(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
17 April 2014 (17.04.2014)

WIPO | PCT

(10) International Publication Number
WO 2014/056945 A1

(51) International Patent Classification:
B60S 1/34 (2006.01)

(21) International Application Number:
PCT/EP2013/070982

(22) International Filing Date:
8 October 2013 (08.10.2013)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
P-401099 8 October 2012 (08.10.2012) PL

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

(54) Title: ARMHEAD OF A WIPER, ESPECIALLY AN AUTOMOTIVE WIPER, AND METHOD FOR ITS FABRICATION

(57) Abstract: The subject of the invention is the armhead of a wiper, especially an automotive wiper, comprising a front part, designed for mounting an arm of the wiper, and a rear part, designed for mounting the armhead to the shaft of the wiper motor, the front and rear parts being permanently fastened to a middle part, characterized in that the front (1), rear (2) and middle (3) parts are fabricated as at least two separate elements, namely, the front (1) and the rear/middle parts, and preferably as three separate elements, namely, the front (1), the rear (2) and the middle (3) part. The invention also involves a method of fabricating such a wiper armhead.

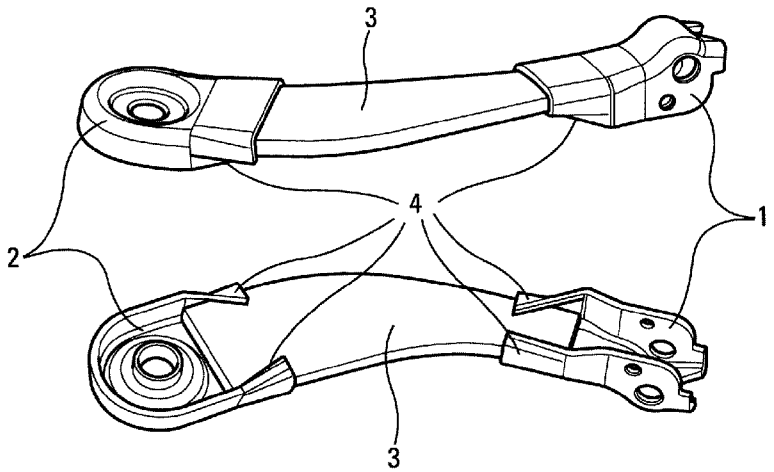

Fig. 1

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Armhead of a wiper, especially an automotive wiper, and method for its fabrication

The subject of the invention is the armhead of a wiper, especially an automotive wiper, and a method for its fabrication. The invention finds application in all wiper systems – such as those used in automobiles, railways, airplanes or ships.

The armhead of a wiper is an element of the wiper system serving to connect the wiper arm to the shaft of the wiper motor. One distinguishes the front part of the armhead, also known as the front element or *front definition*, the rear part of the armhead, also known as the rear element, the conical element, or the *rear definition*, and the middle part of the armhead, also known as the middle element or *middle definition*.

The front part is the part of the wiper armhead to which the wiper arm is mounted. For this purpose, the front part has a set of corresponding openings. The shape of the front part and the arrangement of these openings are standardized. The rear part is the part of the wiper armhead which is mounted on the shaft of the wiper motor, arranging this shaft in a corresponding opening, often being conical, which is present in the rear part. The shape of the rear part and the geometry of this opening are standardized. The middle part, located between the front and rear part, is a relatively simple element, whose shape and dimensions are entirely standardized – they depend on the particular vehicle model, deriving from the place of attachment of the wipers, the height of the hood, the shape of the windshield, and also the visual aspect desired by the vehicle manufacturer. The shape of the middle part can be different – even within the same vehicle – for the wiper assemblies on the driver's side and the passenger side. And therefore the wiper armhead taken as a whole is a specific and variable element for each model of automobile.

Only two methods are known in the prior art for fabricating wiper armheads – by a casting process, which involves pouring liquid material, most often a metal melt or plastics, into a previously prepared mould, and controlling the parameters of the solidification process to obtain an armhead of the appropriate structure, visual appearance, and properties, or by stamping from sheet metal, primarily steel. Stamping is done by means of devices known as dies, primarily on mechanical or hydraulic presses. This machining is chiefly done in the cold state. However, in both cases the armhead of the wiper is fabricated as a single, integrally shaped part (i.e., cast from a single mould or stamped from a single piece of sheet metal). This means that variability in the configuration of the middle part of

the armhead entails variability in the configuration of the armhead as a whole. Consequently, the fabrication of each model of wiper armhead requires the making of a specific tool for that armhead, whether a casting mould or a stamping die, or plastics tooling consisting of a stamp and a die. The result is a very long development time and high cost for the prototype of the wiper armhead and, consequently, a long development time for the wiper system and high price of the end product, or wiper armhead.

