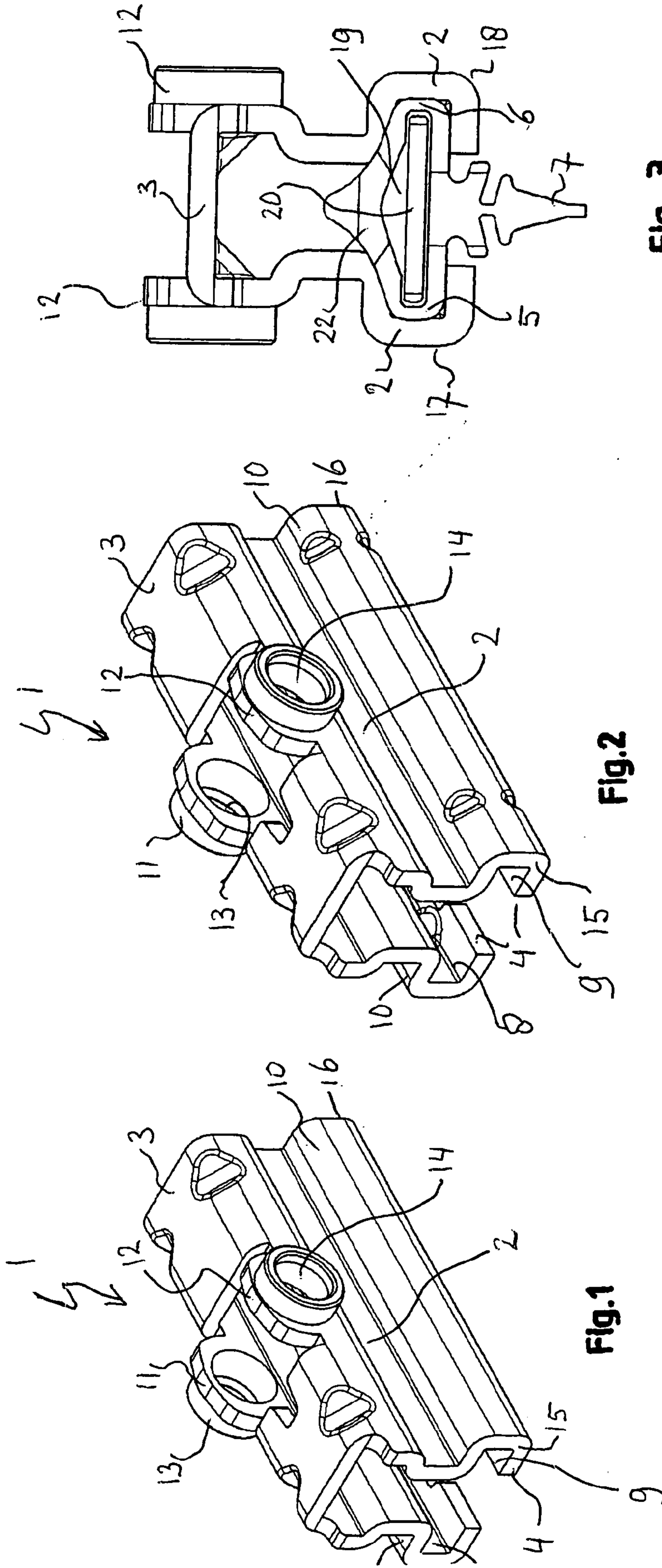


Fig. 3

Fig. 2

Fig. 1

