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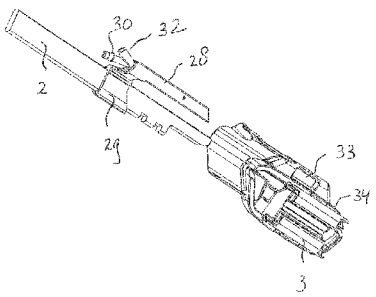
(54) Title: WINDSCREEN WIPER DEVICE OF THE FLAT BLADE TYPE

(57) Abstract: A windscreen wiper device of the flat blade type 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 includes at least one longitudinal slit, in which slit at least one longitudinal strip of the carrier element is disposed, which windscreen wiper device comprises a connecting device (1) for a rod-like extension (2) of an oscillating arm, wherein said rod-like extension (2) can be pivotally connected to said connecting device (1) about a pivot axis near one end thereof, with the special feature that said connecting device (1) comprises a channel (15) arranged to receive said rod-like extension (2), wherein said windscreen wiper device comprises a nozzle (28) for spraying a washing liquid onto said windscreen to be wiped, said nozzle (28) being mounted onto said rod-like extension (2).



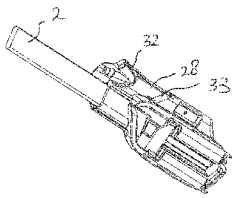


Fig. 8

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A WINDSCREEN WIPER DEVICE OF THE FLAT BLADE TYPE

The present invention relates to a windscreen wiper device of the flat blade type 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 includes at least one longitudinal slit, in which slit at least one longitudinal strip of the carrier element is disposed, which windscreen wiper device comprises a connecting device for a rod-like extension of an oscillating arm, wherein the rod-like extension can be pivotally connected to said connecting device about a pivot axis near one end thereof. Said longitudinal strip is also called a "flexor", while said connecting device is also indicated as a "connector". The slit may be open or closed.

Preferably, said wiper blade comprises a spoiler at a side thereof facing away from the windscreen to be wiped. The spoiler is also called an "air deflector" and is preferably made in one piece with said wiper blade through extrusion. Said longitudinal slit is preferably a central longitudinal slit accommodating said longitudinal strip. Said connecting device is preferably fixedly connected to the longitudinal strip(s) particularly through a welding, brazing ("soldering"), gluing or clamping operation or with the help of a pin inserted through said connecting device and said longitudinal strip(s). In the alternative or in addition thereto, said connecting device is clamped onto the flexible material of the wiper blade, particularly in case the latter is equipped with a central longitudinal slit for the carrier element.

In use, said oscillating arm is connected to a mounting head mounted on a drive shaft, wherein said oscillating arm at one end thereof is pivotally connected to the mounting head by means of a pivot pin and at another end thereof is connected to said wiper blade placed in abutment with said windscreen to be wiped. 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 the oscillating arm into rotation and by means of said connecting device moves the wiper blade. Said oscillating arm can thus oscillate to-and-from between first and second reversal positions.

The present invention also relates to a connecting device, as well as an oscillating arm with a rod-like extension arranged for use in such a windscreen wiper device.

It is noted that the present invention is not restricted to automobiles, but also refers to rail coaches and other (fast) vehicles.

A windscreen wiper device is generally known. This prior art windscreen wiper device 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 element, as a result of which it exhibits a specific curvature. A disadvantage of the known windscreen wiper device is that it is often used in combination with a nozzle fixedly mounted on (or below) a bonnet of a car for spraying a washing liquid onto the car’s windscreen to be wiped. In practice it has become apparent that the windscreen cannot effectively be cleaned by a combination of the oscillating arm and the

nozzle, as the nozzle emits the washing fluid thereon at a large distance relative to the windscreen, so that a relatively large amount of the washing fluid does not effectively reach a wiping pattern on the windscreen to be wiped. Further, it has become apparent that in the prior art a large amount of liquid (consumption) is required in an attempt to clean the windscreen to be wiped. Further, if the washing fluid is spread onto the car's body instead of onto the windscreen to be wiped, it may damage the car. Indeed, ethanol, methanol and other components of the washing fluid are believed to have a corrosive effect on paint, rubber, car wax and plastics, for example.

It is an object of the invention to provide an improved windscreen wiper device, wherein these disadvantages are obviated, in the sense that at minimum costs - without using complex machinery and additional tools - a simple oscillating arm (also called "windscreen wiper arm") is proposed to effectively clean a windscreen to be wiped, without damaging parts of a car, wherein less washing liquid is required to clean the windscreen to be wiped.

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 comprises a first channel arranged to receive said free end of said rod-like extension, wherein said windscreen wiper device comprises a nozzle for spraying a washing liquid onto said windscreen to be wiped, said nozzle being mounted onto said rod-like extension, and wherein said connecting device comprises a second channel arranged to receive said nozzle upon insertion of said free end of said rod-like extension inside said first channel of

said connecting device. Hence, upon sliding said free end of said rod-like extension inside said first channel by hand, said nozzle is mounted in one go (i.e. in one linear movement) into said second channel of said connecting device. As said nozzle in mounted position is located entirely inside said second channel, any discoloration of a material of the nozzle (often a plastic material), due to aging or wear, for example, is not visible from the outside. Hence, any difference in colour between the nozzle and the connecting device is not visible from the outside. This is particularly important, as the nozzle stays on the (rod-like extension of the) oscillating arm during an entire life of a car, whereas the connecting device is retained on the wiper blade and is thus replaced when replacing the wiper blade. Particularly, said nozzle extends parallel to said rod-like extension, wherein said nozzle is invisible from the outside inside said second channel of said connecting device after insertion of said free end of said rod-like extension, in longitudinal direction of said rod-like extension, inside said first channel of said connecting device.

In a preferred embodiment of a windscreen wiper device in accordance with the invention said connecting device comprises a first part and a second part, wherein said rod-like extension of said oscillating arm can be pivotally connected to said first part about said pivot axis, with the interposition of said second part, wherein said second part comprises said first channel and said second channel, wherein said first part is connected to said wiper blade and said second part is detachably connected to said first part, and wherein said nozzle is slid inside said second channel upon insertion of said free end of said rod-like extension inside said first channel of said connecting device.

Preferably, said first channel and said second channel extend parallel in longitudinal direction of said rod-like extension. More preferably, said nozzle and said second channel are elongated and extend parallel to said rod-like extension.

In another preferred embodiment of a windscreen wiper device according to the invention said second channel extends from a side wall of said second part of said connecting device. Particularly, said sidewall in use is located downstream in an upward movement of the oscillating arm.

Hence, an operator fitting the wiper blade onto the rod-like extension of the oscillating arm, simultaneously fits the nozzle onto the connecting device. Thus, no special tools or parts, such as a special wiper blade and/or a special connecting device for the nozzle, are necessary, saving materials and costs. By connecting the nozzle directly to the rod-like extension of the oscillating arm, the nozzle is not only fixed to the rod-like extension in a reliable and controllable manner, although detachably in case of repair or replacement of the nozzle, but the nozzle is located at a very small distance relative to the windscreen to be wiped and is allowed to directly follow any oscillatory movement of the oscillating arm, so that the washing fluid exiting the nozzle can be effectively sprayed thereon, with all positive consequences involved as to effective cleaning of the windscreen to be wiped and safe visibility for a driver. The second channel ensures that any movement of the nozzle in a transversal direction (i.e. in a direction towards said windscreen to be wiped and in a direction away from said windscreen to be wiped, i.e. perpendicular to the windscreen to be wiped) is blocked, whereas the rod-like extension

locked inside said first channel in longitudinal direction thereof ensures that any movement of said nozzle is blocked in the longitudinal direction as well.