Therefore, the goal of the present invention is to propose a design of a wiper armhead that enables a fast and cheap process of development of the wiper system.

Another goal of the invention is to provide a method of fabrication of the wiper armhead that enables a fast and cheap prototyping.

The armhead of a wiper, especially an automotive wiper, comprising a front part, designed for mounting the arm of the wiper, and a rear part, designed for mounting the armhead on the shaft of the wiper motor, these front and rear parts being permanently fastened on a middle part, is characterized according to the invention in that the front, rear and middle parts are configured as at least two separate elements, that is, the front part and the rear/middle part, and preferably as three separate elements, that is, the front, rear and middle part.

In a variant embodiment of the invention, according to which the front, rear and middle parts are made as two separate elements, that is, the front part and the rear part, the length of each of these parts is chosen (e.g., by appropriate trimming, or appropriate inserts in the tooling) for the specific vehicle model in which the wipers will be installed. This means that one of the parts has an established shape (the same for all models), and only the length of the other part is adapted to the specific model. Obviously, one can envision the reverse situation, when the rear part is always identical, while the length of the front part can be adapted.

Preferably, one or more parts of the armhead have ribbing or bosses in a certain direction or directions, imparting the corresponding rigidity and durability to the armhead.

Preferably, one or more parts of the armhead have at least one step or one thickening in the area of the connection of the middle part to the front or rear part. Thanks to this, all the parts of the armhead after the process of connection and painting give the

visual effect of a uniform structure (continuity) or provide some other desirable stylistic effect.

Preferably, the front and rear parts are permanently fastened to the middle part by a permanent fastening selected from the group comprising: crimping, bending, soldering, welding, gluing, riveting, screwing/bolting, overmoulding, or a combination of these.

Preferably, the front and the rear parts are castings of plastics or metal, preferably aluminium, or are bent steel elements.

Preferably, the middle part is a casting of plastics or metal, preferably aluminium, or a bent or cut-out steel element.

Preferably, the connection areas are compatible with masking elements, preferably catches, trims, envelopes, covers, preferably made of plastic.

Preferably, the front, rear and middle parts are made of a rigid material or rigid materials.

Preferably, the middle part has an overall elongated shape, preferably a strip-like shape.

Preferably, the middle part contains at least one curved segment, preferably two or more curved segments and/or the middle part is substantially nonplanar. This means that the middle part cannot be inscribed in a plane, or that it has segments which lie in at least two different planes. Such a configuration of the middle part enables a proper orientation of the arm of the wiper with respect to the axis of rotation in two-dimensional space.

Preferably, the rear part has at least one groove able to receive the wiper motor shaft.

Preferably, the front and rear parts respectively have at least one groove for receiving a segment of the middle part.

In this case, preferably at least one of the front and rear parts has an abutment surface designed for at least part of the longitudinal end of the middle part. In this way, the abutment surface becomes a support for the end of the middle part. Thanks to this, the

proper installation of the front and/or rear part on the middle part is made easier prior to their connection (e.g., by crimping).

In one preferred embodiment of the invention, the armhead consists of three parts, i.e., a front, rear and middle part. In an alternative preferred embodiment of the invention, the wiper armhead consists of two parts, i.e., a front and a rear/middle part.

The invention also involves an automotive windshield wiper assembly containing such an armhead.

The invention also envisions and includes other advantageous embodiments whereby:

- at least a piece of the middle part is situated inside the front or rear part;
- the rear part can contain the base surrounding the opening designed for the mounting therein of the wiper motor shaft, said base becoming a support for the means used to fasten the shaft in the armhead, such as a screw screwed onto the shaft, preferably through a gasket or washer;
- the arm of the wiper can be mounted pivoting on the front part, wherein the axis of rotation of the wiper arm relative to the front part is preferably essentially perpendicular to the axis of rotation of the shaft of the wiper motor;
- the front part can have a first pair of openings designed to accommodate a transverse rivet, for a pivoting of the wiper arm relative to the middle part;
- the front part can have a second pair of openings designed to accommodate a transverse rivet by which an elastic element (such as a spring) can be fastened, this elastic element being designed to fasten it to the wiper arm.

The invention also concerns a method for fabricating an armhead of a wiper, especially an automotive wiper, comprising a front part, designed for mounting the arm of the wiper, a rear part, designed for mounting the armhead to the shaft of the wiper motor, whereby at first the front, rear and middle parts are fabricated as at least two separate

elements, namely, the front and the rear/middle parts, preferably as three separate elements, namely the front, rear and middle parts, and then the front part is permanently fastened to the rear/middle part, and preferably the front and rear parts are permanently fastened to the middle part.

Preferably, the front and rear parts are permanently fastened to the middle part by a permanent fastening selected from the group comprising: crimping, bending, soldering, welding, gluing, riveting, screwing/bolting, overmoulding, or a combination of these.