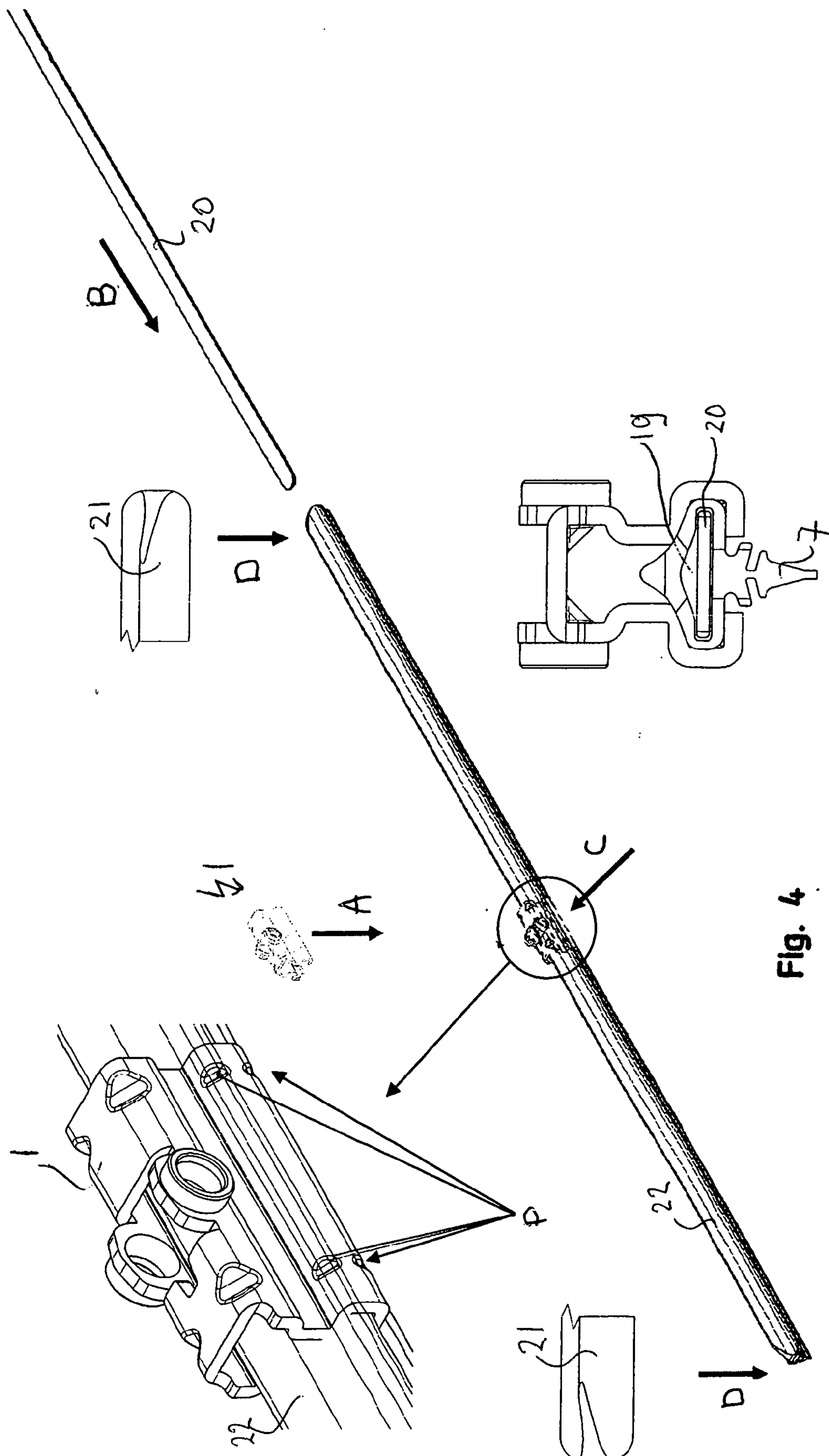


Fig. 4

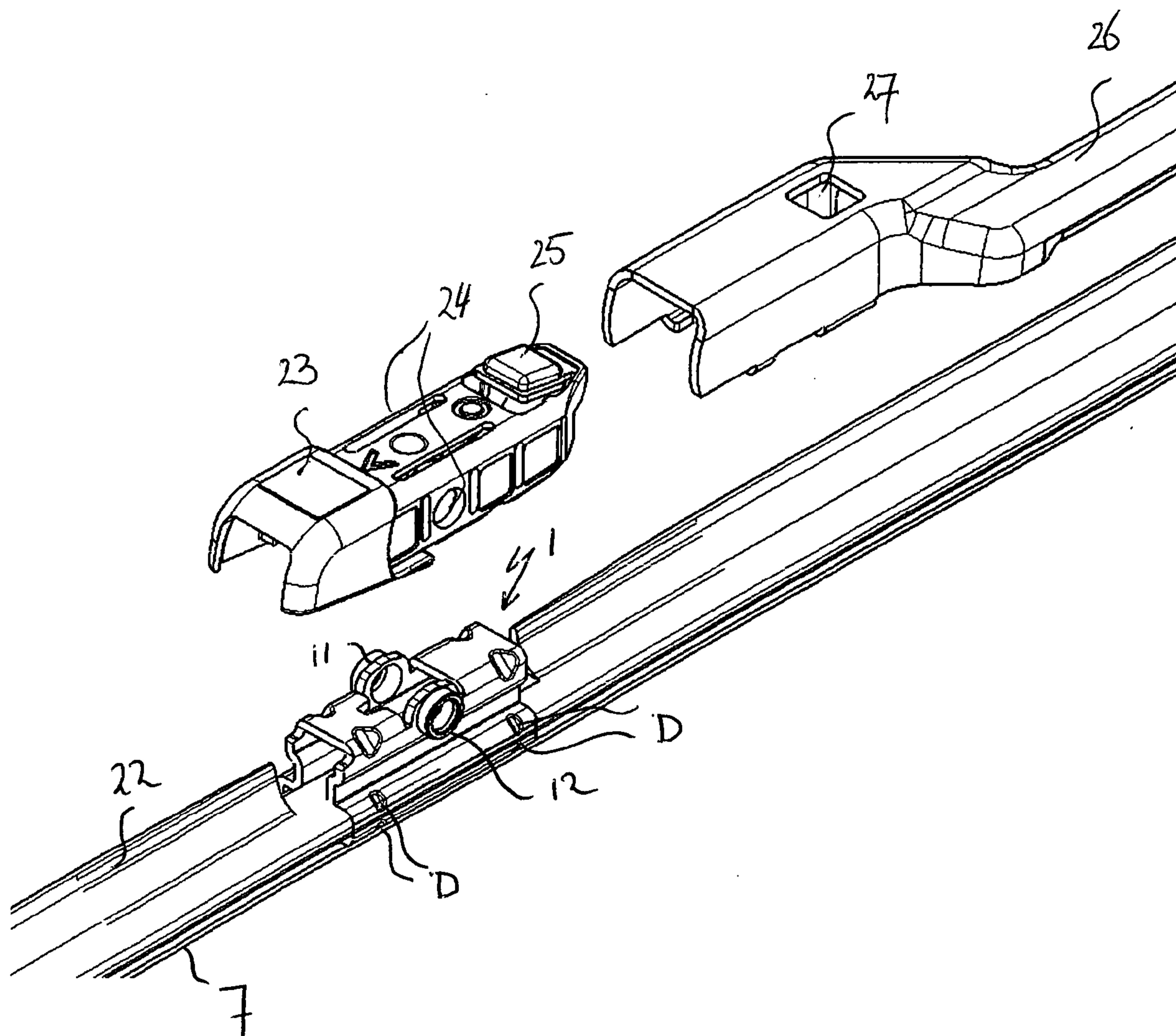