Further, the nozzle may be used as a first nozzle in combination with a second nozzle located on the oscillating arm for spraying a washing liquid onto the windscreen to be wiped. Hence, in that case the washing liquid is sprayed from at least two locations (on the rod-like extension and on the oscillating arm) onto the windscreen to be wiped, namely washing liquid exiting from the first nozzle connected to the rod-like extension, as well as washing liquid exiting from the second nozzle connected to the oscillating arm. Thus, the windscreen can be cleaned efficiently over a very large wiping area thereof, particularly at high speeds. In that case, the first and second nozzles are preferably connected to only one inlet for the washing fluid, so that the first and second nozzles are in liquid contact with each other.

In another preferred embodiment of a windscreen wiper device in accordance with the invention said channel includes a first chamber facing towards an entrance of said channel, as well as a second chamber facing away from said entrance, said first chamber having a larger width than said second chamber, wherein said first chamber is arranged to receive a first part of said free end of said rod-like extension, and wherein said second chamber is arranged to receive a second part of said free end of said rod-like extension, said first part of said rod-like extension having a larger width than said second part of said rod-like extension. In other words, the free end of said rod-like extension has a cut-out in order to form the two parts therein, wherein the first part

is wider than the second part. The second part forms a longitudinally extending finger to be accommodated in the correspondingly shaped second chamber of the channel. The wider first part is to be accommodated in the correspondingly shaped first chamber of the channel. Due to the cut-out there is a larger guiding surface in the connecting device to guide the rod-like extension inside said channel in a reliable yet controlled manner. Preferably, said first and second chambers of the channel have a closed circumference to enhance retention of the rod-like extension therein.

In another preferred embodiment of a windscreen wiper device according to the invention said connecting device comprises a sidewardly and inwardly extending protrusion arranged to engage into a first recess provided on a longitudinal exterior side of said rod-like extension, wherein said connecting device comprises a resilient tongue arranged to engage into a second recess provided on said longitudinal exterior side of said rod-like extension, and wherein said resilient tongue is hingeable along a hinge axis between an inward position retaining said wiper blade onto said rod-like extension and an outward position releasing said wiper blade from said rod-like extension. Particularly, said channel has a closed circumference. More in particular, said channel is formed by a blind hole having a closed circumference. The resilient tongue cooperating with the second recess on the one hand and the protrusion cooperating with the first recess on the other hand form first and second retention means, respectively, for retaining the wiper blade onto the oscillating arm. Said first and second retention means can be used independently from one another, i.e. the first retention means can be used without the

second retention means and the second retention means can be used without the first retention means.

Preferably, said channel has a length and a width, wherein a plane extending in a direction of the width of said channel and a plane extending through said longitudinal strip along a width thereof at the location of the connecting device enclose an angle α, wherein preferably $15^0<\alpha<60^0$. In other words, in a transverse or cross-section of the windscreen wiper device, a centre line of the cross-sectional plane of said channel encloses the angle α with a symmetry axis of said longitudinal groove. Because of the angle α less pressure by the oscillating arm on the wiper blade is necessary to maintain high velocity wiping performances.

In the framework of the present invention said oscillating arm is equipped with said rod-like extension preferably having a rectangular cross-section, wherein said extension is to be inserted in the channel of the connecting device, and wherein said extension has a twisted orientation relative to the oscillating arm preferably having a U-shaped cross-section. Such a twisted arm extension has proven to considerably improve an air flow, to considerably reduce a height of the windscreen wiper device, whereas its design is attractive from a commercial perspective. Said channel preferably having a rectangular cross-section as well, has a possible twisted orientation corresponding to the twisted orientation of the arm extension in order to accommodate said arm extension during use. In other words, a bottom of said channel does not extend parallel to a windscreen to be wiped (when the oscillating arm in one of said reversal positions is in a central region of the windscreen to be wiped and disregarding any small curvature thereof in that

region), but said bottom and said windscreen to be wiped enclose said angle α in that region.

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. Said groove(s) may be closed at one outer end.

In another preferred embodiment of a windscreen wiper device in accordance with the invention said protrusion is dimensioned such that

- in a working position of said wiper blade pivoted relative to said rod-like extension, said protrusion engages into said first recess thus retaining said wiper blade onto said rod-like extension;
- in a service position of said wiper blade pivoted relative to said rod-like extension, said protrusion disengages from said first recess thus releasing said wiper blade from said rod-like extension.

In another preferred embodiment of a windscreen wiper device according to the invention said first and second recesses have an open circumference and are spaced-apart in longitudinal direction.

In another preferred embodiment of a windscreen wiper device in accordance with the invention said resilient tongue is hingeable from said inward position into said outward

position by a push button, wherein said push button forms a part of an outer wall of said connecting device. Particularly, said push button is located near a free end of said connecting device facing towards said rod-like extension.

In another preferred embodiment of a windscreen wiper device according to the invention said first part and said second part are provided with mutually cooperating pivot means for pivotally connecting said second part to said first part. Particularly, said second part is connected to said first part by pivotally engaging protuberances of said first part, at the location of said pivot axis, in recesses provided in said second part. More in particular, said second part is detachably connected to said first part through a snapping/clipping operation.

In another preferred embodiment of a windscreen wiper device in accordance with the invention said first part comprises a flat base having legs integral therewith engaging around longitudinal sides of the wiper blade, at the location of said slit. Preferably, said first part comprises two opposite side walls extending in upright direction from said base, and wherein one of said side walls comprises said sidewardly and inwardly extending protrusion. More preferably, said pivotally engaging protuberances of said first part are provided outwardly on said opposite side walls, and wherein said recesses are provided inwardly in opposite walls of said second part. Said protuberances are particularly mutually spaced far apart, so as to reduce angular play and to reduce wear.

In another preferred embodiment of a windscreen wiper device according to the invention said side walls of said first part are entirely located inside said second part in a working position of said wiper blade.

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

- figure 1 shows in perspective details of a windscreen wiper device of the flat blade type according to the invention, although without a second channel for a nozzle, wherein successive steps are shown for fitting an oscillating arm ("windscreen wiper arm") to a connecting device ("connector") of a wiper blade;

- figure 2 shows in perspective and partly in cross-section the windscreen wiper arm and the connector of figure 1 in assembled position;

- figure 3 shows details of figure 2 in an upper view partly in cross-section and partly cut open;

- figure 4 shows details of figure 2 in side views and in cross-section;

- figure 5 on the top corresponds to figure 3 on the top, but designating other parts of the connector of figure 1, while figure 5 on the bottom shows in perspective two types of rod-like extensions to be accommodated inside the connector;

- figure 6 shows various bottom views of the connector of figure 1;

- figure 7 shows several perspective views, as well as a cross-sectional view, of the connector and the windscreen wiper arm of the figures 1-6, but now equipped with a second channel for a nozzle; and

- figure 8 shows successive steps for fitting the windscreen wiper arm to the connector of figure 7, seen from below.

Figure 1 refers a windscreen wiper device of the flat blade type built up of a wiper blade, in the longitudinal sides of which opposing longitudinal groove are formed, and of longitudinal strips ("flexors") made of spring band steel, which are fitted in said longitudinal grooves. Said strips form a flexible carrier element for the rubber wiper blade, as it were, which is thus biased in a curved position (the curvature in operative position being that of a windscreen to be wiped). As shown in figures 1, 2, 3 and 4, the windscreen wiper device is furthermore built up of a connecting device 1 of plastic material for a rod-like extension 2 of a windscreen wiper arm. Said connecting device 1 comprises a first part 3 and a second part 4 acting as a joint part, wherein said rod-like extension 2 arm can be pivotally connected to said first part 3 about said pivot axis, with the interposition of said second part 4. Said first part 3 comprises a flat base 5 having inwardly extending legs 6 integral therewith engaging around longitudinal sides of the wiper blade, at the location of said grooves, as a result of which the first part 1 is firmly attached to the unit consisting of the wiper blade and the strips. Said first part 3 comprises two opposite side walls 7,8 extending in upright direction from said flat base 5. On said opposite side walls 7,8 are formed

cylindrical protuberances 9,10 extending outwardly. These protuberances 9,10 pivotally engage, at the location of said pivot axis, in identically shaped recesses 11,12 provided in opposite walls 13,14 of the second part 4. Hence, said second part 4 is detachably connected to said first part 3 through a snapping/clipping operation. As shown in figure 2 above, said side walls 7,8 of said first part 3 are entirely located inside said second part 4 in a working position of said wiper blade.

