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# (54) CALIBRATION UNIT FOR BOTTLE CORK MUSELETS

(57) The present invention refers to the field of the manufacture of systems of corking bottles, and in particular it relates to apparatuses for making muselets for equipping bottles of *spumante,* champagne, beer and sparkling wine in general. Even more specifically, the invention concerns a unit that, in one of the aforementioned apparatuses or downstream of it, is intended for calibrating muselets, i.e. for precisely refining the final configuration thereof according to a predetermined standard, so as to reach the required coherence to best use the muselets in the successive automatic bottling lines.

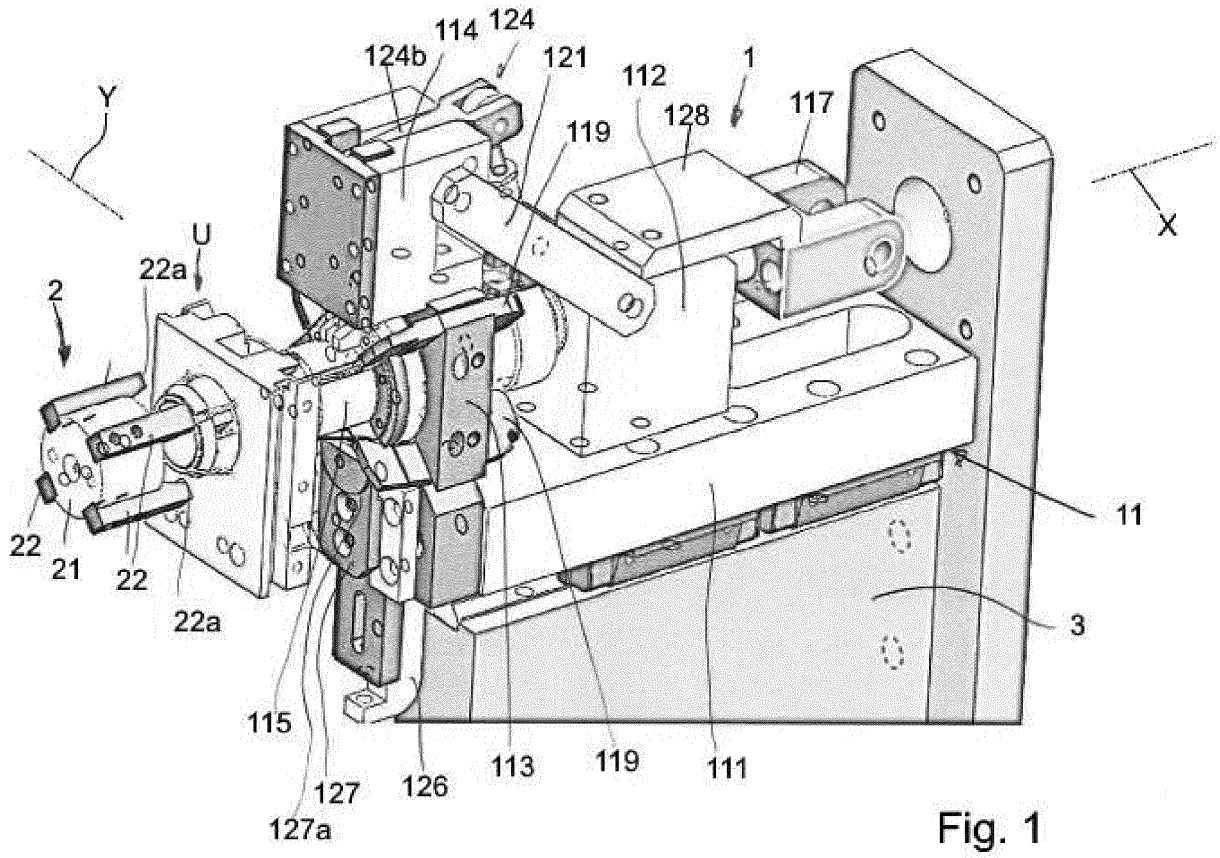


Fig. 1

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## Description

**[0001]** The present invention refers to the field of the manufacture of systems of corking bottles, and in particular it relates to apparatuses for making muselets for equipping bottles of *spumante,* champagne, beer and sparkling wine in general. Even more specifically, the invention concerns a unit that, in one of the aforementioned apparatuses or downstream of it, is intended for calibrating muselets, i.e. for precisely refining the final configuration thereof according to a predetermined standard, so as to reach the required coherence to best use the muselets in the successive automatic bottling lines.

**[0002]** Bottle cork muselets, generally consist of a body and a lower belt each formed from a respective piece of metal wire. The body comprises a top ring member, intended for making direct contact with the upper surface of the bottle cork or that defines a housing seat for a cap made of thin metal plate, intended for coupling with the said surface of the cork. The body also comprises a plurality of legs, normally four, which extend from the ring-shaped element, in equally angularly spaced apart position, slightly diverging and provided with respective end eyelets.

**[0003]** The belt in turn has an annular extension and is mounted during processing by insertion through the eyelets of the legs. It is used to allow the muselet to be clamped around the neck of the bottle during use.

**[0004]** Muselets are made in automatic machines comprising a plurality of work stations through which the semi-worked products are fed in steps. In particular, a first work station makes the body; the bodies are then fed to a conveyor, generally of the rotary table type, which transports the bodies through the following stations for the subsequent processing, i.e. the shaping of the eyelets, the insertion of the belt, of the cap, and calibration.

**[0005]** Precisely with particular reference to this last step, this is a very important operation and more precisely consists of folding the metal wire at some points that are considered strategic (eyelets, legs, belt), in order to ensure the maximum conformity of the shape to the required standard, with the consequent possibility of correct stacking of the muselets and subsequent improved usability in automatic bottling lines.

**[0006]** The prior art provides for a certain number of solutions for carrying out the calibration. None of them is, however, fully satisfactory, in particular with respect to two essential requisites: ensuring the quality of the muselet, which must be free from abrasions, scratches and similar small damage, which however occur according to some known systems through rubbing stresses or impacts to which the metal wire is subjected; simplicity of the process and of the relative mechanical unit, which however in the prior art is rather complex, dispersive, with high consumption and expensive maintenance, and in any case capable of ensuring the required result only through two or more process stages, and relative work units.

**[0007]** The object of the present invention is therefore to provide a calibration unit of bottle cork muselets which allows an accurate calibration of the muselets, fully protecting the integrity of the surface finish, and therefore with lower and/or less critical stresses with respect to known systems.

**[0008]** A further, no less significant, object of the present invention, is to provide a unit of the aforementioned type which makes it possible to carry out the calibration with a single work step, through one single-stage device that is structurally basic, productively cost-effective, simple to install and maintain and has low energy consumption.

**[0009]** These and other accessory objects are achieved with the calibration unit of bottle cork muselets according to the invention, the essential characteristics of which are defined by the first of the attached claims.

**[0010]** The characteristics and advantages of the calibration unit of bottle cork muselets according to the invention will become clearer from the following description of an embodiment thereof, given as an example and without limiting purposes, with reference to the attached drawings, in which:

- figure 1 is an axonometric view of a unit according to the invention;
- figure 2 is a top plan view of the unit of figure 1;
- figure 3 is an axonometric view of the unit, exploded and with parts omitted;
- figures 4a, 4b show the unit respectively in a first section according to a central plane of symmetry of the unit, and in a second section made according to a plane inclined by 45° with respect to the plane of symmetry and passing through a longitudinal axis of the unit (the second section being limited to a part - enlarged - of the unit), the figures referring to a configuration of the unit in a starting step (or zero step) of the calibration procedure;
- figures 5a to 9b show, in pairs of figures (5a and 5b, 6a and 6b, etc.) that are analogous to the previous figures 4a, 4b (with partial and enlarged representations in figures 8a and 9a), respective successive steps according to which the configuration of the unit evolves during the course of the calibration procedure, the step according to the pair of figures 7a and 7b also being shown by figure 7c which is an axonometric partial view from the front side of the main part of the unit.

**[0011]** With reference to the above figures, the unit according to the invention extends according to a longitudinal extension axis X that crosses a feed path Y of the muselets G previously formed (but not yet calibrated). The latter are supported singularly, each centred with its own axis X' on the axis X, by its own housing unit U of the known type, not described in detail and preferably made in accordance with the teachings of Italian patent no. 102014902223842 to the present applicant, to be

considered incorporated herein for reference. Again according to a typical (but not limiting) solution, the feeding path Y can be circular, with the units U mounted on the periphery of a carousel, so that the longitudinal extension axis X of the unit is in a radial direction with reference to the trajectory Y (and to the carousel). The plane XY is typically horizontal, and the unit (or at least the main part thereof, as will be seen shortly), rises vertically.

