

(51) International Patent Classification:
A01G 3/02 (2006.01)(21) International Application Number:
PCT/EP2015/057758(22) International Filing Date:
9 April 2015 (09.04.2015)

(25) Filing Language: English

(26) Publication Language: English

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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, 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.

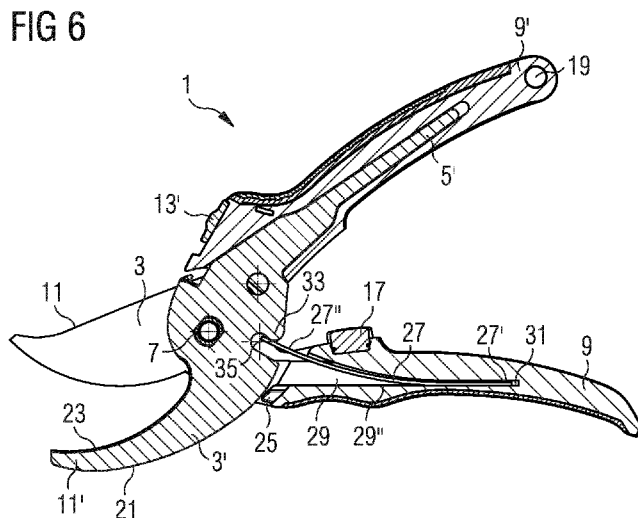
(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, 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: SHEARS COMPRISING A FIRST AND A SECOND SHEAR PART

FIG 6



(57) **Abstract:** The invention relates to shears, in particular pruning shears or secateurs (1), comprising a first shear part (3) and a second shear part (3'). Each of the first and second shear parts (3, 3') have a cutting blade (11, 11') and a shaft or lever arm (5, 5') which are arranged at opposite sides of a pivot (7) which rotatably connects the first and second shear parts (3, 3') with each other. The shears further comprise a laminated or flat spring element (27) acting upon the first and second shear parts (3, 3') to move the shears on to an open position. The laminated or flat spring element (27) comprises a first portion (27') fixedly arranged at or allocated to the first shear part (3) and a flexibly arranged second portion (27'') acting on the second shear part (3'). In order to propose a shears with a long lifetime of a laminated or flat spring element used in the shears, the second portion (27''), preferably the first and the second portions (27', 27''), of the laminated or flat spring element (27) delineates a curve, the first derivative of the curve being continuous along the entire length of the curve.

SHEARS COMPRISING A FIRST AND A SECOND SHEAR PART

The invention relates to the field of shears, in particular pruning shears or secateurs.

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For cutting purposes, shears usually comprise a first shear part and a second shear part, both shear parts having a cutting blade and a shaft or lever arm which are arranged at opposite sides of a pivot. The pivot connects both first and shear parts with each other in rotatable manner.

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Specific shears like pruning shears or secateurs comprise a spring element for providing an opening force to the first and second shear parts in order to bring the shears in an open position for a start of a following cutting movement. From DE 34 26 577 A1 a type of secateurs is known, having a flat spring element which acts upon the first and second shear parts to move the secateurs on to an open position. The flat spring element is fixedly arranged with a first end portion thereof at the first shear part by clamping it between an arrangement of two pins which are positioned laterally offset to one another and an inner surface of a handle. The second end portion of the flat spring is flexible and acts on the second shear part applying a spring force for opening the secateurs.

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The flat spring element of the secateurs described in DE 34 26 577 A1 comprises several kinks for mounting purposes what causes stress peaks for the flat spring element during its bending movement which stress peaks reduce the lifetime of the flat spring element.

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It is therefore an object of the present invention to propose a shears with a long lifetime of a laminated or flat spring element used in the shears.

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The drawback of the solution known from the prior art is overcome with shears, in particular with pruning shears or secateurs, according to the technical features of claim 1.