With reference to figures 1 through 6 said second part 4 comprises a channel 15 arranged to receive (in a linear movement) said rod-like extension 2 of said oscillating arm. As shown, said channel 15 has a length and a width, and wherein a plane extending in a direction of the width of said channel and a plane extending through said longitudinal strip along a width thereof at the location of the connecting device enclose an angle $\alpha=30^{0}$.

One of said side walls 8 of said first part 3 comprises a protrusion 16 extending sidewards and inwards and arranged to engage into a first recess 17 having an open circumference and provided on a longitudinal exterior side 18 of said rod-like extension 19. For mounting or dismounting the connecting device 1 from the rod-like extension the second part 4 (and thus the free end of the rod-like extension 2 connected thereto), is pivoted relative to the first part 3, wherein reference is made to figures 1, 2 middle and bottom. As far as dismounting is concerned, while carrying out the pivot movement, the protrusion or cam 16 is no longer in line with the first recess 17, so that the second part 4 and the first part 3 attached thereto can be released from the rod-like extension 2 (see service position seen in figure 2 middle and bottom). As far as

mounting is concerned, while carrying out the pivot movement, the protrusion or cam 16 becomes in line with the first recess 17, so that the second part 4 and the first part 3 attached thereto is retained onto the rod-like extension 2 (working position seen in figure 2 top). The mutually cooperating protrusion 16 and recess 17 act as second retention means in case first retention means, as explained below, would inadvertently fail.

The rod-like extension 2 is also provided with a second recess 19 also having an open circumference and also provided on the same longitudinal exterior side 18 of said rod-like extension 2. As shown, said first and second recesses 17,19 have an open circumference and are spaced-apart in longitudinal direction. Said second recess 19 cooperates with a resilient tongue 20 on the second part 4 arranged to engage into a second recess 19, together acting as first retention means in this case. Said resilient tongue 20 is hingeable along a hinge axis between an inward position retaining said second part 4 (together with the first part 3 and the wiper blade attached thereon) onto said rod-like extension 2 and an outward position releasing second part 4 (together with the first part 3 and the wiper blade attached thereon) from said rod-like extension 2. Said resilient tongue is hingeable (i.e. activated and deactivated) from said inward position into said outward position by a push button 21. Said push button 21 forms a part of an outer wall 22 of said second part 4 and is located near a free end of said second part 4 facing towards said rod-like extension 2.

As depicted in figure 5 on the top, said channel 15 comprises a first chamber 23 facing towards an entrance 24

of said channel 15, as well as a second chamber 25 facing away from said entrance 24. Said first chamber 23 is wider than said second chamber 25. Said first chamber 23 is arranged to receive a first part 26 of a free end of said rod-like extension 2, wherein said second chamber 25 is arranged to receive a second part 27 of said free end of said rod-like extension 2. The free end of said rod-like extension 2 has a cut-out 28 in order to form said two parts 26,27 therein, wherein the first part 26 is wider than the second part 27. As indicated, the second part 27 forms a longitudinally extending finger, as if it were, to be accommodated in the correspondingly shaped second chamber 25 of the channel 15. The wider first part 26 is to be accommodated in the correspondingly shaped first chamber 23 of the channel 15. The first part 26 of the rod-like extension 2 comprises the recesses 17,19 cooperating with the protrusion 16 and the resilient tongue 20 of the connecting device 1. As seen in figure 5 on the bottom, there two types of rod-like extension 2 to be accommodated in the chambers 23,25 of the channel 15: these types mutually differ in width A,B of said first and second parts 26,27 thereof.

Figure 6 shows various bottom views of the second part 4 of the connecting device of figure 1 clearly showing how the resilient tongue 20 can be activated or deactivated with the help of the push button 21. By pushing in the push button 21 the resilient tongue 20 is removed from the recess 19, so that the wiper blade 2 may be released from the rod-like extension 2.

As shown in figure 8, an elongated nozzle 28 for spraying a washing liquid onto a windscreen to be wiped is clamped onto

said rod-like extension 2, wherein use is made of a clip 29 clamped around the rod-like extension 2. The nozzle 28 is connected to a washing liquid pipe 30 for transporting washing liquid from a source (not shown) via the pipe 30 to the nozzle 28, so that washing liquid may exit the nozzle 28 via the outlet 31 thereof. The nozzle 28 extends parallel to the rod-like extension 2, as seen in figures 7, 9 and 10. Particularly, the outlet 31 acts as an outlet for washing liquid in forward direction to form a so called "front spray". In that case outlet 32 acts as an outlet for washing liquid in backward direction ("rear spray").

As indicated, figure 7 shows several perspective views, as well as a cross-sectional view, of the connecting device 1 and the rod-like extension 2 of the earlier figures, but now equipped with a channel 33 for said nozzle 28, while figure 8 shows successive steps for fitting the rod-like extension 2 to the connecting device 1 of figure 7, seen from below. Corresponding parts have been designated with the same reference numerals. Thus, said channel 15 for the rod-like extension 2 is a first channel and said channel 33 for the nozzle 28 is a second channel. Said first channel 15 and said second channel 33 extend parallel in longitudinal direction of said rod-like extension 2. Hence, upon sliding said free end of said rod-like extension 2 inside said first channel by hand, said nozzle 28 is mounted in one go (i.e. in one linear movement) into said second channel 33 of said connecting device 1. Reference is made to figure 8. As said nozzle 28 in mounted position is located entirely inside said second channel 33, any discoloration of a material of the nozzle 28 (often a plastic material), due to aging or wear, for example, is not visible from the outside. The second channel 33 acts as a cover, as if it were. Therefore,

any difference in colour between the nozzle 28 and the connecting device 1 is not visible from the outside. This is particularly important, as the nozzle stays on the (rod-like extension 2 of the) oscillating arm during an entire life of a car, whereas the connecting device 1 is retained on the wiper blade and is thus replaced when replacing the wiper blade. The part 4 is made of one piece of material.

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

CLAIMS

1. A windscreen wiper device of the flat blade type 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 includes at least one longitudinal slit, in which slit at least one longitudinal strip of the carrier element is disposed, which windscreen wiper device comprises a connecting device (1) for a rod-like extension (2) of an oscillating arm, wherein said rod-like extension (2) can be pivotally connected to said connecting device (1) about a pivot axis near a free end thereof, **characterized in that** said connecting device (1) comprises a first channel (15) arranged to receive said free end of said rod-like extension (2), wherein said windscreen wiper device comprises a nozzle (28) for spraying a washing liquid onto said windscreen to be wiped, said nozzle (28) being mounted onto said rod-like extension (2), and wherein said connecting device (1) comprises a second channel (33) arranged to receive said nozzle (28) upon insertion of said free end of said rod-like extension (2) inside said first channel (15) of said connecting device (1).

2. A windscreen wiper device according to claim 1, wherein said nozzle (28) extends parallel to said rod-like extension (2), and wherein said nozzle (28) is invisible from the outside inside said second channel (33) of said connecting device (1) after insertion of said free end of said rod-like extension (2), in longitudinal

direction of said rod-like extension (2), inside said first channel (15) of said connecting device (1).

3. A windscreen wiper device according to claim 1 or 2, wherein said connecting device (1) comprises a first part (3) and a second part (4), wherein said rod-like extension (2) of said oscillating arm can be pivotally connected to said first part (3) about said pivot axis, with the interposition of said second part (4), wherein said second part (4) comprises said first channel (15) and said second channel (33), wherein said first part (3) is connected to said wiper blade and said second part (4) is detachably connected to said first part (3), and wherein said nozzle (28) is slid inside said second channel (33) upon insertion of said free end of said rod-like extension (2) inside said first channel (15) of said connecting device (1).