**[0012]** The trajectory Y separates two parts 1, 2 of the unit according to the invention, both supported in a mobile manner so as to slide in a reciprocating fashion, towards and away from one another, along the axis X according to which such parts are aligned. A main part 1 is the calibration device itself, and in the case of the carousel-type configuration it is preferably on the outer side, whereas a cup-shaped anvil 2 is arranged in the region circumscribed by the trajectory Y.

**[0013]** The cup-shaped anvil comprises a cylindrical element 21 coaxial to the axis X and with a surface 21a facing towards the unit U having a concave shape and from the periphery of which the ends 22a of respective fins 22 project axially, spaced apart in the circumferential direction in accordance with the spacing of the legs of the muselets, i.e. in practice at points angularly spaced by 90° and so that two diametrically opposite fins are on a plane inclined by 45° with respect to the plane XY.

**[0014]** Indeed, while the surface 21a is adapted to offer an abutment to a top ring member Ga of the muselet G, possibly equipped with a cap C, the ends 22a function as a stop to the upper portion of legs Gm of the muselet, and to this purpose they offer faces angled in accordance with the angle of the legs. The aforementioned reciprocating movement of the anvil 2 is carried out by an automatic actuation system of obvious configuration for those skilled in the art, not shown or described here, and is adapted to take the anvil to a work position in which the ends 22a of the fins come into abutment on the unit U.

**[0015]** The muselet is clearly completed, according to what is known, by a belt Gc at the axial end (taking as a reference the elongation direction of its own axis X') opposite to the top ring member Ga and joined to it through the legs Gm, which engage with the same belt through eyelets Gb. The belt and the lower part of the legs with the relative eyelets is in particular the part that undergoes a firm hold by the unit U, which on the other hand allows the top ring member and the remaining part of the legs of the muselet to project outside towards the anvil 2.

**[0016]** With reference now to the actual calibration device 1, it provides a carriage 11 comprising a base 111 from which the following components rise up, mentioned orderly following the X axis starting from the end most distant from the unit U (definable as rear end): a first guide 112, a support 113, in turn topped by an integral second guide 114, and a puncheon 115. All of these components are therefore integral with each other and adapted to reciprocate, in a coordinated manner with the anvil 2, through a sliding mounting of the base 111 on an outer frame 3 that can be (and normally is) part of the overall framework of an apparatus also comprising previous muselet-forming stations. The movement takes place from a rest position towards a work position that will be discussed again shortly.

**[0017]** The first guide 112 movably supports a rod 116 in turn coaxial with the axis X and provided with a further relative reciprocating movement with respect to that of the base 111 (i.e. of the entire carriage 11). The movement of the rod takes place from a rearwards displaced position to an advanced position (advancement or work stroke), with the opposite stroke (return stroke) that can advantageously be assisted by elastic means, not represented, arranged to also counteract the advancement stroke (again relative to the carriage), being compressed between the first guide 112 and a rear end bracket 117 on which the connection with powering means is made. The powering means are also not represented and they typically take the form of a pneumatic cylinder.

**[0018]** With it being understood that the actuation of the carriage can also be carried out by an independent system, according to an advantageous solution the powering means operating on the rod 116 through the bracket 117 are also exploited to drive the absolute reciprocating movement of the carriage 11: accordingly - in the advancement stroke - the relative movement of the rod is effected in a final step, after the puncheon 115, in the aforementioned work position, has gone into abutment on the assembly of units U and cup-shaped anvil 2, and therefore at a point in which the resistance of the aforementioned suitably calibrated elastic means can be overcome. A block 128 extends rearwards from the first guide 112 above the bracket 117 and acts as stop element for the latter against undesired deviations towards the other, further improving the guiding precision.

**[0019]** In general, it is clear that the drive/actuation systems, as well as the control systems, can change and be integrated with those of the aforementioned apparatus, typically with reference to pneumatic and electronic systems that are *per se* common in the field or able to be developed in an obvious manner by those skilled in the art, therefore not represented or described in detail.

**[0020]** The rod 116 is provided at the front end, adjacent to the support 113, with an enlarged head 118, that will be further described shortly. The support 113 essentially consists in the preferred example of a frame that delimits a central passage 113a for the insertion of the aforementioned head 118 and rotatably supporting four external levers 119, configured as first class levers, arranged in two pairs of opposite levers on two planes inclined by 45° with respect to the plane XY and rotating on such planes, so as to be adapted to interfere externally with the legs of the muselet. Each external lever 119 has a cam-shaped rear actuation end 119a, adapted to make abutting contact with the head 118 and to project from the rear side of the support 113, and a front end 119b shaped as a folding blade, arranged instead at the front of the support, with an inclined edge adapted to fold the respective leg of the muselet, in the region of the eyelet,

according to a desired inclination.

**[0021]** The puncheon 115, which is a bell-like element shaped so as to fit perfectly on its outside the muselet G, in the work position, and therefore matches, at least at some end portion, with respect to the cup-shaped anvil 2, projects frontally and integrally from the support 113. The puncheon 115 has an inner cavity 115a open on the rear side and in turn rotatably supports, in respective radial cuts, four internal levers 120 having an overall star-shaped configuration on the same planes as the external levers 119 to come into abutting contact, in this case internally, with the legs of the muselet.

**[0022]** The internal levers 120 are configured as second class levers, being pivoted at the front end (link between own front ends 120a and the front end of the puncheon). They are then adapted for acting as stop and reference to the leg of the muselet (see in particular figure 7b) with an intermediate outer edge portion 120b, substantially opposite the inclined edge of the blade-like front end 119b of the corresponding external lever and suitably shaped to this purpose (in particular in accordance with the desired optimal profile for the eyelet). Finally, a rear end 120c in turn shaped and provided for higher precision and safety with a slot-shaped constraint, faces towards the inside of the cavity 115a and represents the end on which the setting into rotation takes place, again by the head 118.

**[0023]** Both the movement of the external levers 119 and that of the internal levers 120 is brought about, in a passive return step from the work position, and therefore opposite to the active thrusting step by the head 118 starting from the rest position, by elastic means having obvious configuration and not shown.

**[0024]** The second guide 114 arranged above the support 113, and advantageously consolidated with the first guide 112 through bars 121, slidably supports an upper slide 122 sliding in a direction perpendicular to the plane XY. The upper slide is equipped with a lower end plug 123 with an arc-shaped profile 123a (see in particular figure 7c) so as to be adapted for exerting a stop on a corresponding portion of the belt of the muselet. The movement of the upper slide 122 is controlled by a lever mechanism 124 that converts a thrust exerted according to the axis X, again by the head 118, into a thrust in a direction perpendicular to the plane XY, indeed to pull down the slide.

**[0025]** In particular, a first arm 124a of the lever mechanism 124 is pivoted, at a base end thereof, to a tongue 125 integral with the head 118, and with its other end to a corresponding actuation end of a second arm 124b, adapted to rotate as a first class lever about a central hinge point with respect to the second guide 114. The other end of the second arm 124b, opposite with respect to the mentioned actuation end, is eventually connected, again rotatably, to the upper slide 122. The geometry of the lever mechanism is made, according to optimisation criteria that can be devised in an obvious way, so that only in a last part of the stroke of the rod 116 the first arm 124a rises close to the vertical, pushing the actuation end of the second arm 124b upwards and by reaction pushing the other end of the same second arm downwards, thus lowering the slide into the work position.

**[0026]** Finally, a lower slide 126 is slidably supported by the support 113, on the front face of the latter. This lower slide is mobile from a raised position, biased by elastic means that are not shown, towards a lowered position and provides for a block 127 forming a step 127a with arc-shaped profile, having a convexity facing downwards (again see figure 7c), for hooking the belt from the inside and for stretching it downwards to shape a lower bulging segment Gca of the belt, i.e. an area that projects towards the outside, to be twisted on itself in order to tighten the belt on the neck of the bottle. Also the downwards movement of the lower slide (work position) is carried out by the head 118, which thrusts a cam-shaped rear tooth 126a adapted to make contact with the head and also in this case convert a thrust according to the axis X into a thrust perpendicular to the plane XY.

**[0027]** Therefore, again considering the head 118, it has been clarified that this component is the true drive transmitting element, not only to the upper slide through the lever mechanism 124, but also to the various aforementioned mobile parts (internal and external levers, lower slide) by way of mechanical abutment, according to a determined sequence controlled by the degree of advancement of the rod 116 with respect to the base 111. In particular, the head 118 provides for two successive frusto-conical portions 118a and 118b, the first one 118a advanced closer to the tip and having a shorter average diameter and the second one 118b at the rear and having a greater average diameter. The first portion is adapted to drive the movement of the internal levers (pulling apart the rear ends) penetrating in the passage 113a of the support 113 and the inner cavity 115a of the puncheon 115, while the second portion is adapted to drive the external levers, again pulling apart the respective rear ends and radially closing the front ends, and then also the lower slide 126 by pushing on its tooth 126a.