Preferred sample embodiments

The invention will now be presented more closely in preferred sample embodiments, making reference to the enclosed drawings, where:

Fig. 1 shows a wiper armhead according to the invention, after clamping the front and rear part on the middle part, seen from above and from below,

Fig. 2 shows a wiper armhead according to the invention, before clamping the front and rear part on the middle part, seen from above,

Fig. 3 shows a wiper armhead according to the invention, after clamping the front and rear part on the middle part, seen from above,

Fig. 4 shows an example of a bent round section,

Fig. 5 shows the front part of the wiper armhead according to the invention in one sample embodiment,

Fig. 6 shows a sample embodiment of the armhead according to the invention in a two-part variant (before mounting, side view), indicating the adapted area on element (2),

Fig. 7 (A, B) shows a sample embodiment of the armhead according to the invention in a two-part variant (after mounting, seen from below), indicating the bent/joined distance, and explaining the option of regulating the length of the armhead for geometrically identical components (1) and (2), while

Fig. 8 (A, B) shows a sample embodiment of the armhead according to the invention in a two-part variant (view from above A – before mounting, B – after mounting), with a conspicuous step S.

The drawing makes use of the following notations: 1 – front part of the wiper armhead, 1a – first pair of openings, 1b – second pair of openings, 2 – rear part of the wiper armhead, 3 – middle part of the wiper armhead, 4 – connection area, 5 – mounting elements of the front and rear part of the wiper armhead (e.g., flange that will be bent during the mounting), S – step.

In the preferred sample embodiment shown in figs. 1-3, the wiper armhead according to the invention has a front part (also known as the front element or *front definition*), a rear part 2 (also known as the rear element, conical element, or *rear definition*), these parts 1 and 2 being fastened by crimping on the middle part 3 (also known as the middle element or *middle definition*).

As mentioned at the outset, the front part 1 is the part of the wiper armhead to which the wiper arm is mounted. For this purpose, the front part 1 has a set of corresponding openings. The shape of the front part 1 and the disposition of these openings are standardized. The rear part 2 is the part of the wiper armhead which is mounted on the shaft of the wiper motor, placing this shaft in the corresponding opening appearing in the rear part 2. The shape of the rear part 2 and the geometry of this opening are standardized. The middle part 3, on which the front 1 and rear 2 parts are fastened, is a relatively simple element, whose shape and dimensions depend on the specific vehicle model and many other factors mentioned at the outset – such as the place of attachment of the wipers, the height of the hood, the shape of the windshield, and so on.

Typically, the front part 1 and the rear part 2 are made of materials such as steel sheet, while the middle part 3 is made of metal or plastic, as a casting.

In the sample embodiment shown, the front 1 and rear 2 parts are fastened on the middle part 3 by crimping the front 1 and rear 2 part on the middle part 3 in the connection areas 4, by the clamping of the mounting elements 5. Alternatively, to fasten the front 1 and rear 2 parts to the middle part one can use many other fastening techniques familiar to the skilled person, such as: bending, soldering, welding, gluing, riveting, screwing/bolting, or a

combination of these techniques, as long as the chosen connection techniques assure the required rigidity and durability of the wiper armhead obtained in this way.

In the sample embodiment presented, the front 1 and rear 2 parts have a cross section in the connection area 4 allowing them to be crimped on the middle part 3. Alternatively, the front 1 and rear 2 parts can be configured in many other ways, among which can be mentioned: a section in the shape of the letter U, a round section, a section in the shape of the letter L. An example of a bent round section is shown in Fig. 4.

The middle part 3 can have a step or thickening near the connection areas 4, thanks to which the front 1 and/or rear 2 part can be lined with the middle part 3. This is important in the case of a preferred method of connecting these parts, that of crimping. Furthermore, the connection areas 4 can be compatible with various masking elements, such as catches, trims, envelopes, and so on, such as those made of plastic. All of these solutions make it possible to enhance the esthetics of the connection areas 4 and/or give the wiper armhead the desired esthetics (visual aspect).

In the sample embodiment shown, the front 1 and rear 2 parts have an inwardly curved edge in the connection area 4. Alternatively, portions of the front 1 and rear 2 parts intended to be joined to the middle part 3 can be configured in many other ways. For example, the middle part can be bent likewise on the front and rear parts. The joining can be done by any chosen edges or surfaces. The front and/or rear and middle parts can also fit together or be overlapped.