4. A windscreen wiper device according to claim 3, wherein said first channel (15) and said second channel (33) extend parallel in longitudinal direction of said rod-like extension (2).

5. A windscreen wiper device according to claim 4, wherein said nozzle (28) and said second channel (33) are elongated and extend parallel to said rod-like extension (2).

6. A windscreen wiper device according to claim 4 or 5, wherein said second channel (33) extends from a side wall (34) of said second part (4) of said connecting device (1).

7. A windscreen wiper device according to claim 6, wherein said sidewall (34) in use is located downstream in an upward movement of the oscillating arm.

8. A windscreen wiper device according to any of the preceding claims 1 through 7, wherein said channel (15) includes a first chamber (23) facing towards an entrance (24) of said channel (15), as well as a second chamber (25) facing away from said entrance (24), said first chamber (23) having a larger width than said second chamber (25), wherein said first chamber (23) is arranged to receive a first part (26) of said free end of said rod-like extension (2), and wherein said second chamber (25) is arranged to receive a second part (27) of said free end of said rod-like extension (2), said first part (26) of said rod-like extension (2) having a larger width than said second part (27) of said rod-like extension (2).

9. A windscreen wiper device according to any of the preceding claims 1 through 8, wherein said connecting device (1) comprises a sidewardly and inwardly extending protrusion (16) arranged to engage into a first recess (17) provided on a longitudinal exterior side (18) of said rod-like extension (2), wherein said connecting device (1) comprises a resilient tongue (20) arranged to engage into a second recess (19) provided on said longitudinal exterior side (18) of said rod-like extension (2), and wherein said resilient tongue (20) is hingeable along a hinge axis between an inward position retaining said wiper blade onto said rod-like extension (2) and an outward position releasing said wiper blade from said rod-like extension (2).

10. A windscreen wiper device according to claim 9, wherein said protrusion (16) is dimensioned such that

- in a working position of said wiper blade pivoted relative to said rod-like extension (2), said protrusion (16) engages into said first recess (17) thus retaining said wiper blade onto said rod-like extension (2);
- in a service position of said wiper blade pivoted relative to said rod-like extension (2), said protrusion (16) disengages from said first recess (17) thus releasing said wiper blade from said rod-like extension (2).

11. A windscreen wiper device according to claim 9 or 10, wherein said first and second recesses (17,19) have an open circumference and are spaced-apart in longitudinal direction.

12. A windscreen wiper device according to claim 9, 10 or 11, wherein said resilient tongue (20) is hingeable from said inward position into said outward position by a push button (21), wherein said push button (21) forms a part of an outer wall (22) of said connecting device (1).

13. A windscreen wiper device according to claim 12, wherein said push button (21) is located near a free end of said connecting device (1) facing towards said rod-like extension (2).

14. A windscreen wiper device according to any of the preceding claims 1 through 13, wherein said first

channel (15) has a length and a width, and wherein a plane extending in a direction of the width of said channel (15) and a plane extending through said longitudinal strip along a width thereof at the location of the connecting device (1) enclose an angle α, wherein preferably $15^0<\alpha<60^0$.

15. A windscreen wiper device according to any of the preceding claims 3 through 14, wherein said first part (3) and said second part (4) are provided with mutually cooperating pivot means for pivotally connecting said second part (4) to said first part (3).

16. A windscreen wiper device according to claim 15, wherein said second part (4) is connected to said first part (3) by pivotally engaging protuberances (9,10) of said first part (3), at the location of said pivot axis, in recesses (11,12) provided in said second part (4).

17. A windscreen wiper device according to any of the preceding claims 3 through 16, wherein said second part (4) is detachably connected to said first part (3) through a snapping/clipping operation.

18. A windscreen wiper device according to any of the preceding claims 3 through 17, wherein said first part (3) comprises a flat base (5) having legs (6) integral therewith engaging around longitudinal sides of the wiper blade, at the location of said slit.

19. A windscreen wiper device according to claim 18, wherein said first part (3) comprises two opposite side walls (7,8) extending in upright direction from said base (5),

and wherein one of said side walls (8) comprises said sidewardly and inwardly extending protrusion (16).

20. A windscreen wiper device according to claim 19, wherein said pivotally engaging protuberances (9,10) of said first part (3) are provided outwardly on said opposite side walls (7,8), and wherein said recesses (11,12) are provided inwardly in opposite walls (13,14) of said second part (4).

21. A windscreen wiper device according to claim 19 or 20, wherein said side walls (7,8) of said first part (3) are entirely located inside said second part (4) in a working position of said wiper blade.

22. A windscreen wiper device according to any of the preceding claims 3 through 21, wherein said first and said second parts (3,4) are each made in one piece of plastic material.

23. A connecting device (1) arranged for use in such a windscreen wiper device according to any of the preceding claims 1 through 22.

24. An oscillating arm with a rod-like extension (2) arranged for use in such a windscreen wiper device according to any of the preceding claims 1 through 22.