**[0028]** The unit according to the invention therefore works according to the sequence described hereinafter.

**[0029]** A muselet G, housed and transported with or without cap in the unit U is positioned coaxially to the axis X of common alignment between the device 1 and the cup-shaped anvil 2, mutually spaced apart as a result of the rearward positioning of rod 116 and carriage 11, and of that of the anvil 2 moved away from the unit U. Such a step is shown in figures 1 and 2, as well as in figures 4a and 4b. All of the active calibration elements (levers, slides) are in a rest position.

**[0030]** In the subsequent step (figures 5a and 5b) the anvil advances to the work position and stops against the unit U, receiving the top part of the muselet G and ensuring that the alignment of the latter with respect to the calibration device 1 is perfect and stable during all subsequent operations, avoiding undesired deformations and movements through calibration pressures on

the legs.

**[0031]** Figures 6a and 6b show a subsequent step, according to which, by means of the drive exerted on the rod 116 through the bracket 117, the carriage 11 reached the work position (its own maximum advancement) so that the shaped puncheon 115 enters into the muselet and stops against the inner part thereof, perfectly fitting into it and indeed locking it, in cooperation with the anvil 2, again keeping a precise axial reference during the entire operation. In this step the external and internal levers are all still in the rest condition, i.e. the external levers 119 with the radially open front ends and the internal levers 120 with the rear ends mutually closed towards the centre.

**[0032]** At this point, as the rod 116 keeps being thrusted, the latter starts its relative advancement with respect to the carriage 11 ensuring that the head 118 thus progressively penetrates the central passage 113a of the support 113 and the cavity 115a of the puncheon 115 (figures 7a, 7b and then 8a, 8b). Firstly, the external levers 119, then the internal levers 120 rotate towards the respective work positions by means of the abutment of the surfaces 118b and 118a respectively on the rear ends 119a, first, of the external levers, and on the rear ends 120c, later, of the internal levers.

**[0033]** With such rotary movements the levers act with the desired folding action of the legs in the area of the eyelet, coming into contact with them in the radial direction and without substantial sliding on the legs themselves, which are duly held and precisely guided in the suitable configuration along the entire extension thereof. The eyelets Gb at the lower ends of the legs are in particular received and calibrated (figure 8b) each between the shaped outer edge portion 120b of an internal lever 120 and the inclined edge of the front end 119b of the external lever 119. The external levers in particular compress the legs at a determined point to give the desired final shape (fold) to make the muselets precisely and reliably stackable, and to perfectly shape the eyelets to ensure that the belt is fixedly connected to the legs but still being able to slide in duly calibrated eyelets.

**[0034]** Figures 9a and 9b show the last step of the advancement stroke, in which two final and almost simultaneous movements are carried out, i.e. slightly beforehand, as already explained through the lever mechanism 124, the descent of the upper slide 122 with the block 123 to hold the belt on the outside so as not to make it rotate and to compress it to avoid possible ends of the metal wire poking out. Just afterwards, in the last millimetres of the stroke of the rod, the rear frusto-conical surface 118b of the head 118 causes the descent of the lower slide 126 with the block 127 that will give the desired final shape to the lower bulging segment of the belt.

**[0035]** At this point, the muselet is perfectly calibrated. The system will go back into the rest position, carrying out the various steps described above in reverse, by means of the negative stroke of rod 116 and carriage 11.

**[0036]** It should be understood that thanks to the unit according to the invention numerous important advantages are obtained. The muselet is calibrated without risks of causing abrasions, scratches or damage in general, because the various holding and/or folding elements grip onto the parts of the muselet without rubbing or significant impacts. The muselet is thus capable of satisfying the highest quality standards, not only by keeping the surface finish of the muselet unaltered, but more generally due to the precision of the calibration that the four movements (internal levers, external levers, upper slide, lower slide) coordinated according to respective single degrees of freedom with respect to the base 111 are capable to achieve, with the assistance of the puncheon and of the cup-shaped anvil cooperating with the housing unit U.

**[0037]** Moreover, the process in a single work stage and on a single unit is extremely fast and productively advantageous. The unit is also structurally and operatively basic, and therefore cost-effective also in terms of management, consumption and maintenance.

**[0038]** Although the solution that makes use of the rod 116 is deemed practical and advantageous, it is possible to provide for different mechanisms for the transmission of the drive in a single sequence and with a single movement of the four contact actions on the elements of the muselet or folding thereof, as implementable by those skilled in the art to achieve an equivalent or even less performing result.

**[0039]** The present invention has been described with reference to preferred embodiments thereof. It should be understood that there can be other embodiments that fall within the scope of the claims here attached.

## Claims

1. A calibration unit for bottle cork muselets, a muselet (G) comprising a plurality of legs (Gm) that extend between a top ring member (Ga) and a bottom belt ring (Gc) comprising a bottom belt ring (Gc) and a top ring member (Ga) mutually distanced and coaxial along a muselet own axis (X') and joined by a plurality of equally spaced legs (Gm) which engage with said belt ring through end eyelets (Gb), the unit comprising a calibration device (1) and a cup-shaped anvil (2), distanced at opposite sides with respect to a feeding path (Y) of single muselets to be calibrated in succession, said device comprising a movable carriage (11) provided with a base (111) integrally carrying a shaped puncheon (115) adapted to fit inside the single muselet to be calibrated, said puncheon (115) and said anvil (2) being mutually coaxial along a device longitudinal axis (X) which crosses said trajectory (Y) and in coincidence with which said muselet own axis (X') of the single muselet is adapted to stay, said base (111) of said carriage (11) and said anvil (2) being also movable in a reciprocating fashion along said device longitudinal ax-

is (X) starting from a mutually spaced rest position which lets the single muselet enter therebetween according to said feeding path (Y), towards a work position in which said anvil (2) and said puncheon (115) become mutually close, clamping between them at least said top ring member (Ga) of the muselet, the device further comprising, integrally with said base (111) as far as the displacement along said device longitudinal axis (X) is concerned, but movable relative to the same base according to respective different degrees of freedom: a plurality of external levers (119) able to operate in radial abutment on the outside of at least one segment of respective legs (Gm) adjacent to the belt ring (Gc) of the muselet; a plurality of internal levers (120) associated with said puncheon (115) and adapted to operate in radial abutment on the inside of substantially the same leg segment; an upper slide (122) adapted to operate in abutment on the outside of an upper segment of said belt ring (Gc); a lower slide (126) able to operate in abutment on the inside of a lower bulging segment (Gca) of said belt ring; and a drive member (116), movable in an advancement stroke relative to said base (111) along said longitudinal axis (X) and adapted to drive in sequence, following such relative motion, said external levers (119), said internal levers (120), said upper slide (122) and said lower slide (126) from a rest position to a work position in abutment with said muselet.

**2.** The unit according to claim 1, wherein said drive member comprises a rod (116) slidably supported by first guide means (112) which rise from said base (111), said rod providing: at a front end, an enlarged head (118) adapted to come into contact with said external levers (119), with said internal levers (120), and with said lower slide (126); and at a rear end, connection means (117) for connecting the member with powering means.

**3.** The unit according to claim 2, wherein the advancement of said rod with respect to said base (111) is hindered by elastic means tuned so as to exert a resistance adapted to be overcome by said powering means acting on the rod, making it advance relative to the base (111), only after said base has reached its work position.

**4.** The unit according to claim 2 or 3, wherein said external levers (119) are hinged as first class levers to a support frame (113) from which said puncheon (115) protrudes, said frame and said puncheon presenting respectively a passage (113a) and an inner cavity (115a) adapted to be penetrated by said head (118) in said advancement stroke of said rod (116), said internal levers (120) being hinged as second class levers, with their own front ends, to said puncheon (115), both said external levers (119) and said internal levers (120) having rear actuating ends adapted to be radially displaced apart by said head (118) to push against the legs (Gm) of the muselet, respectively: front ends (119b) of said external levers shaped as a folding blade; and intermediate outer edge portions (120b) of said internal levers.

**5.** The unit according to claim 4, wherein said front ends (119b) of said external levers comprise each a blade edge inclined in accordance with a desired inclination of said legs (Gm) of the muselet, and said outer edge portions (120b) of said internal levers (120) are shaped according to a desired profile to be obtained for said eyelets (Gb).

**6.** The unit according to claims 4 or 5, wherein said lower slide (126) is slidably supported by said support frame (113), on a front face thereof, and comprises a rear, cam-shaped tooth (126a), adapted to come into contact with said head (118).