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The shears according to the present invention are provided with a first shear part and a second shear part. Both the first and second shear parts comprise a

cutting blade and a shaft or lever arm which are arranged at opposite sides of a pivot. The pivot rotatably connects the first and second shear parts with each other, allowing the shears to be moved from an open to a closed position and back to the open position. The shears further comprise a laminated or flat
5 spring element which acts upon the first and second shear parts to move the shears on to their open position so that the operator of the shears only has to perform the closing and therewith cutting operation. The laminated or flat spring element comprises a first portion fixedly arranged at or allocated to the first shear part and a flexibly arranged second portion acting on the second
10 shear part. In order to provide a shears with a long lifetime of a laminated or flat spring element used in or for the shears, the second portion, preferably the first and the second portions, of the laminated or flat spring element, in particular the entire laminated or flat spring element, delineates a curve, with the first derivative of the curve being continuous along the entire length of the
15 curve, i. e., the curve and/or the laminated or flat spring element does not comprise any kind of kink, in particular the laminated or flat spring element has at least at its second portion a smooth development or gradient. Thus, the laminated or flat spring element can release continuously without stress peaks and a long lifetime of the laminated or flat spring element is provided.

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The second portion, preferably the first and second portions, may be bent in relation to an at least approximately hyperbolic curve along its entire length. In case the bending stiffness of the laminated or flat spring element is at least approximately constant along the entire length of the second portion, or of the
25 first and the second portions, an at least approximately homogeneous flexural behavior is on hand for the laminated or flat spring element.

Preferably, the second portion, or even more the first and second portions or the entire laminated or flat spring element, delineates along a hyperbolic
30 curve, analog to an arc of a circle related to a segment of a circle with a central angle of at most 45° , the central angle in particular being within a range of 10° to 20° . Such a value for the central angle corresponds to a radius reaching a high value.

35 One specific embodiment is characterized by a laminated or flat spring element with a fixedly arranged and rectilinear first portion which is turning into a flex-

ibly arranged bent or curved second portion. The transition from first to second portion may follow a tangential gradient, thus also providing a smooth intersection for the avoidance of stress peaks. Said transition is preferably located at the border between first and second portions.

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Another specific embodiment is characterized by a laminated or flat spring element which is bent along its entire length and the first portion is straightened when being mounted in a rectilinear channel or groove which is arranged either in or at the shaft or lever arm or in or at a handle which is connectable with or allocated to the shaft or lever arm of the first shear part.

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The laminated or flat spring element may be firmly fixed by encasing its first portion in the channel or groove. Firm fixation is realized by a channel or groove having dimensions corresponding to the outer dimensions of the first portion, so that frictional forces keep the laminated or flat spring element in place. In addition, as the first portion of the laminated or flat spring element continuously tends to return into its bent position, a respective spring force is working on the channel or groove, thereby clamping the first portion against the channel or groove surface, what improves the fixation of the laminated or flat spring element with its first portion within the channel or groove.

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Preferably, the second portion of the laminated or flat spring element extends into a space or clearance which is arranged at the handle, providing a space for the movement of the laminated or flat spring element. In particular, the space or clearance is arranged adjacent to the channel or groove. In order to further support avoidance of stress peaks on the laminated or flat spring element, the channel or groove widens at its mouth towards the space or clearance so that no sharp edge can affect the laminated or flat spring element during its bending movement.

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In a preferred embodiment the space or clearance is adjusted to the bending range area that the second portion engages during the movement of the first and second shear parts from the closed to the open position of the shears. In particular, the longitudinal section of the bending range area is at least approximately triangular. However, in order to adapt to the different shapes the laminated or flat spring element takes during its bending movement, the side

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of such space or clearance which the laminated or flat spring element touches or approaches, when the shears is in or moves towards its open position, may be curved, preferably with the same radius the second portion of the laminated or flat spring takes in the open position of the shears.

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On the other hand, the side of the space or clearance which the laminated or flat spring element touches or approaches, when the shears is in or moves towards its closed position, may support the laminated or flat spring element during closure of the shears. Such support may be effected by the laminated
10 or flat spring element unreeling on said side of the space or clearance during the closure of the shears, thus causing the laminated or flat spring element leaning against said side gradually up to its entire length. In particular, said side of the space or clearance is curved similar to the laminated or flat spring element in that position of the shears. More specifically, both the side and the
15 laminated or flat spring element are then rectilinear.