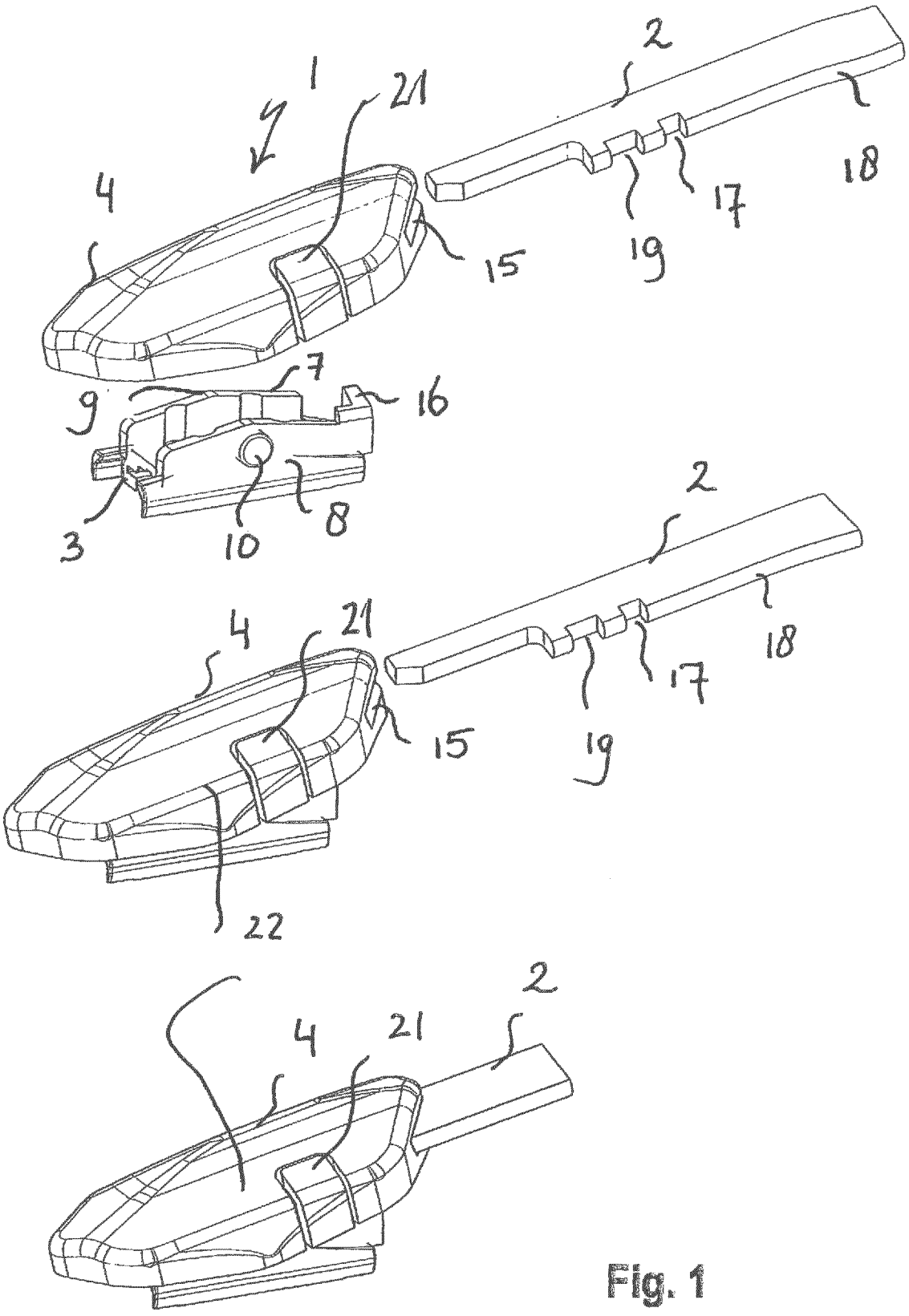


Fig. 1

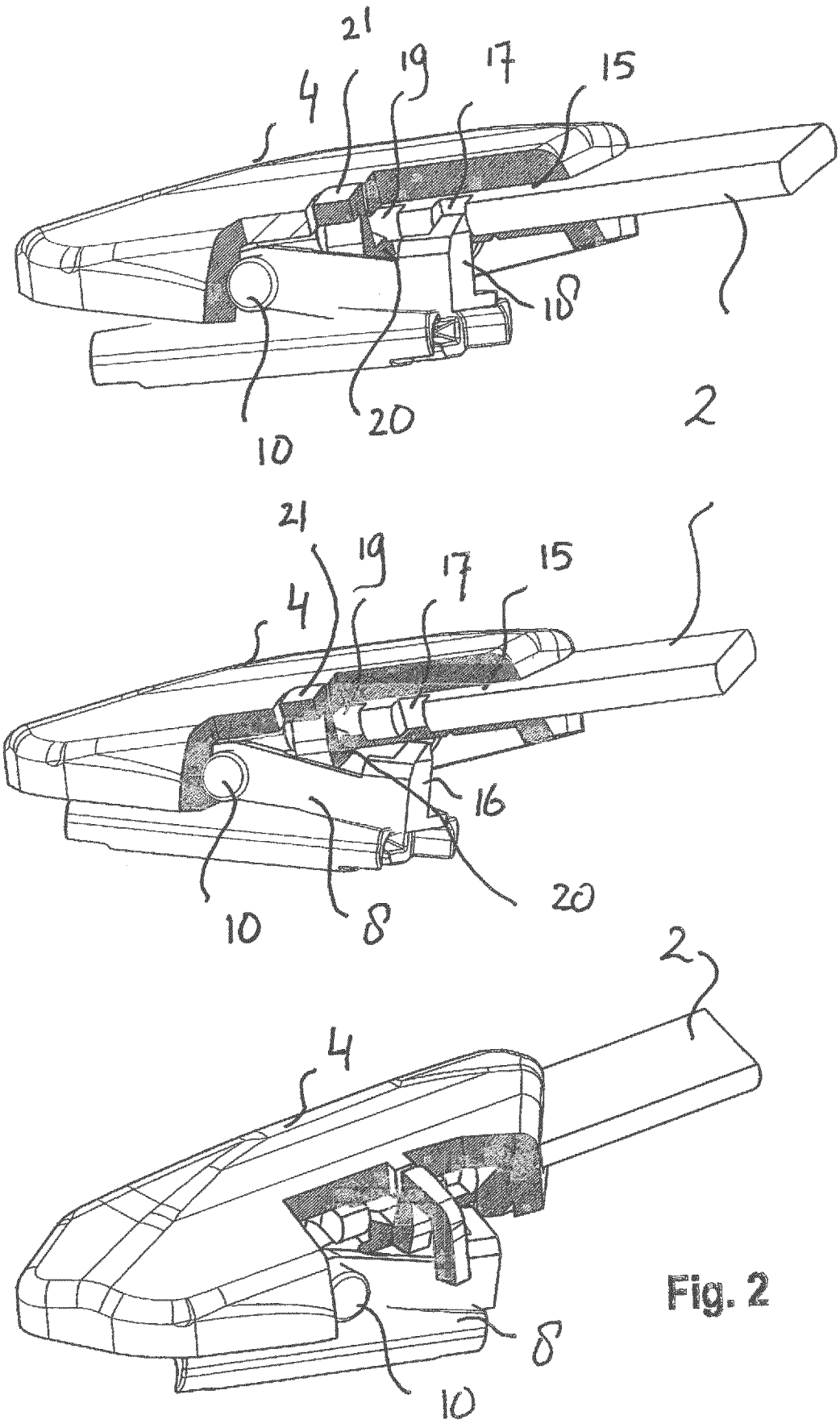
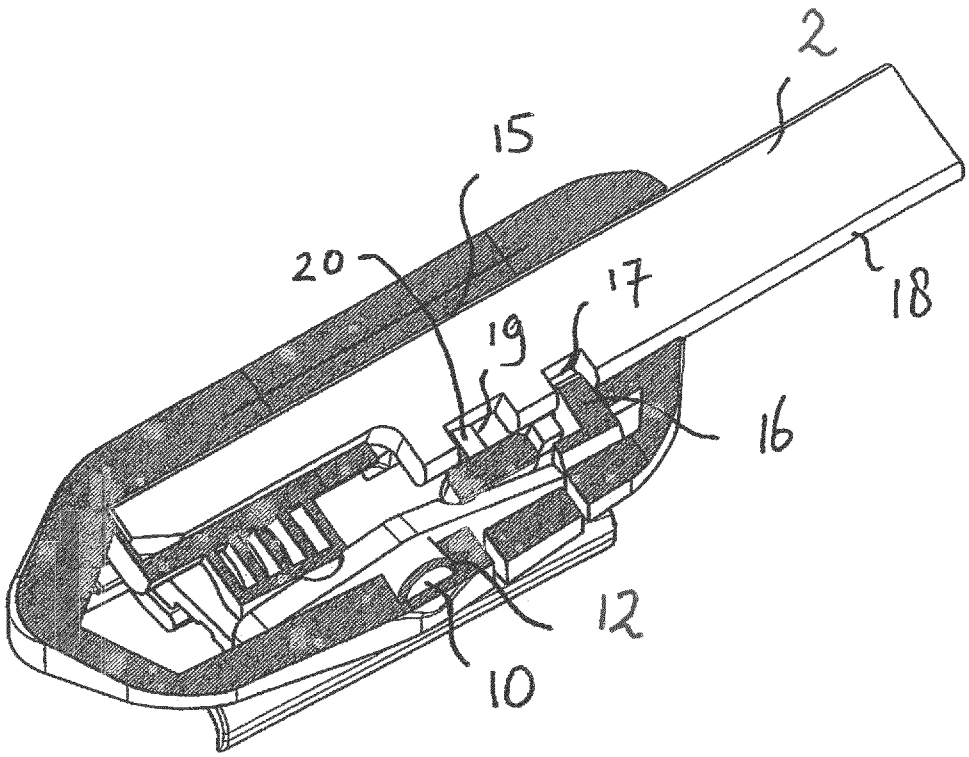