**7.** The unit according to claim 6, wherein said head (118) comprises two successive frusto-conical portions (118a, 118b), a first portion (118a) at a more advanced towards a front tip and having a lower average diameter, and a rearward second portion (118b) with a greater average diameter, said first portion (118a) being adapted to drive said internal levers (120) causing said rear ends thereof to become spaced apart, said second portion (118b) being adapted to drive said external levers (119), again causing the rear end thereof to become spaced apart and the front ends to close radially, and then also said lower slide (126) by pushing on said tooth (126a).

**8.** The unit according to any of the previous claims, wherein the movement of at least said external levers (119), said internal levers (120) and said lower slide towards the respective work positions is hindered by elastic means.

**9.** The unit according to any of the claims from 2 to 8, wherein said head (118) is connected to said upper slide (122) through a lever mechanism (124) comprising a first arm (124a) pivoted with a base end thereof to said head (118), and with the other end to a corresponding actuation end of a second arm (124b), rotatable as a first-class lever around a central hinge point with respect to second guide means (114) of said upper slide, the other end of said second arm (124b) being rotatably connected to the upper slide (122), the geometry of the lever mechanism being such that only in a final step of the relative advancement stroke of said rod (116) said first arm (124a) rises close to the vertical, pushing up said actuation end of the second arm (124b) and as a result displacing downwards the other end of the sec-

ond arm, thus lowering said upper slide (122) to the operating position.

**10.** The unit according to any of the previous claims, wherein said external levers and said internal levers are arranged in pairs on planes inclined at 45° with respect to a plane (XY) defined by said device longitudinal axis (X) and said path (Y).

**11.** The unit according to any of the previous claims, wherein said cup-shaped anvil (2) comprises a cylindrical element (21) with a concave surface (21a) facing towards said path (Y), the ends (22a) of respective fins (22) protruding axially from the periphery of said surface, said fins being arranged in pairs on planes inclined at 45° with respect to a plane (XY) defined by said device longitudinal axis (X) and said path (Y).

**12.** The unit according to any of the previous claims, wherein said upper slide (122) comprises a lower end plug (123) with an arc-shaped profile (123a) adapted to exert a stop on a corresponding portion of said ring belt (Gc) of said muselet (G).

**13.** The unit according to any of the previous claims, wherein said lower slide (126) comprises a block (127) provided with a step (127a) with an arc-shaped profile defining a convexity that faces downwards, adapted to hook said belt ring (Gc) from the inside and stretch it downwards to shape said lower bulging segment (Gca). (Fig. 1)

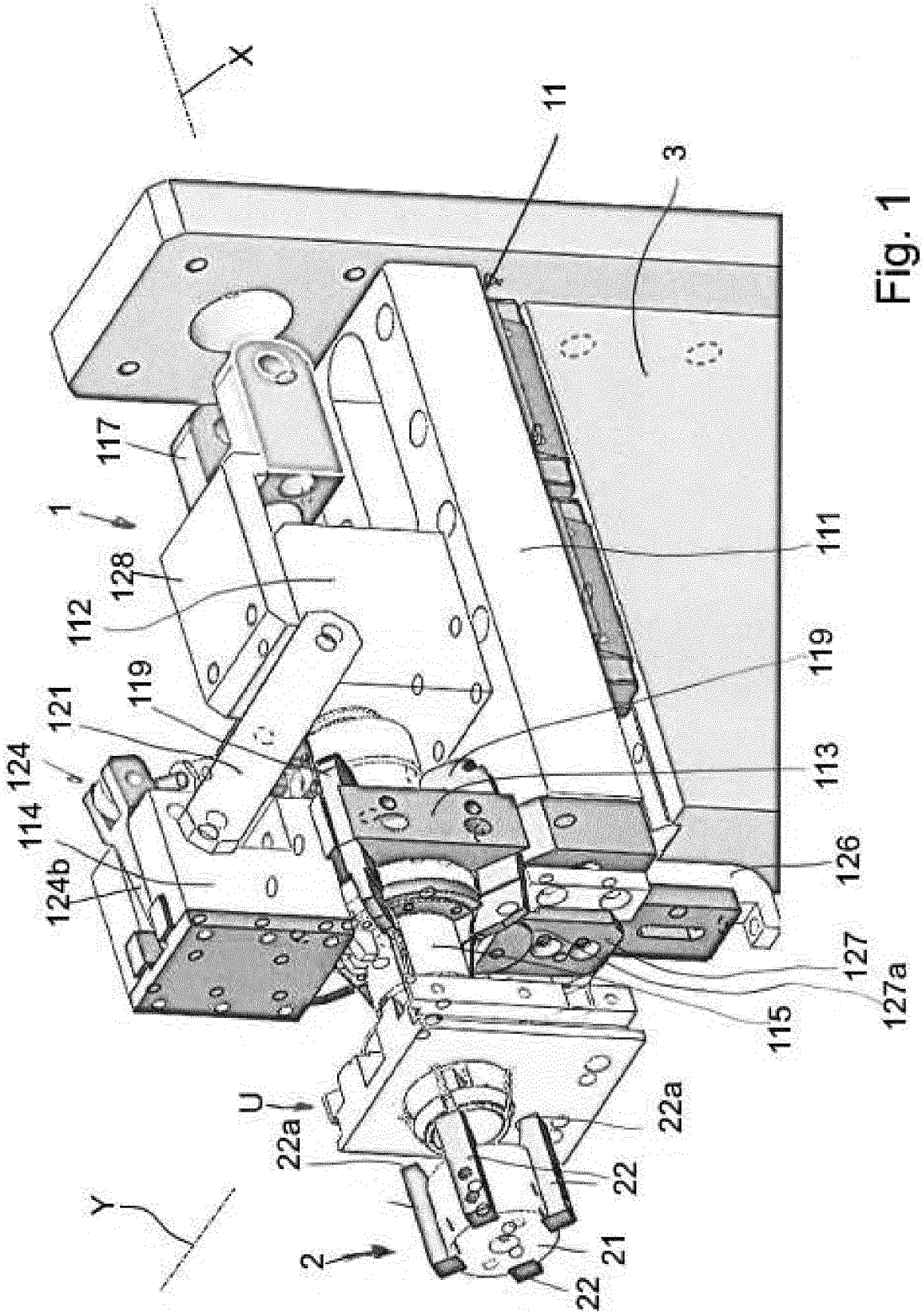
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Fig. 1