As for the middle part 3, depending on the needs of the specific vehicle/automobile model, this can have a ribbing or bosses in a particular direction or directions, imparting the appropriate rigidity and durability to this part 3. The middle part 3 in the sample embodiment shown was produced as a casting from molten metal (alternatively, one can use plastic). However, it can also be made as a cast element (English *cast part*) or be cut out from steel. In each of these instances, the middle part 3 is relatively simple structurally as compared to the front 1 and rear 2 parts. Therefore – in each of the above instances – one can quickly make a prototype of the middle part 3 with different technologies, and thanks to the fastening on it of the specially fabricated standardized front 1 and rear 2 parts one can very quickly (compared to the prior art) obtain a prototype of the complete wiper armhead.

The end effect of adopting the invention is: shortening of the prototyping time for the complete wiper armhead, and in this connection also the development time for the entire system of wipers for a particular vehicle. Moreover, the costs are reduced and the design of the tooling needed to make the prototype is simplified – since according to the invention it is sufficient to produce a relatively simple mould for the casting of the middle part 3 or relatively simple tooling – bending machine – for the bending/stamping of the middle part 3. Hence, this leads to a lowering of the costs of fabrication of the complete wiper armhead.

As mentioned earlier,

- the front part can have a first pair of openings 1a, designed to accommodate a transverse rivet for a pivoting of the arm of the wiper with respect to the middle part;
- the front part can have a second pair of openings 1b, designed to accommodate a transverse rivet by which an elastic element (spring) can be fastened, this elastic element being designed for attachment to the wiper arm,

which has been illustrated in Fig. 5. The use of the pairs of openings (1a, 1b) is not limited to the three-part variant – it can also be well implemented in the two-part variant, as discussed below.

In the sample embodiment shown in Figs. 6-8, the wiper armhead according to the invention has two parts: a front part 1 and a rear/middle part 2. A sample embodiment is shown below where the front part 1 is always identical, while the length of the rear part 2 in the region X can be adapted, e.g., by trimming, as well as by other known methods of tool use, in order to obtain an appropriate length of the overall armhead.

Obviously, one can imagine the contrary situation, when the rear part is always identical, while the length of the front part can be adapted.

To a certain extent, it is also possible to regulate the length of the armhead in the mounting process alone, by determining the site of the bending. In this case, the front 1 and rear/middle 2 parts do not require further adapting (e.g., trimming), and one can obtain armheads of different lengths, as shown in Figs. 7 A and B.

Figs. 8 A and B also illustrate a two-part variant in which the front 1 and the rear/middle 2 part are joined by using a step S, of height S mm. Fig. 8A shows the parts 1 and 2 prior to the connection. One notices that the part 2 has a projection, whose dimensions are adapted to part 1 and which is designed to fit into part 1 in the assembly process. Fig. 8b shows the parts 1 and 2 after being joined.

In this case, a portion of the rear/middle part 2 is placed inside the front part 1. Again, such a method of joining parts 1, 2 together, as well as the use of the step S, is not limited to the two-part variant – it can also be well implemented in the three-part variant.

Patent claims

1. Armhead of a wiper, especially an automotive wiper, comprising a front part, designed for mounting an arm of the wiper, and a rear part, designed for mounting the armhead to the shaft of the wiper motor, the front and rear parts being permanently fastened to a middle part, **characterized in that** the front (1), rear (2) and middle (3) parts are fabricated as at least two separate elements, namely, the front (1) and the rear/middle (2) parts, and preferably as three separate elements, namely, the front (1), the rear (2) and the middle (3) parts.

2. Armhead according to Claim 1, **characterized in that** one or more parts of the armhead, especially the middle part (3), have ribs or bosses in a given direction, providing rigidity and durability to this middle part (3).

3. Armhead according to Claim 1 or 2, **characterized in that** one or more parts of the armhead, especially the middle part (3), have at least one step or one thickening in the area of the connection (4) of the middle part (3) to the front (1) or rear (2) part.

4. Armhead according to Claim 1, 2 or 3, **characterized in that** the front (1) and rear (2) parts are permanently fastened to the middle part (3) by a permanent fastening selected from the group comprising: crimping, bending, soldering, welding, gluing, riveting, screwing/bolting, overmoulding, or a combination of these.

5. Armhead according to any one of the preceding claims, **characterized in that** the front (1) and the rear (2) parts are castings of plastics or metal, preferably aluminium, or are bent steel elements.

6. Armhead according to any one of the preceding claims, **characterized in that** the middle (3) part is a casting of plastics or metal, preferably aluminium, or a bent or cut-out steel element.

7. Armhead according to any one of the preceding claims, **characterized in that** the front (1), rear (2) and middle (3) parts are made of a rigid material or rigid materials.

8. Armhead according to any one of the preceding claims, **characterized in that** the middle part (3) has an overall elongated shape, preferably a strip-like shape.

9. Armhead according to any one of the preceding claims, **characterized in that** the middle part (3) contains at least one curved segment, preferably two or more curved segments and/or the middle part (3) is substantially nonplanar.