The invention will be described more fully in detail hereinafter with reference to the accompanying drawings, in which

- Fig. 1 is a side view of a secateurs in a closed condition;
- Fig. 2 the secateurs of Fig. 1 in a view from above;
- 5 Fig. 3 the secateurs of Fig. 1 in a sectional view along the line A - A according to Fig. 2;
- Fig. 4 the secateurs of Fig. 1 in a front perspective view with a flat spring in an exploded view;
- 10 Fig. 5 the secateurs of Fig. 1 in a rear perspective view with removed handles; and
- Fig. 6 the secateurs of Fig. 1 in the sectional view of Fig. 3, but in an open position.
- 15

Secateurs 1 as shown in particular in Fig. 1 are composed of a first and a second shear part 3, 3' which are made of metal and are connected to each other by means of a pivot 7 being e. g. a screw and a respective screw nut or the like. Each of the first and second shear parts 3, 3' comprise a lever arm 5, 5', each thereof being assembled with a handle 9, 9' made of plastics or rubber for grasping and operating the secateurs 1, and a cutting blade 11, 11', both lever arms 5, 5' and cutting blades 11, 11' are arranged on opposite sides related to the pivot 7.

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In order to safely retain or convey the secateurs 1, they may be set in an idle or closed position as illustrated with Figs. 1 to 5. In order to secure the idle or closed position, an interlocking element 13 is arranged at the handle 9' of the second shear part 3' which is movable in a longitudinal direction of the handle 9'. The interlocking element 13 is composed of a manipulator for shifting 13' and a latch 13'', the latter one interacting with a notch 15 arranged at the lever arm 5 of the first shear part 3 when the secateurs 1 are in the idle or closed position. Moving the interlocking element 13 in the opposite longitudinal direction with removing the latch 13'' from the notch 15 causes the secateurs 1 to pass on to their open or operational position as illustrated with Fig. 6. As being best illustrated with Fig. 3, when the secateurs 1 are closed again

and a cutting operation is executed, a first stopper element 17 pressed into a pocket in the lower handle 9 of the first shear part 3 is provided, with the handle 9' of the second shear part 3' striking against the top side of the stopper element 17 thereby defining the stop of the cutting operation. At an end portion of handle 9' of the second shear part 3' an eyelet 19 is provided for allowing a hanging and storing of the secateurs 1, e.g. at a wall hook.

A cutting operation with the secateurs 1 is usually started when the secateurs 1 are in an open position, in particular in a fully open position as illustrated with Fig. 6, by pivoting the first and second shear parts 3, 3' which are connected by the pivot 7. The operator performs a closing movement via the handles 9, 9' onto the cutting blades 11, 11' using the leverage effect for operating a high cutting force. The fully open position is defined by a bottom side 21 of the cutting blade 11' of the second shear part 3' striking against a second stopper element being a protrusion 25 arranged at the handle 9 of the first shear part 3. Said bottom side 21 faces the cutting edge 23 of the cutting blade 11' of the second shear part 3'.

The open position for starting the cutting operation is reached by means of an opening force generated by a spring element which may be a flat spring element 27, as illustrated with Figs. 3 to 6. The flat spring element 27 is arranged at the handle 9 of the first shear part 3 and fixed in radial and/or lateral directions at a first portion 27' of the flat spring element 27 by a respective groove 31 provided at an inner surface of the handle 9. A second portion 27'' of the flat spring element 27, adjacent to the first end portion 27', is in a flexible arrangement in order to perform the spring force onto the second shear part 3', thereby passing through a spring excursion which is defined by the range between the open and the closed position. In order the flat spring element 27 to perform the excursion, a respective space or clearance 29 is provided at handle 9.

Fig. 6 illustrates the flat spring element 27 in its nearly unstressed state which is obtained in the fully open position of the secateurs 1. In this respect, although the flat spring element 27 is shown with a rectilinear illustration, the exploded view of Fig. 4 reflects the flat spring element 27 in its stressed state, which in particular is taken when secateurs 1 are in their closed position as

show with Fig. 3. In the unstressed position, the flat spring element 27 adopts a bent shape analog to a segment of a circle with a big radius (see Fig. 6). As can be understood from Fig. 6, the first portion 27' of the flat spring element 27 which is arranged in the groove 31 is shown with a rectilinear arrangement in order to fit into the rectilinear groove 31, however, when disassembled from the groove 31 the first portion 27' of the flat spring element 27 follows the radius of curvature of the second portion 27''. When mounted in the groove 31, the straightened first portion 27' thus performs a clamping force onto the groove limitations or walls, thereby supporting a fixing and keeping in position of the flat spring element 27.