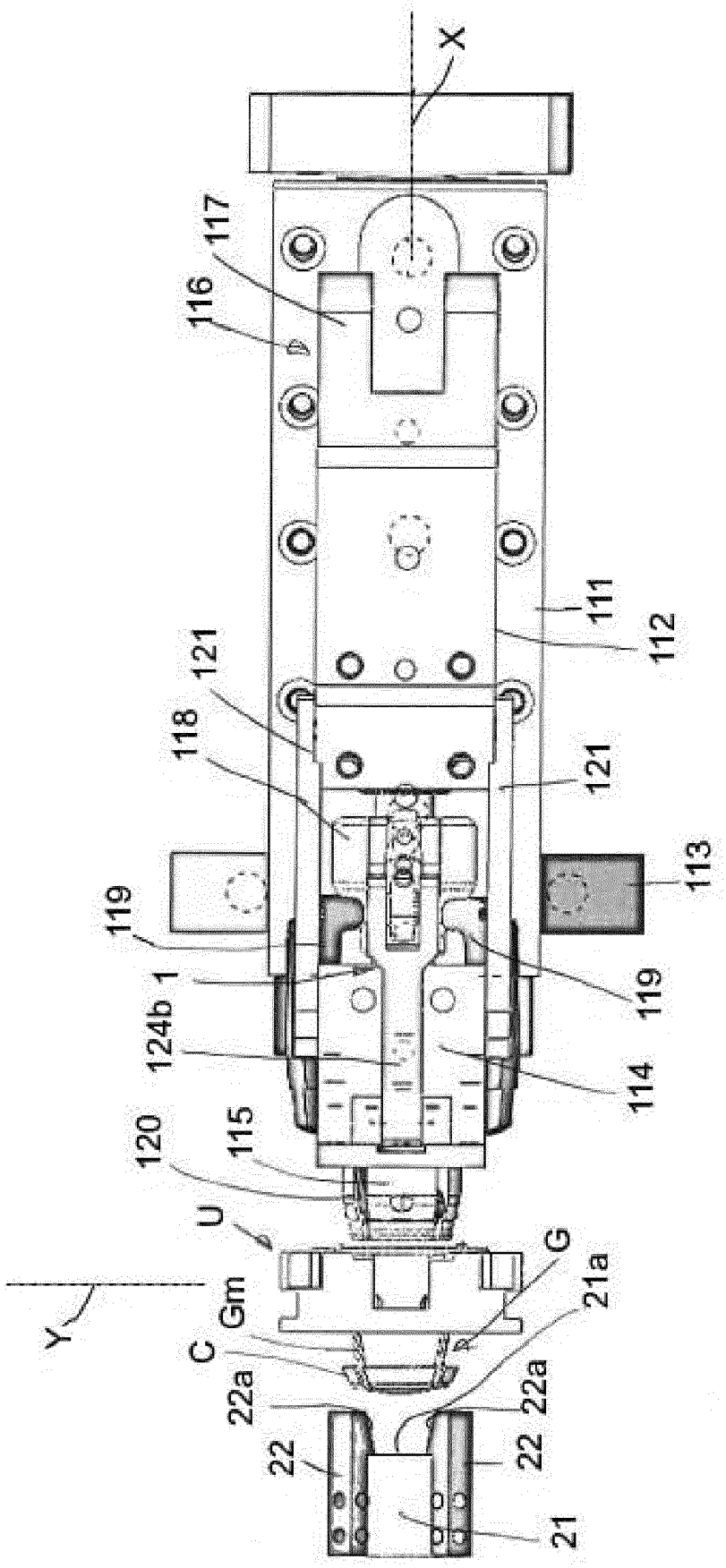
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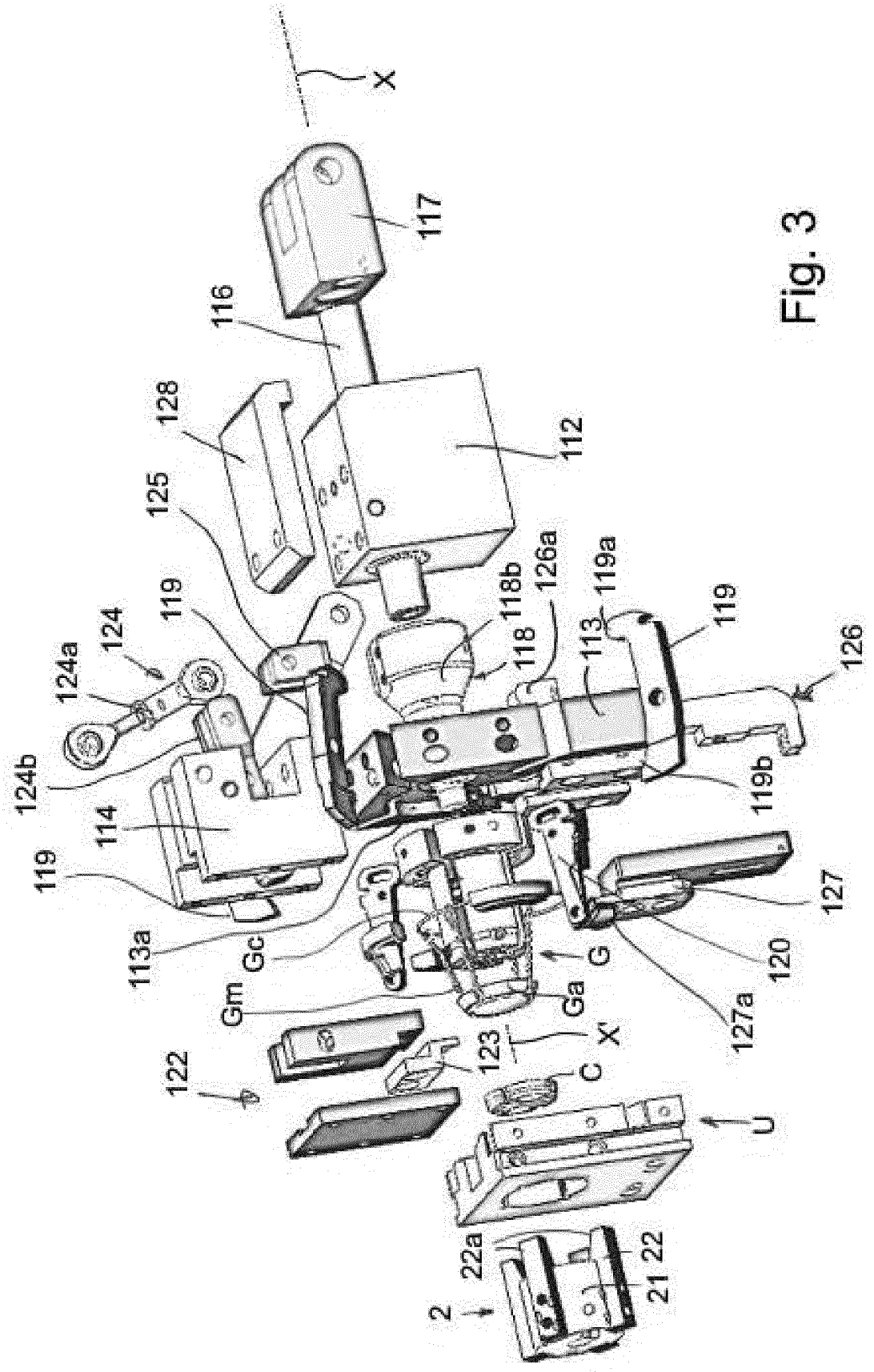
Fig. 2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Gm
Ga
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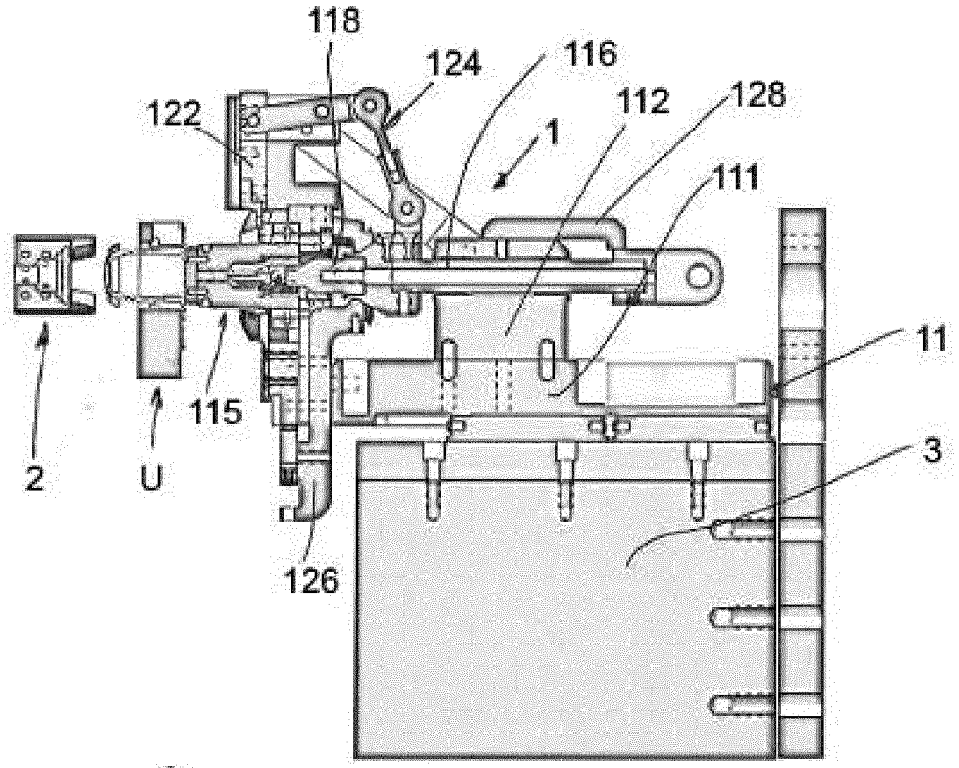
122
123
X'
C
U
2
22a
22
21