10. Armhead according to any one of the preceding claims, **characterized in that** the rear part (2) has at least one groove able to receive said wiper motor shaft.

11. Armhead according to any one of the preceding claims, **characterized in that** the front (1) and rear (2) parts respectively have at least one groove for receiving a segment of the middle part (3).

12. Armhead according to claim 11, **characterized in that** at least one of the front (1) and rear (2) parts has an abutment surface for at least part of the longitudinal end of the middle part (3).

13. Armhead according to any one of the preceding claims, **characterized in that** it consists of a front (1), rear (2) and middle (3) part or consists of a front (1) and a rear/middle part (2).

14. Automotive windshield wiper comprising an armhead according to any one of the preceding claims.

15. Method for fabricating an armhead of a wiper, especially an automotive wiper, comprising a front part, designed for mounting the arm of the wiper, and a rear part, designed for mounting the armhead to the shaft of the wiper motor, **characterized in that** at first the front (1), rear (2) and middle (3) parts are fabricated as at least two separate elements, namely, the front (1) and the rear/middle (2) parts, preferably as three separate elements, namely the front (1), rear (2) and middle (3) parts, and then the front part (1) is permanently fastened to the rear/middle part (2), and preferably the front (1) and rear (2) parts are permanently fastened to the middle part (3).

16. Method according to Claim 15, **characterized in that** the front (1) and rear (2) parts are permanently fastened to the middle part (3) by a permanent fastening selected from the group comprising: crimping, bending, soldering, welding, gluing, riveting, screwing/bolting, overmoulding, or a combination of these.