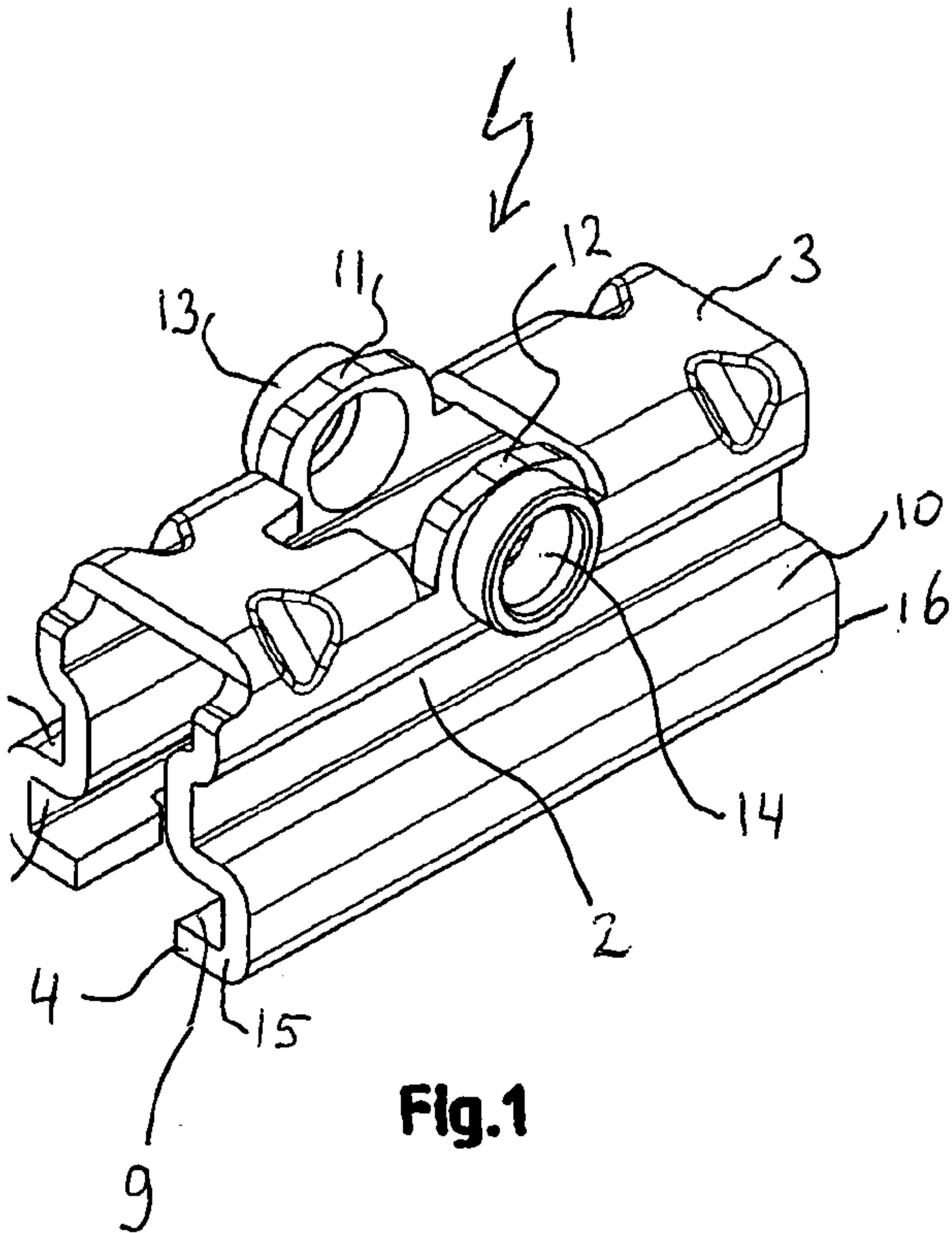


Fig. 5



**Fig.1**