Fig. 3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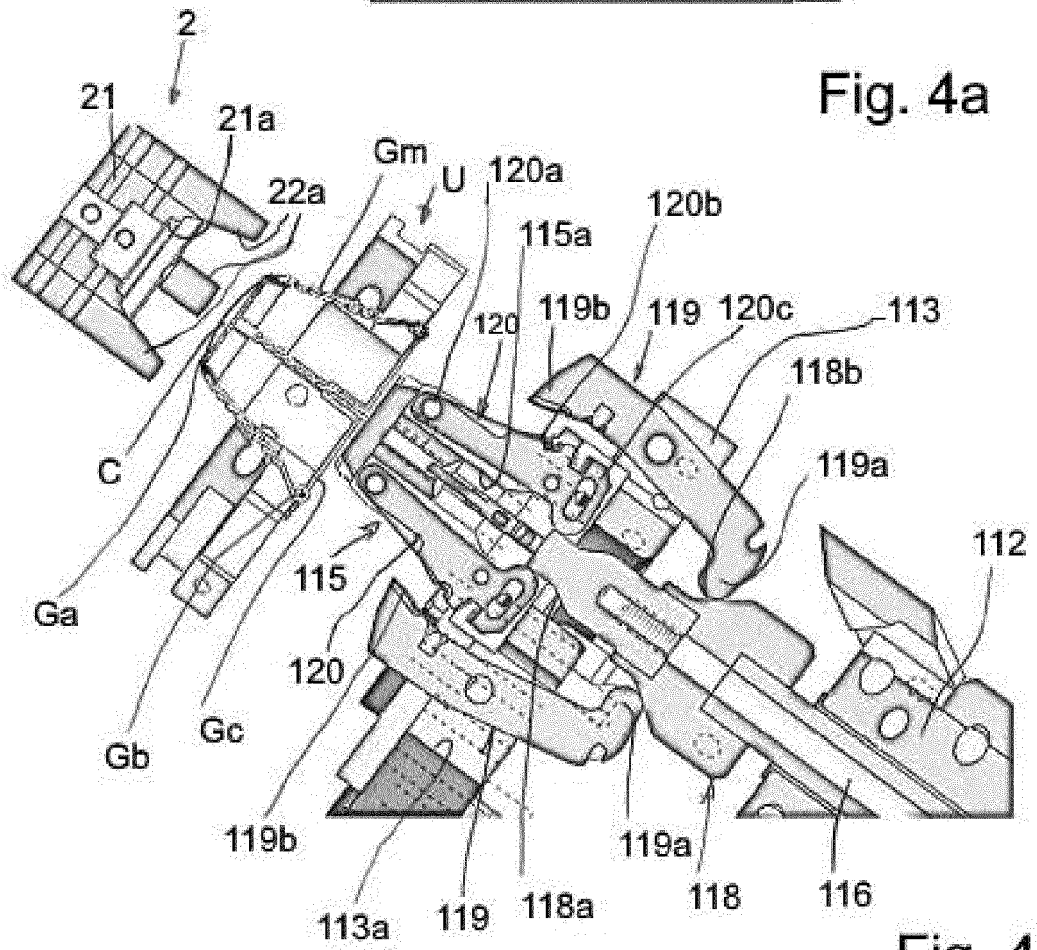
124
116
122
112
128
1
111
11
115
3
2
U
126

Fig. 4a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21
21a
Gm
U
120a
22a
120b
115a
119b
119
120c
113
120
118b
C
119a
112
115
Ga
120
Gb
Gc
119b
119a
113a
119
118a
118
116