The flat spring element 27 is fixed in radial and/or lateral directions by means of the groove 31 and, at the open groove side, by means of the lateral surface of the lever arm 5. The arrangement of groove 31 and lever arm 5 establishes a space for the first portion 27' of the flat spring element 27 without any clearance in order to secure firm positioning with preventing twisting or movement of the flat spring element 27 in radial and/or lateral directions.

The flat spring element 27 is also secured against movement in a first axial direction towards the pivot 7. To this end, an end section of the flat spring element 27 being also an end section of its first portion 27' is bent over a rounded corner, thereby constituting a hook 37 angled under a right angle. The hook 37 abuts a tail of lever arm 5 preventing a movement in the first axial direction.

Finally, the flat spring element 27 is also secured in a second axial direction away from pivot 7 which movement is limited by an end wall of the groove 31 positioned in close proximity to the tail of the lever arm 5, just keeping a space for reception of the hook 37.

The flat spring element 27 is arranged at the secateurs 1 in removable and exchangeable way, so that the operator can substitute it when it is broken. The assembling of the flat spring element 27 is executed as indicated with Figs. 4 to 6. Initially, flat spring element 27 is separated from the secateurs 1 as illustrated with Fig. 4, however, as already described, Fig. 4 shows the flat spring element 27 in straightened state. As indicated with Fig. 5, the flat spring ele-

ment 27 is then attached to the lever arm 5 of the first shear part 3, with at least its first end portion 27' being oriented parallel to the axis of lever arm 5. After such arrangement, handle 9 is slid on the joining of lever arm 5 and flat spring element 27 ahead with its open end which is positioned ahead the space or clearance 29, i. e. handle 9 is moved from the end portion of lever arm 5 alongside the lever arm 5 until the handle 9 reaches its final position. The hook 37 encompassing the tail of lever arm 5 guarantees that flat spring element 27 is kept in place and not moved with the handle 9 while the latter one is slid on lever arm 5. With such assembly, the flat spring element 27 is also firmly fixed since the flat spring element 27 is guided into the groove 31 at handle 9'.

The lever arm 5' of the second shear part 3' is shaped by providing a fulcrum 33 which is located in close distance to the pivot 7. The second end portion 27'' of the flat spring element 27 is pressing against fulcrum 33 so as to perform the spring force onto the second shear part 3' for opening the secateurs 1. Fulcrum 33 is designed by a rounded contact surface for smoothly contacting the second end portion 27'' of the flat spring element 27. While the secateurs 1 merely open under an angle of about 40°, the surface of the fulcrum 33 directed to the flat spring element 27 is shaped by a turn of about 65° passing over into a recess establishing a pocket 35 into which the second end portion 27'' of the flat spring element 27 extends when the secateurs 1 are in their open position (see Fig. 6).

The pocket 35 is filled with a lubricant (not shown) in particular with grease. The construction of the secateurs 1 and their pocket 35 is designed such that the operator of the secateurs 1 is enabled to refill the pocket 35 with lubricant. During the opening movement of the secateurs 1 from their closed position (see Fig. 3) to the open position (see Fig. 6) the end portion of flat spring element 27 arranged opposite to the the end section forming the hook 37 is dunking into the lubricant thereby lubricating the flat spring element 27 at its contacting surface with fulcrum 33. The lubricant may directly flow to the contacting area or it may be driven from the pocket 35 to the contacting area by low interfacial surface tension between lubricant and the surface of the flat spring element 27.

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List of reference numerals

1	secateurs
3, 3'	first and second shear parts
5, 5'	lever arms
7	pivot
9, 9'	handles
11, 11'	cutting blades
13	interlocking element
13'	manipulator
13''	latch
15	notch
17	hexagon head screw
19	eyelet
21	bottom side
23	cutting edge
25	protrusion
27	flat spring element
27', 27''	first and second portions of flat spring element
29	clearance
29', 29''	clearance sides
31	groove
33	fulcrum
35	pocket
37	hook