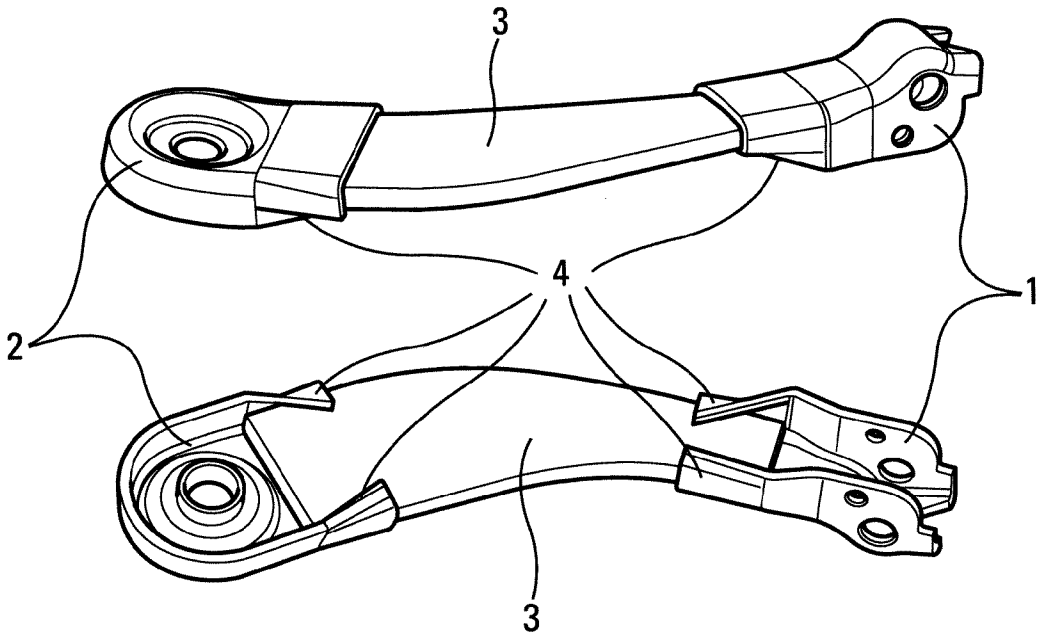

Fig. 1

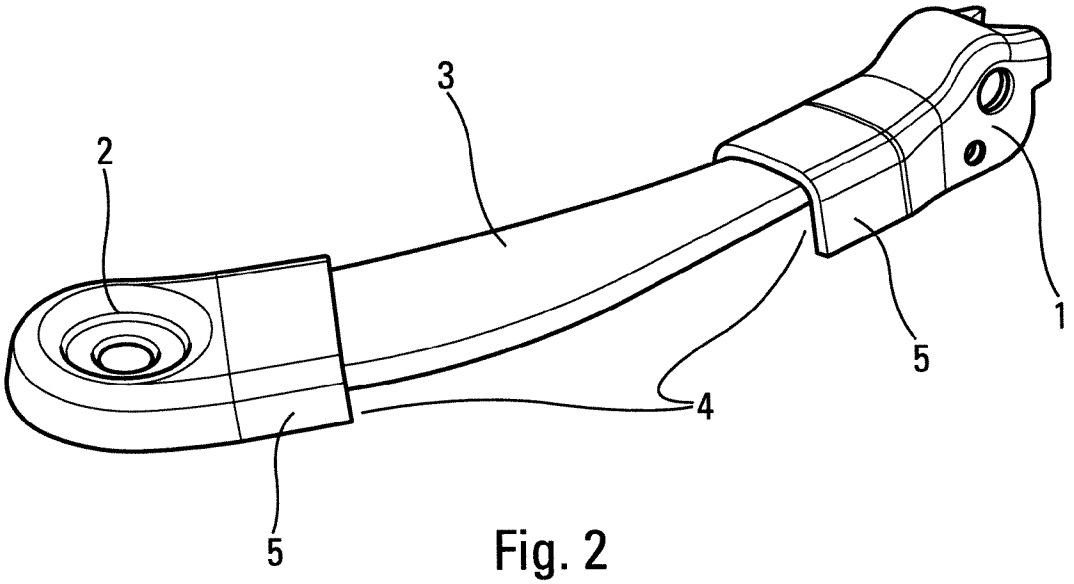

Fig. 2

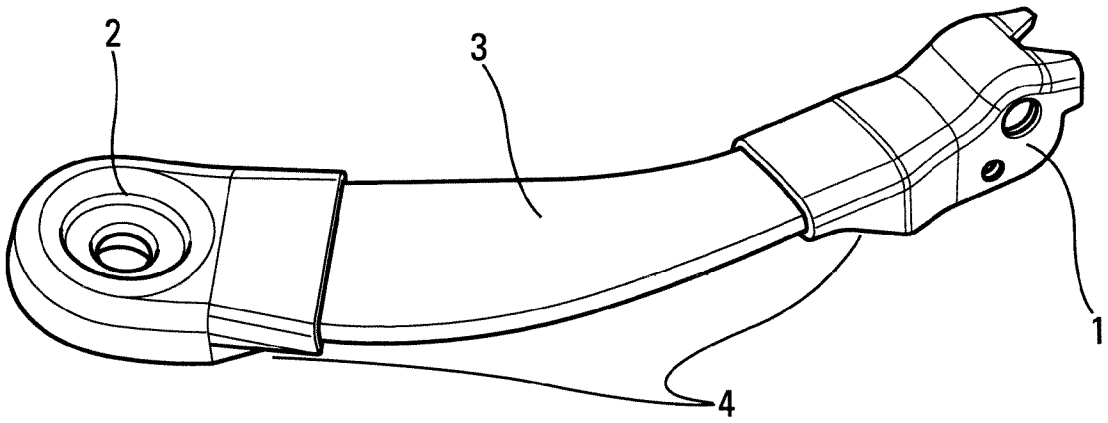

Fig. 3

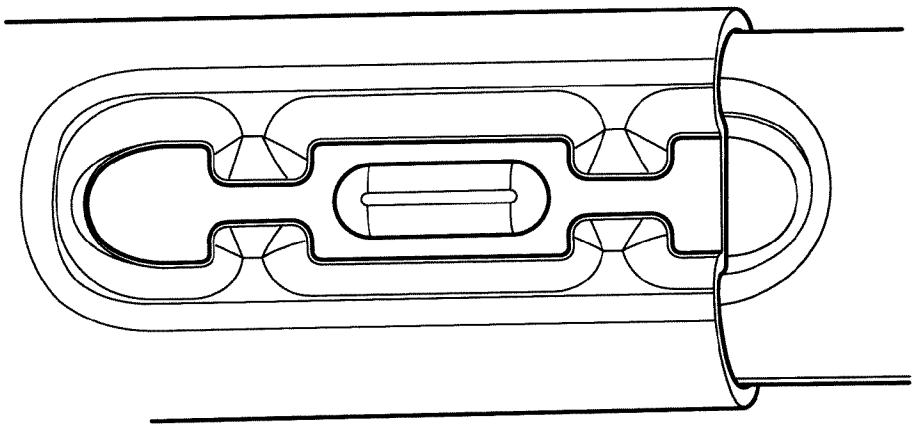

Fig. 4

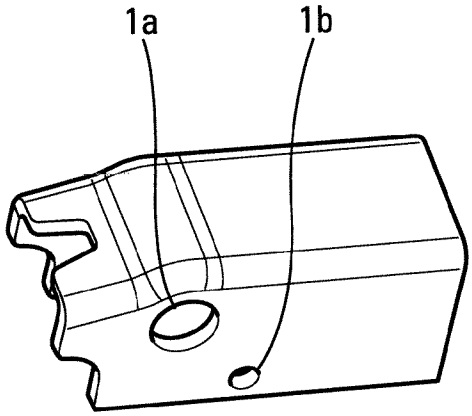

Fig. 5

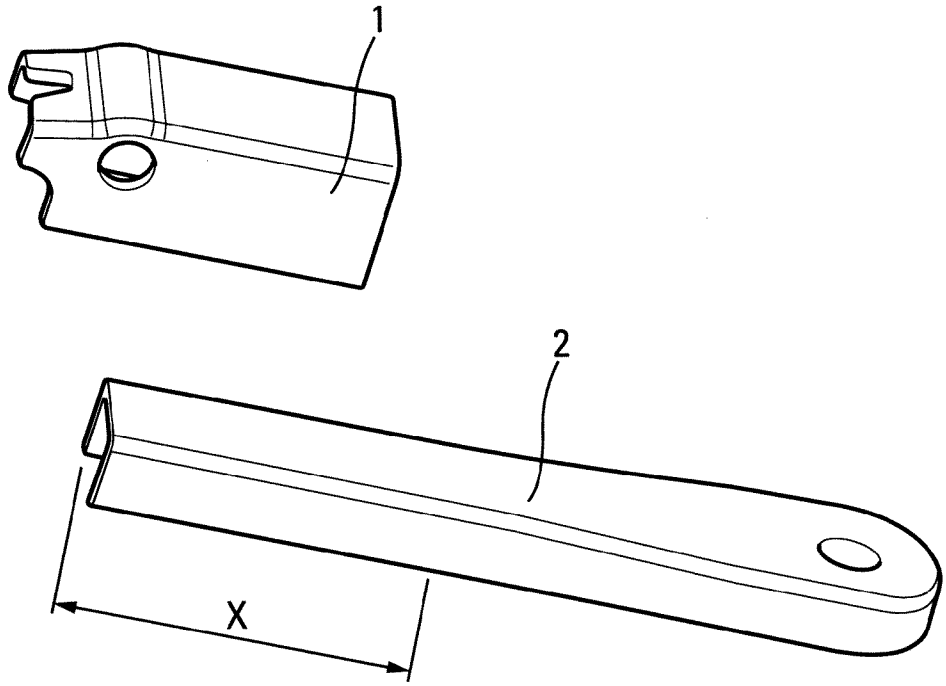

Fig. 6

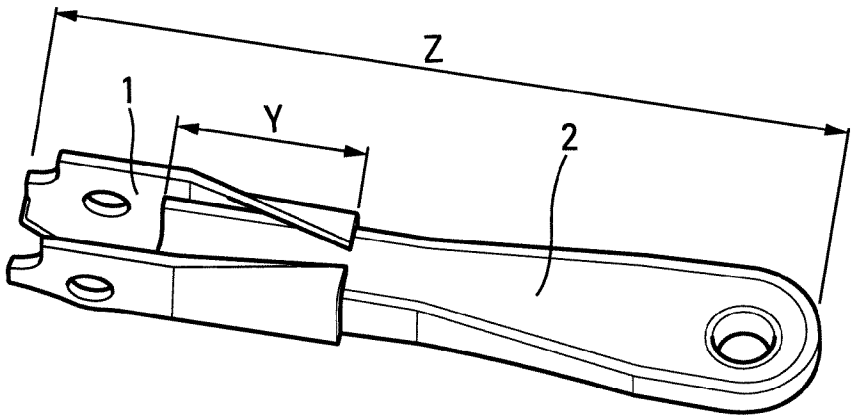

Fig. 7A

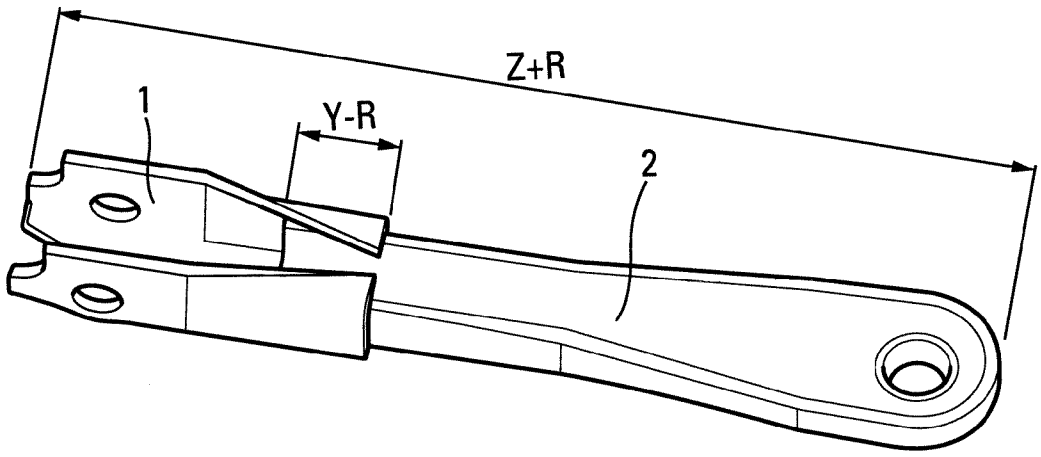

Fig. 7B

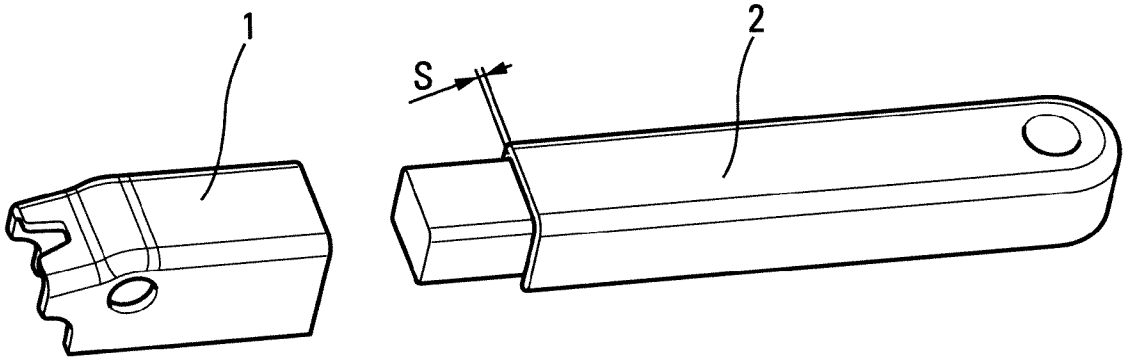

Fig. 8A

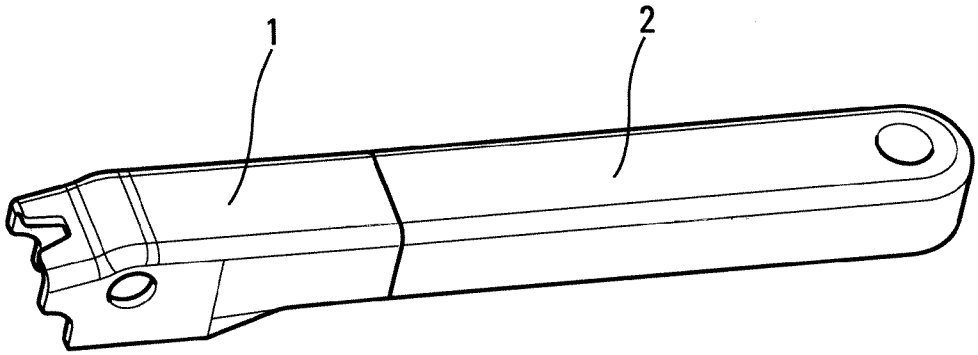

Fig. 8B

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2013/070982

A. CLASSIFICATION OF SUBJECT MATTER
INV. B60S1/34