Fig. 4b

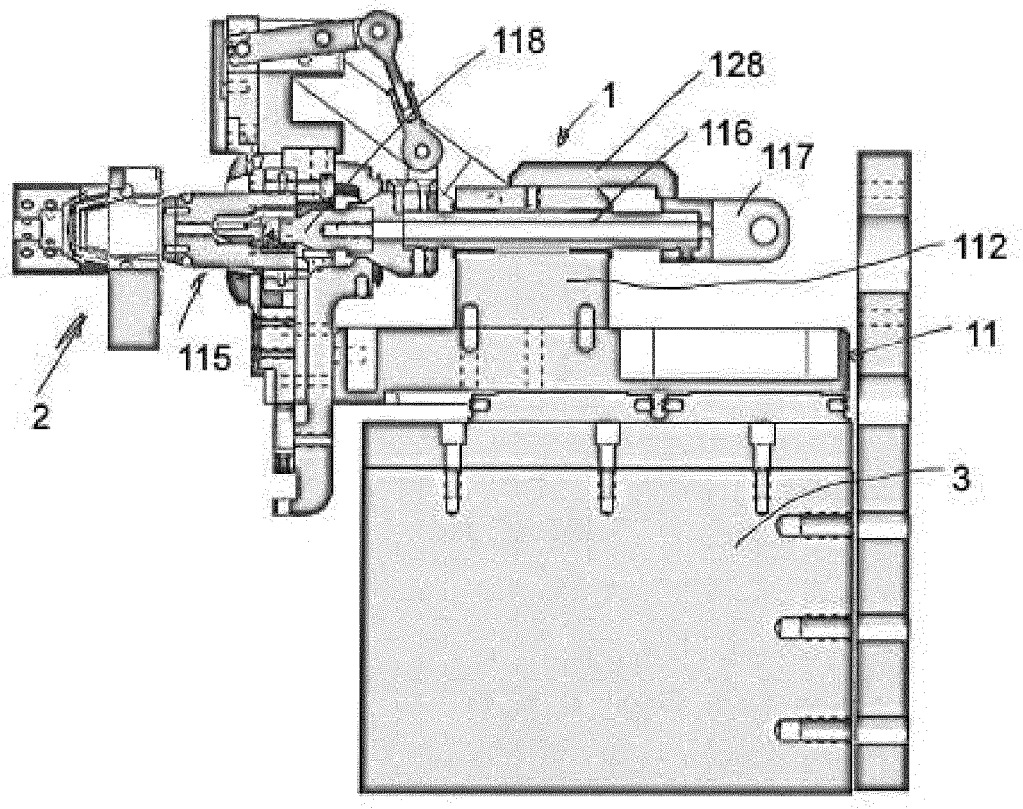

118
128
1
116
117
112
11
115
2
3

Fig. 5a

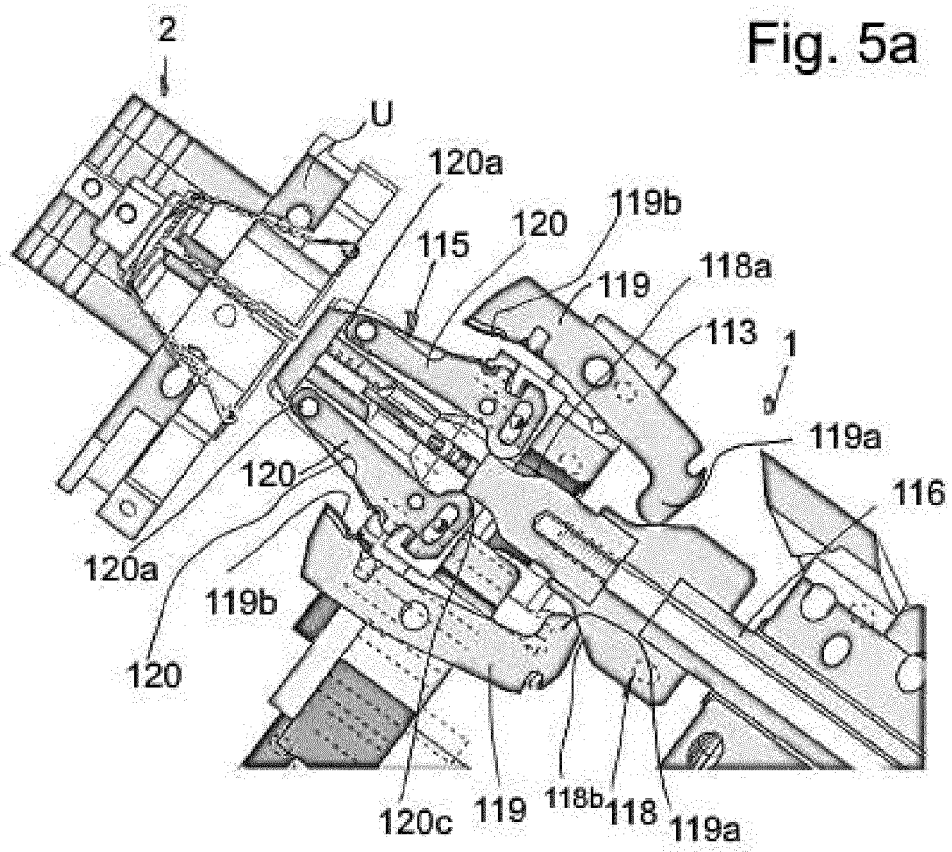

2
U
120a
120
119b
115
119
118a
113
1
119a
116
120
120a
119b
120
120c
119
118b
118
119a

Fig. 5b

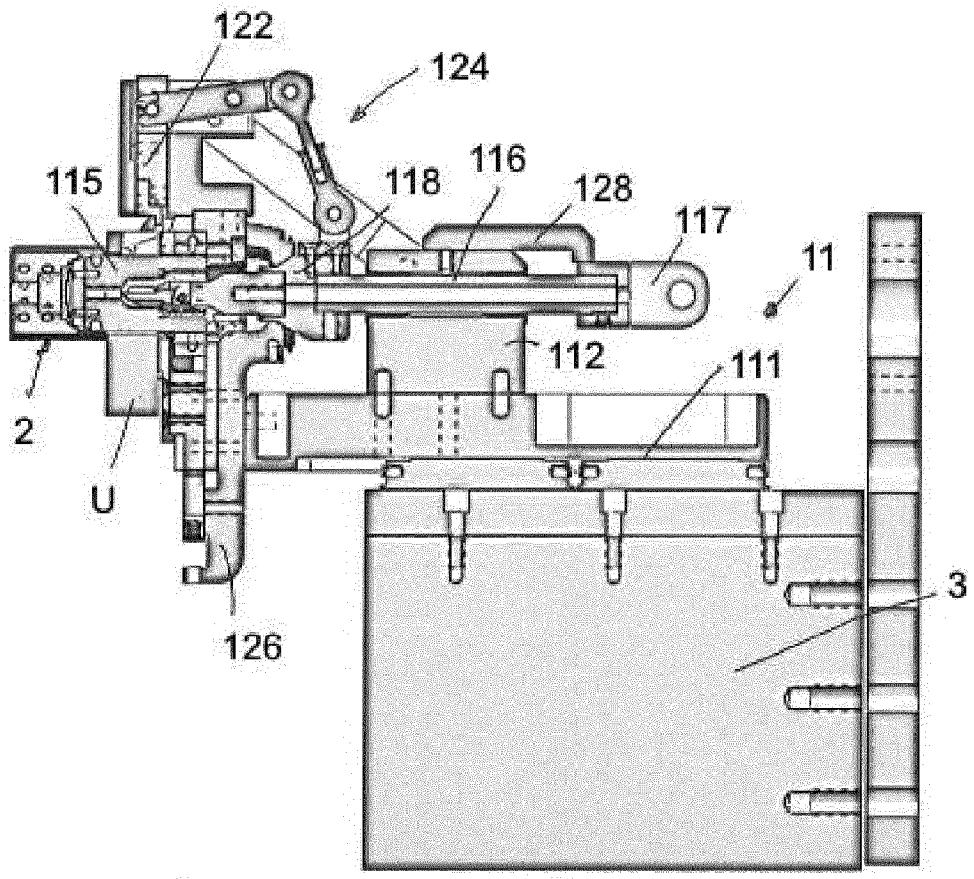

122
124
115
118
116
128
117
11
112
111
2
U
126
3

Fig. 6a