Fig. 2



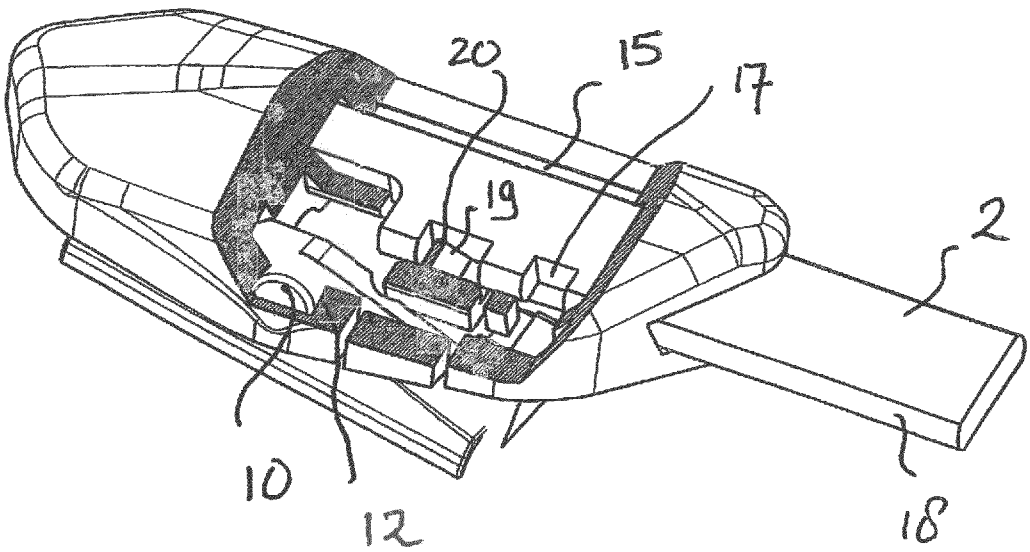


Fig. 3

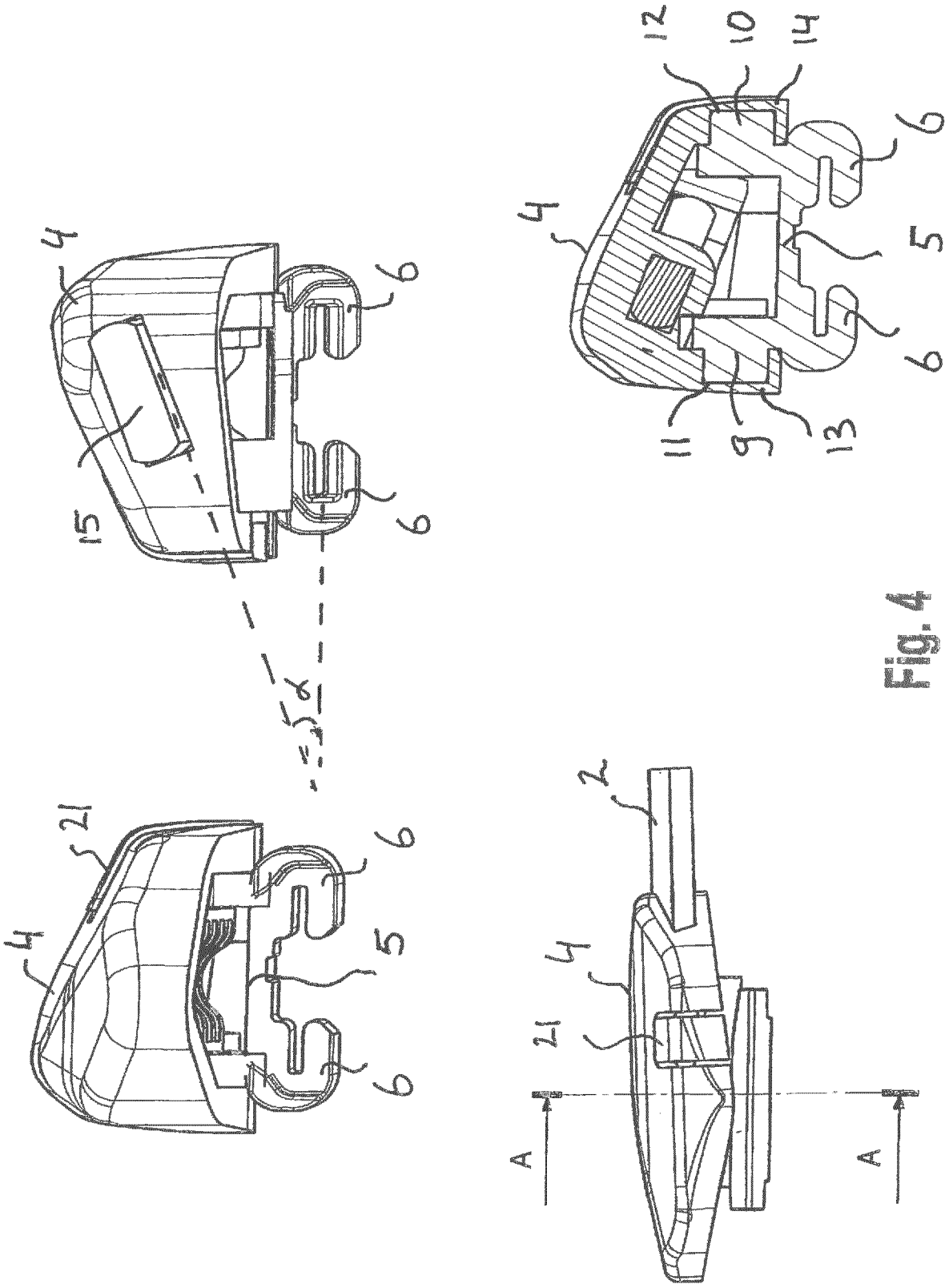
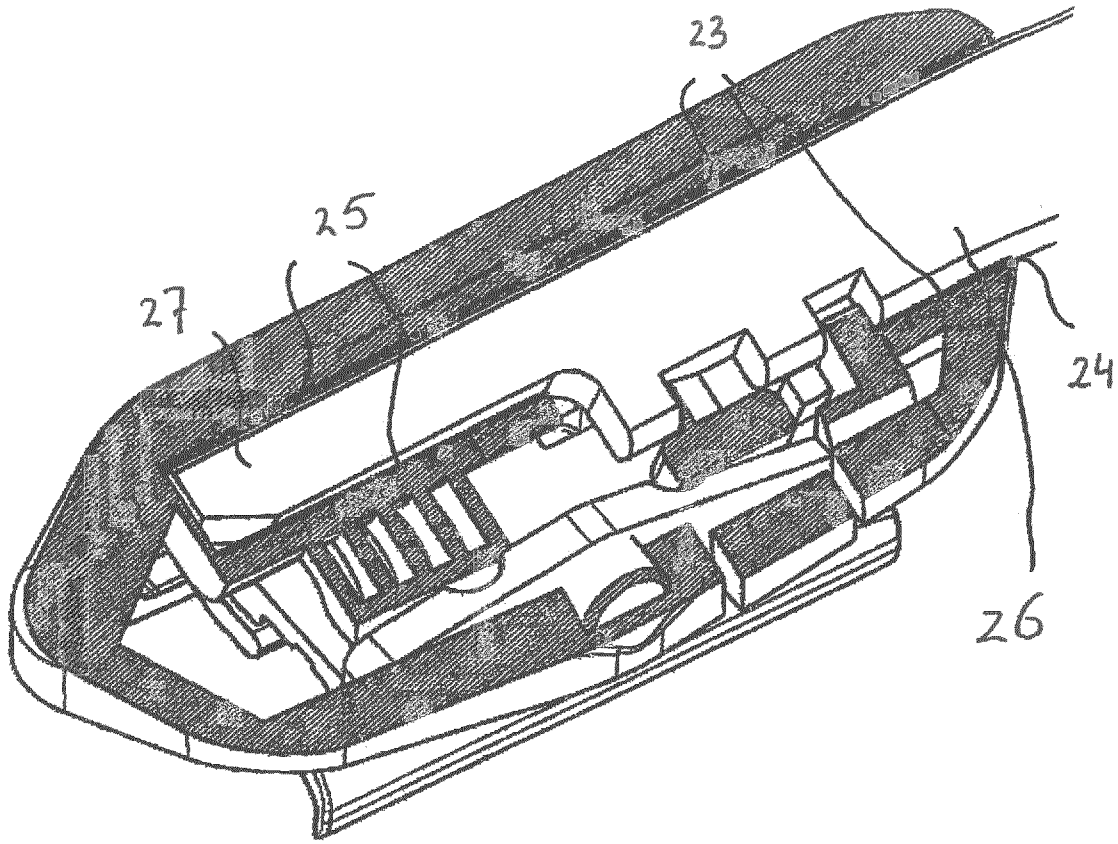