Claims

1. Shears, in particular pruning shears or secateurs (1), comprising a first shear part (3) and a second shear part (3'), each of the first and second shear parts (3, 3') having a cutting blade (11, 11') and a shaft or lever arm (5, 5') which are arranged at opposite sides of a pivot (7),
5 the pivot (7) rotatably connecting the first and second shear parts (3, 3') with each other, the shears further comprising a laminated or flat spring element (27) acting upon the first and second shear parts (3, 3') to move the shears on to an open position, the laminated or flat spring element (27) comprising a first portion (27') fixedly arranged at or allocated to the first shear part (3) and a flexibly arranged second portion
10 (27'') acting on the second shear part (3'), wherein the second portion (27''), preferably the first and the second portions (27', 27''), delineates a curve, the first derivative of the curve being continuous at any point or position of the entire length of the curve.
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2. Shears according to claim 1, wherein the second portion (27''), preferably the first and the second portions (27', 27''), is bent related to an at least approximately constant radius along its entire length, the radius preferably reaching a high value.
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3. Shears according to claim 1 or 2, wherein the bending stiffness of the laminated or flat spring (27) is at least approximately constant along the entire length of the second portion (27'').
- 25 4. Shears according to claim 2 or 3, wherein the second portion (27''), preferably the entire laminated or flat spring element (27), delineates along a hyperbolic curve, analog to an arc of a circle related to a segment of a circle with a central angle of at most 45°, the central angle preferably being in a range of 10° to 30°.
- 30 5. Shears according to any of claims 1 to 4, wherein the fixedly arranged first portion (27') is rectilinear and turns into a bent flexible second portion (27''), in particular following a tangential gradient, wherein preferably the transition is located at the border between first portion (27') and second portion (27'').

6. Shears according to any of the claims 1 to 4, wherein the laminated or flat spring (27) is bent along its entire length and the first portion (27') is straightened when being mounted in a rectilinear channel or groove (31) arranged in or at the shaft or lever arm or arranged in or at a handle (9) which handle (9) is connectable with or allocated to the shaft or lever arm (5) of the first shear part (3).
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7. Shears according to any of claims 1 to 6, wherein the first portion (27') is fixed by encasing in a channel or groove (31) arranged in or at the shaft or lever arm or arranged in or at a handle (9) which is connectable with or allocated to the shaft or lever arm (5) of the first shear part (3).
10
8. Shears according to claim 8, wherein the second portion (27'') extends into a space or clearance (29) which is arranged at the handle (9), the space or clearance (29) in particular being arranged adjacent to the channel or groove (31).
15
9. Shears according to claim 8, wherein the space or clearance (29) is adjusted to the bending range area the second portion (27'') engages during the movement of the first and second shear parts (3, 3') from the closed to the open position of the shears.
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10. Shears according to claim 9, wherein the longitudinal section of the space or clearance (29) is at least approximately triangular.
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11. Shears according to claim 10, wherein the side (29') of the triangular space or clearance (29), which side (29') the laminated or flat spring element (27) touches or approaches, when the shears is in or moves towards its open position, is curved, preferably with the same radius or curve structure the laminated or flat spring (27) takes in the open position of the shears.
12. Shears according to claim 10 or 11, wherein the side (29'') of the space or clearance (29), which side (29'') the laminated or flat spring element (27) touches or approaches, when the shears is in or moves towards its closed position, supports the laminated or flat spring element (27) during closure of the shears.
13. Shears according to claim 12, wherein the laminated or flat spring element (27) unreels on the side (29'') of the space or clearance (29), which side (29'') the laminated or flat spring element (27) touches or approaches, when the shears is in or moves towards its closed position.
14. Shears according to claim 12 or 13, wherein the side (29'') of the space or clearance (29), which side (29'') the laminated or flat spring element (27) touches or approaches, when the shears is in or moves towards its closed position, is curved like the laminated or flat spring element (27) in that position of the shears, in particular both being at least approximately rectilinear.