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	EP 0 670 252 A1 (VALEO SYSTEMES ESSUYAGE [FR]) 6 September 1995 (1995-09-06) the whole document	1-16
X	DE 41 40 959 A1 (SWF AUTO ELECTRIC GMBH [DE]) 19 November 1992 (1992-11-19) the whole document	1-16
X	US 5 894 628 A (EGNER-WALTER BRUNO [DE] ET AL) 20 April 1999 (1999-04-20) column 22, lines 26-49; figure 28	1-8, 11-16
X	DE 197 30 579 A1 (BOSCH GMBH ROBERT [DE]) 21 January 1999 (1999-01-21) the whole document	1,4-10, 13-16
X	EP 1 520 759 A1 (BOSCH GMBH ROBERT [DE]) 6 April 2005 (2005-04-06) column 5, paragraph 22; figure 11	1,4-16

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

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2013/070982

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0670252 A1	06-09-1995	DE 69502221 D1	04-06-1998
		DE 69502221 T2	13-08-1998
		EP 0670252 A1	06-09-1995
		FR 2716852 A1	08-09-1995
DE 4140959 A1	19-11-1992	NONE	
US 5894628 A	20-04-1999	DE 4408732 A1	21-09-1995
		EP 0750554 A1	02-01-1997
		ES 2136279 T3	16-11-1999
		JP 3689110 B2	31-08-2005
		JP H09510161 A	14-10-1997
		US 5894628 A	20-04-1999
		WO 9525025 A1	21-09-1995
DE 19730579 A1	21-01-1999	DE 19730579 A1	21-01-1999
		EP 0928264 A1	14-07-1999
		JP 2001501892 A	13-02-2001
		US 6467985 B1	22-10-2002
		WO 9903713 A1	28-01-1999
EP 1520759 A1	06-04-2005	DE 10345804 A1	21-04-2005
		EP 1520759 A1	06-04-2005