Fig. 4



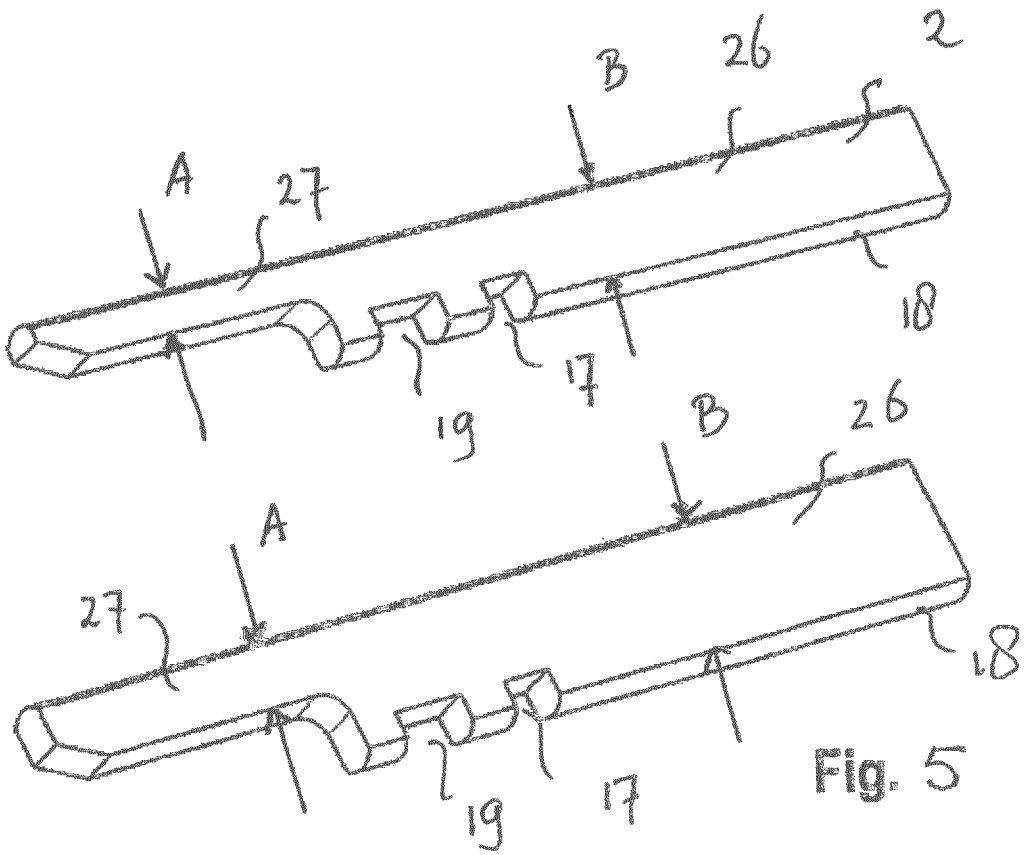


Fig. 5

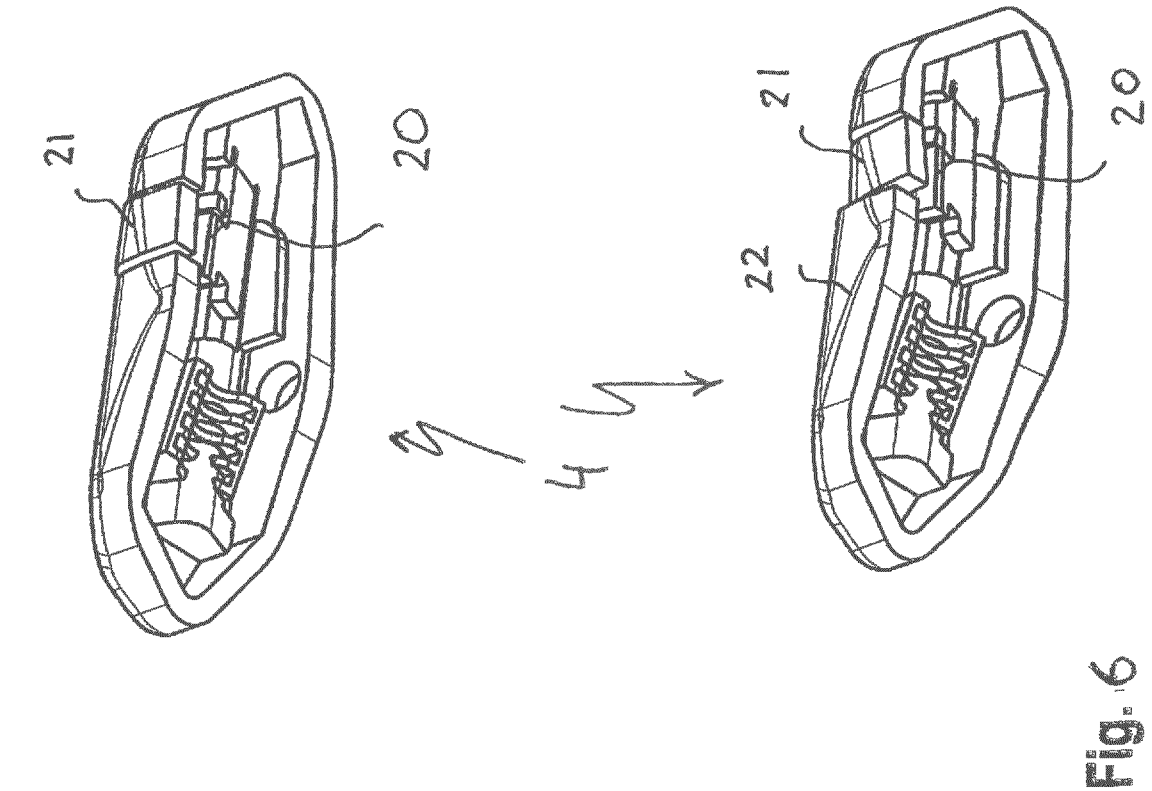
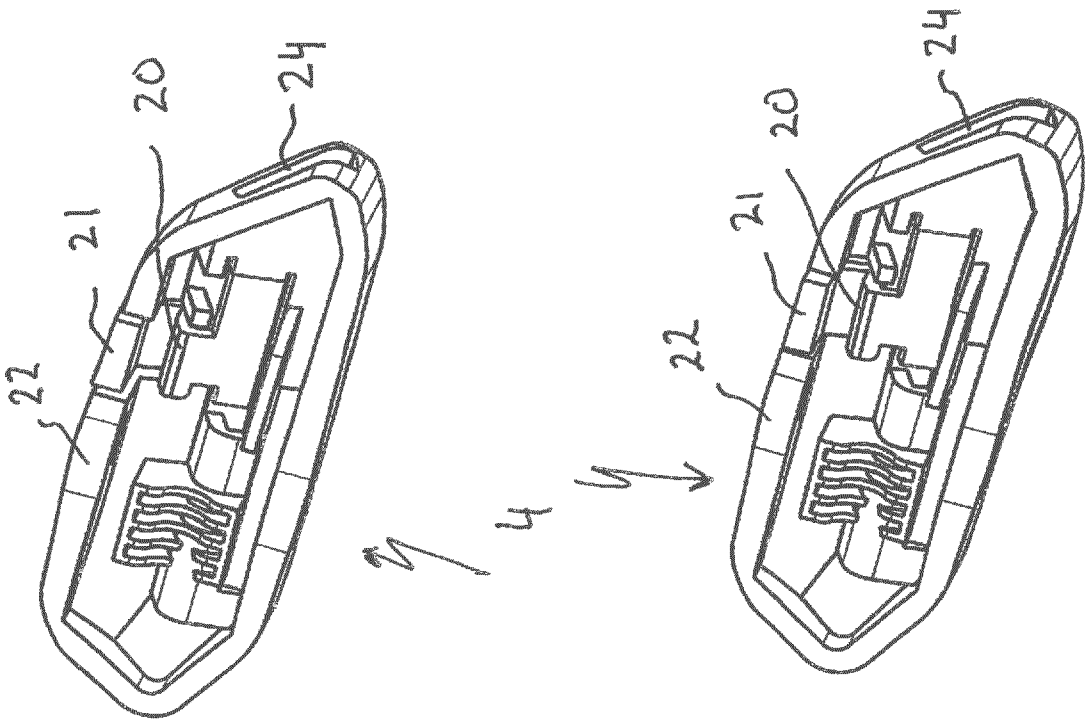
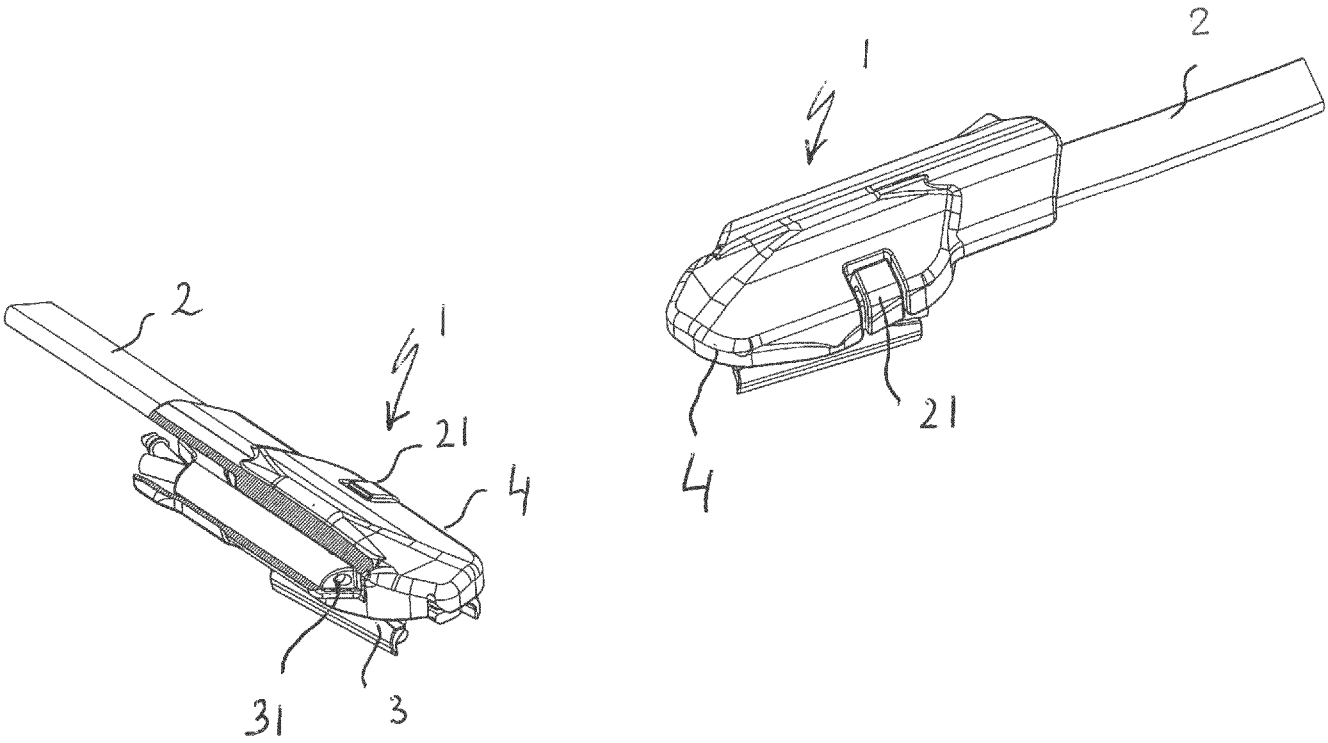