FIG 1

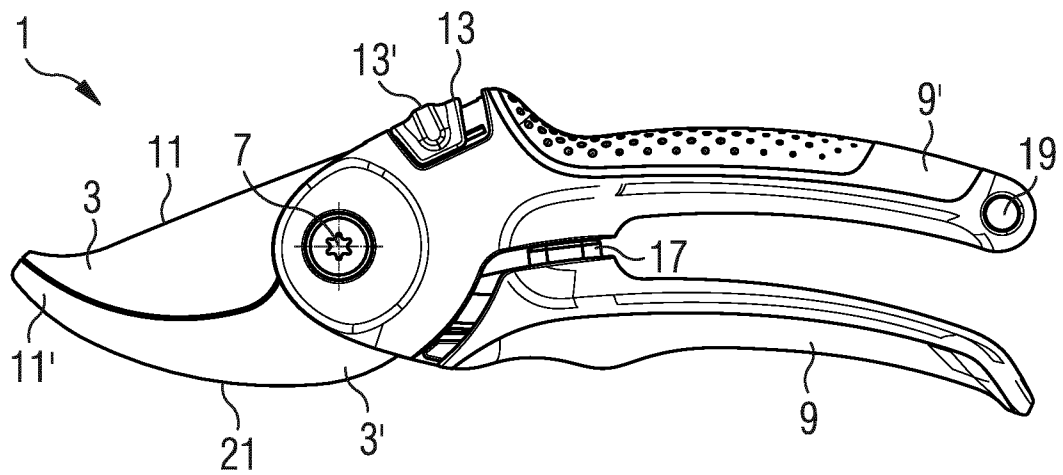


FIG 2

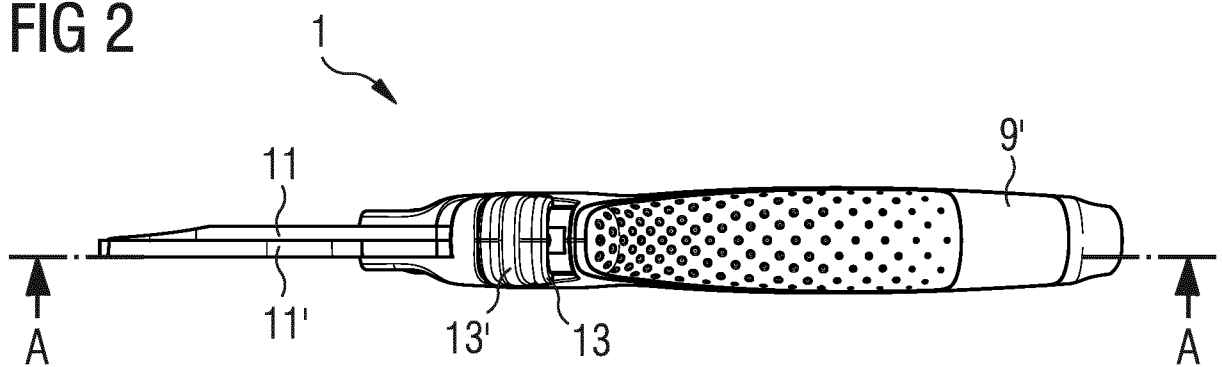


FIG 3

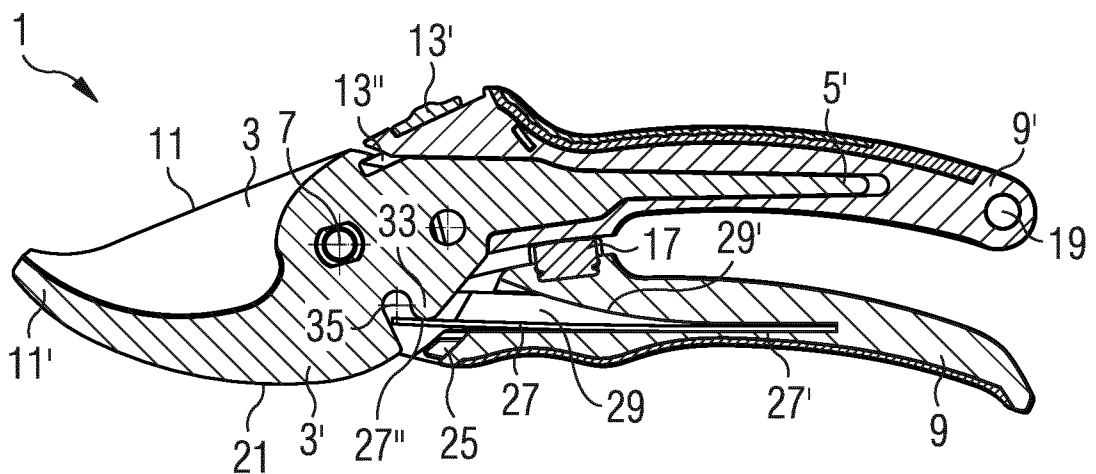


FIG 4

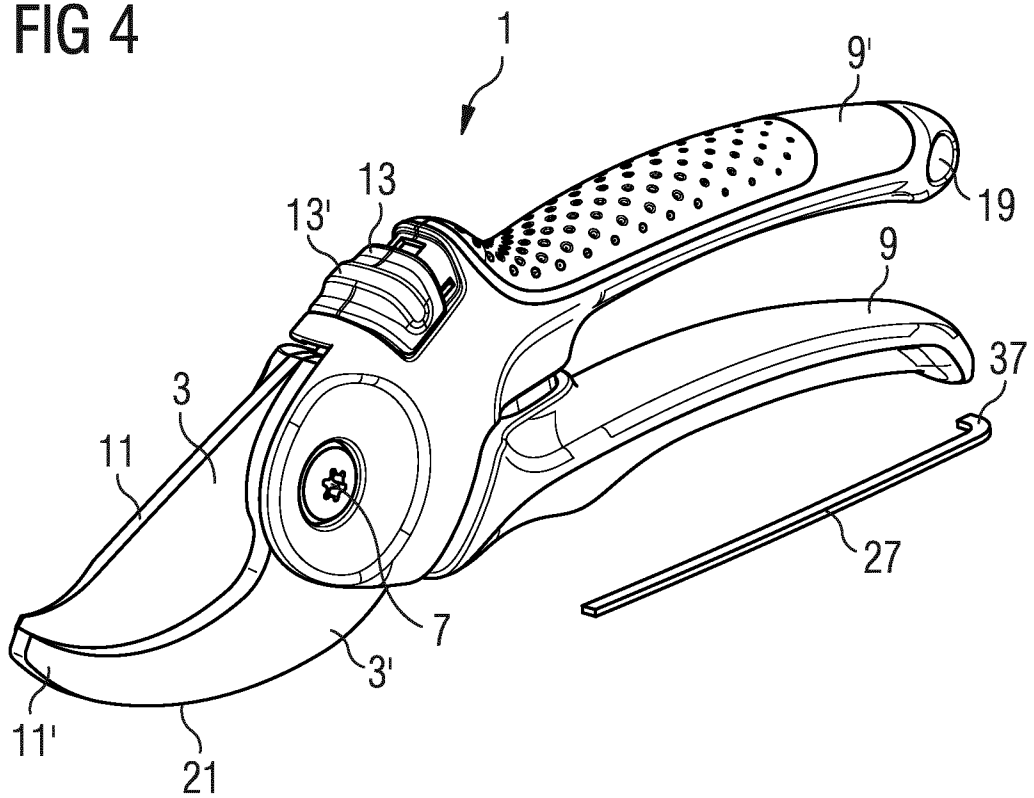


FIG 5

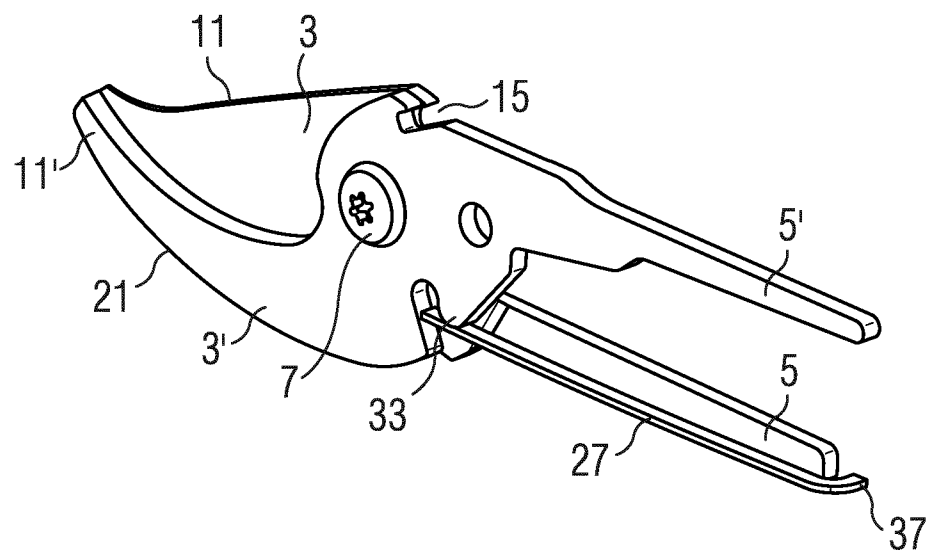
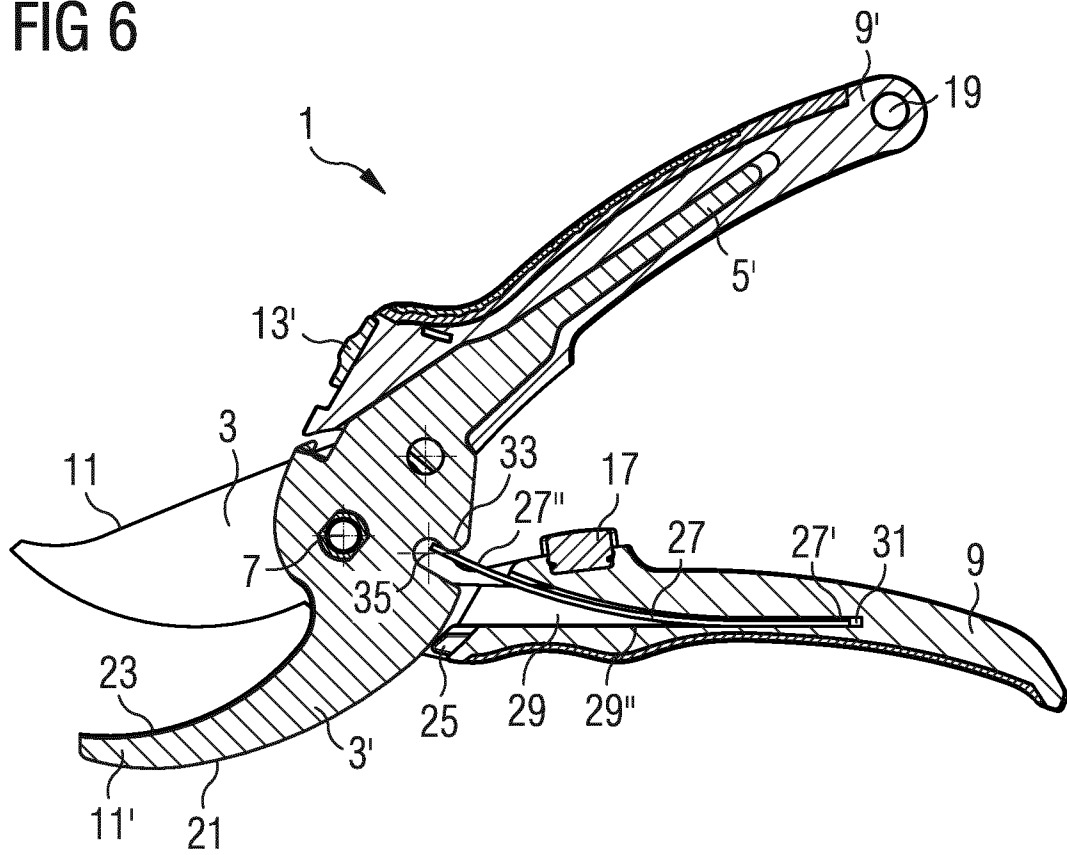


FIG 6



INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2015/057758

A. CLASSIFICATION OF SUBJECT MATTER
 INV. A01G3/02
 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)

A01G B25B B27B B26B

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 367 774 A (LABARRE ERNEST D [US] ET AL) 29 November 1994 (1994-11-29) column 3, line 42 - line 53; figures -----	1-14
X	GB 590 646 A (ALLAN ROBERT BLACKWOOD; RAWLPLUG CO LTD) 24 July 1947 (1947-07-24) page 3, line 38 - line 47; figures 1,2 -----	1-14
X	GB 366 865 A (WILLIE SAYNOR) 11 February 1932 (1932-02-11) page 2, line 67 - line 71; figure 1 -----	1-5
X	DE 28 01 254 C2 (WALLACE MFG) 5 June 1985 (1985-06-05) column 3, line 49 - line 58; figures -----	1-3,5
A	----- -/--	4,6,7



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search

9 December 2015

Date of mailing of the international search report

17/12/2015

Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2015/057758

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 34 26 577 A1 (GARDENA KRESS & KASTNER GMBH [DE]) 28 March 1985 (1985-03-28) cited in the application page 14, paragraph 2; figures -----	1-14

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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