Fig. 6





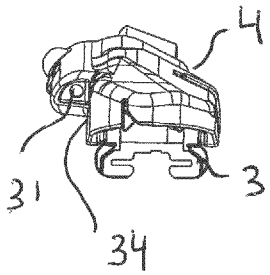
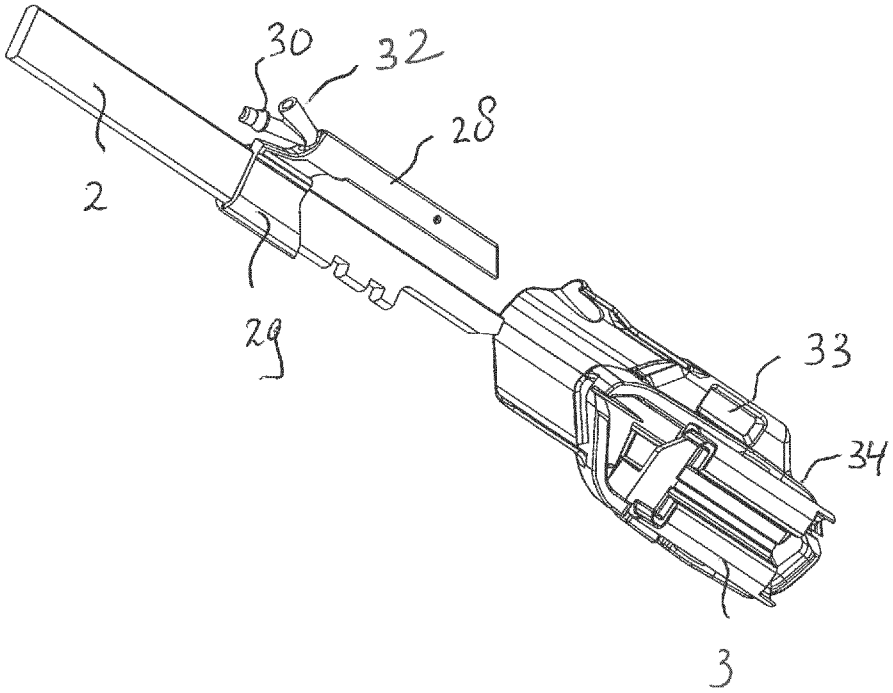


Fig. 7



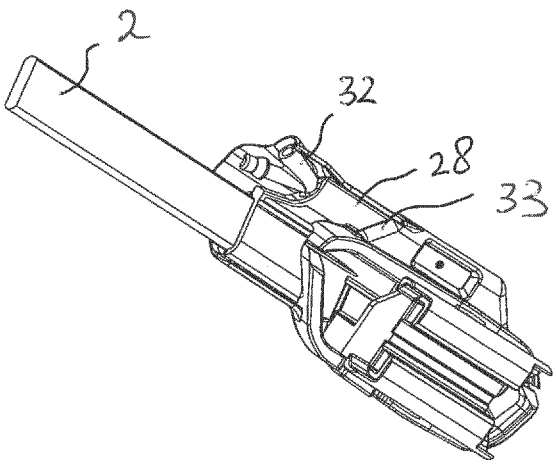


Fig. 8

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2018/085930

A. CLASSIFICATION OF SUBJECT MATTER
INV. B60S1/40 B60S1/52
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B60S

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 10 2015 224631 A1 (BOSCH GMBH ROBERT [DE]) 8 June 2017 (2017-06-08)	24
Y	the whole document	1-7, 14-23
A		8-13

Y	EP 1 099 609 A2 (TRICO PRODUCTS CORP [US]) 16 May 2001 (2001-05-16) the whole document	1-7, 14-23

E	WO 2019/161990 A1 (BOSCH GMBH ROBERT [DE]) 29 August 2019 (2019-08-29) the whole document	1-7, 13-24

X	WO 2016/119852 A1 (FEDERAL MOGUL SA [BE]) 4 August 2016 (2016-08-04)	24
A	the whole document	1-23

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

☒ See patent family annex.

* Special categories of cited documents :

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
5 September 2019	17/09/2019

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Blandin, Béatrice

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2018/085930

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