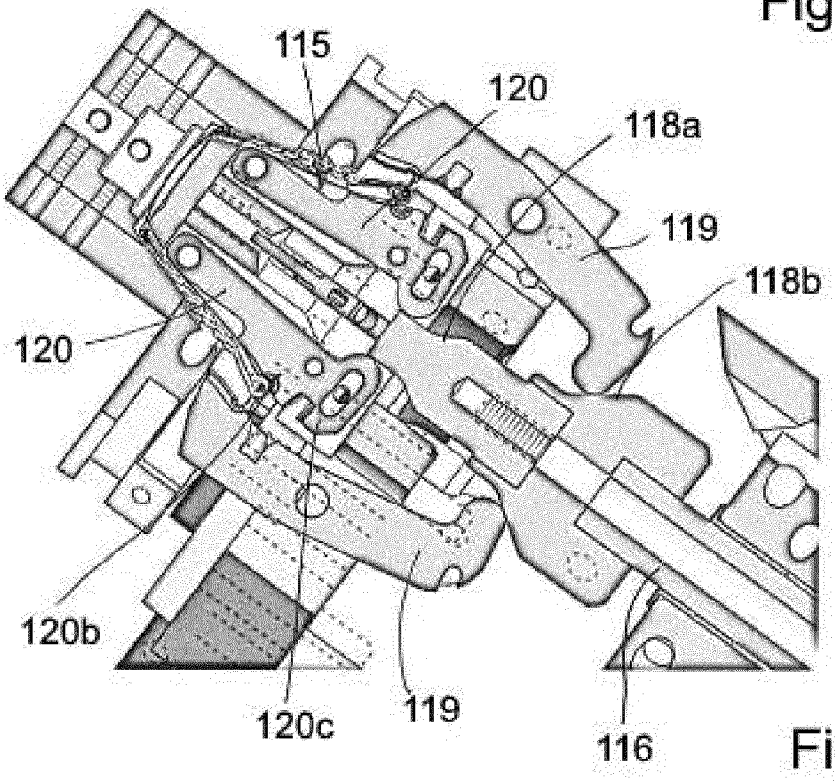

115
120
118a
119
118b
120
120b
120c
119
116

Fig. 6b

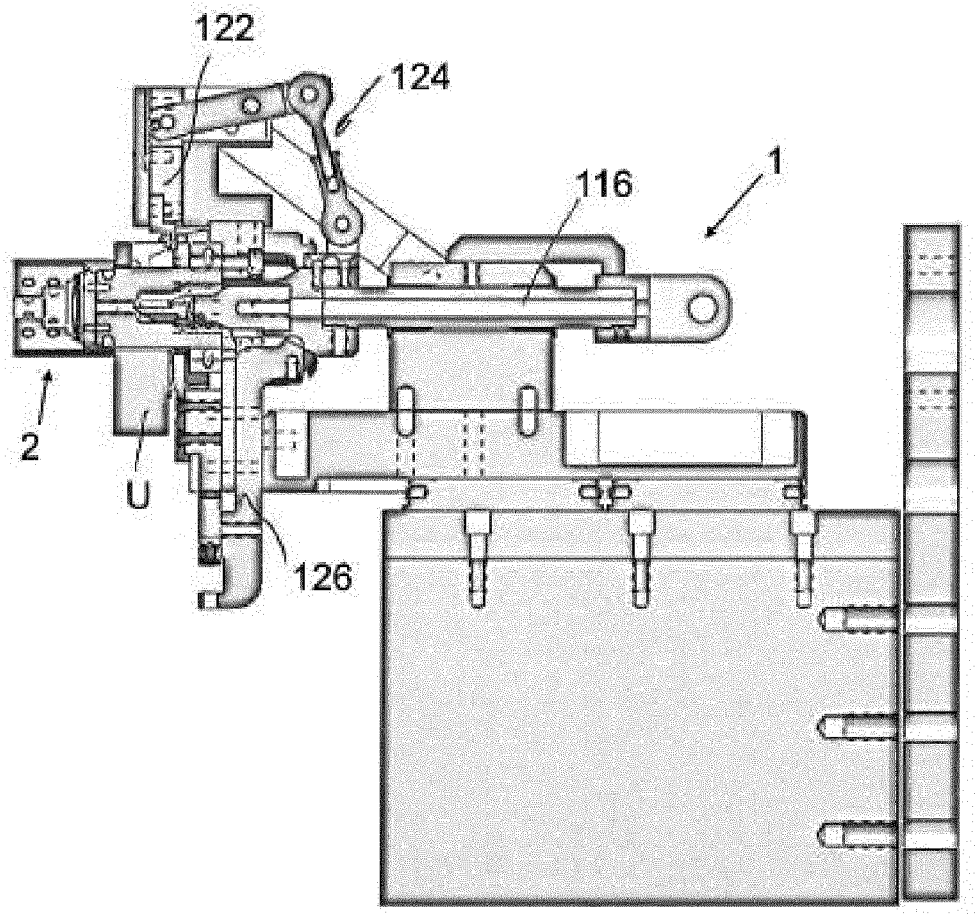

122
124
116
1
2
U
126

Fig. 7a

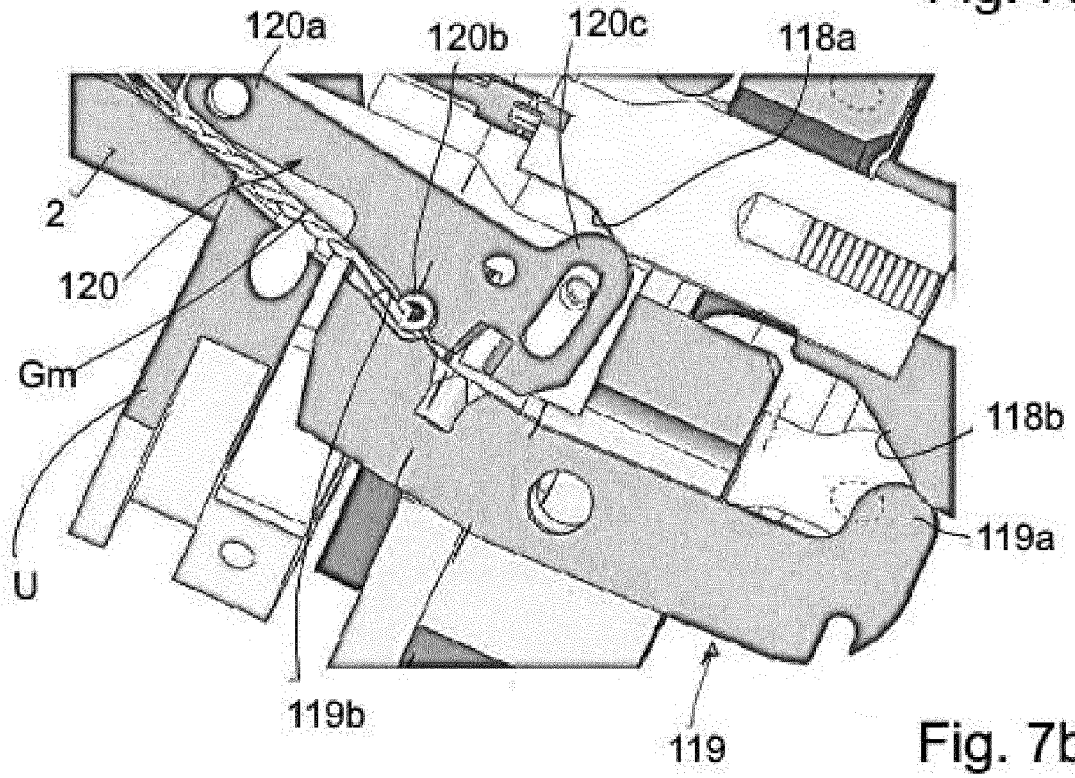

120a
120b
120c
118a
2
120
Gm
U
118b
119a
119b
119

Fig. 7b

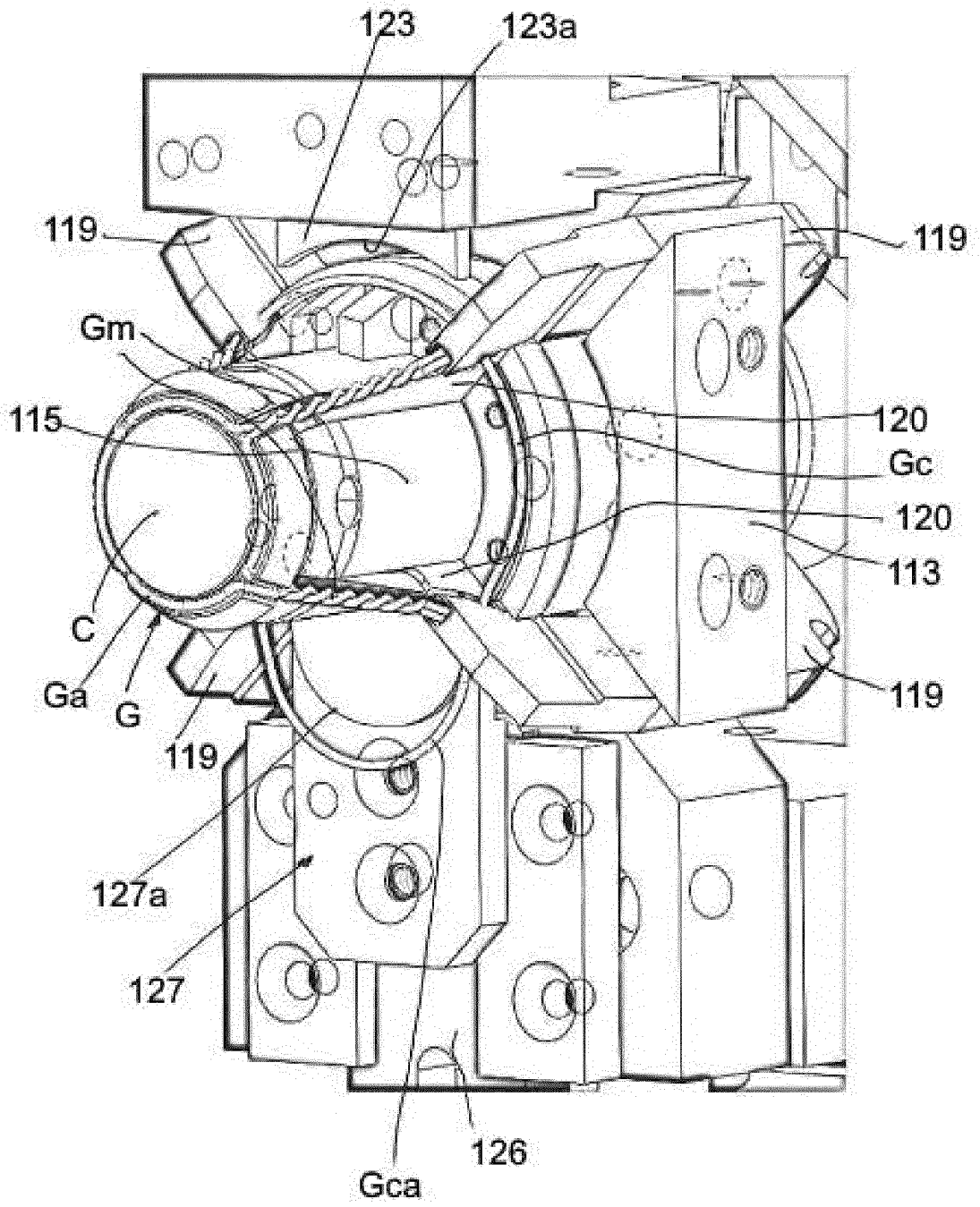
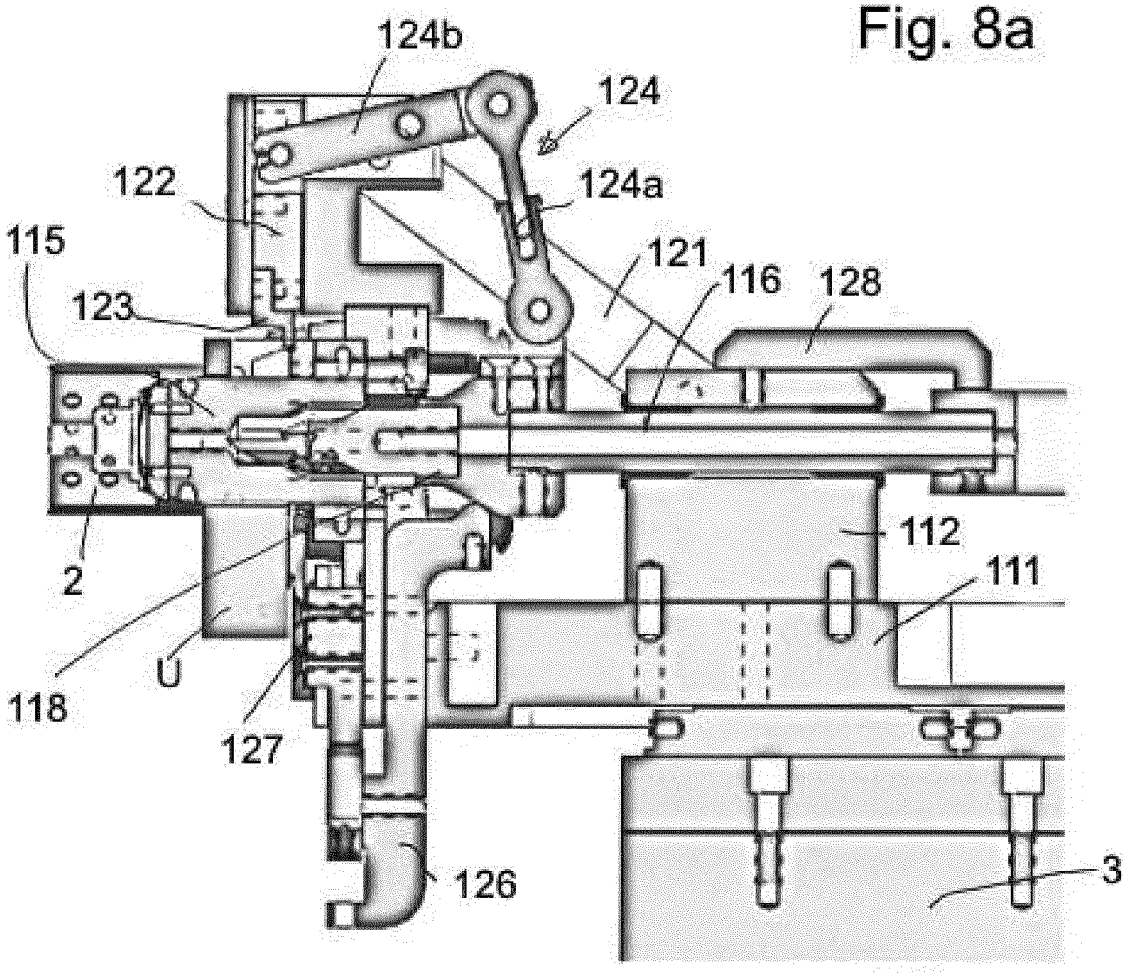

123
123a
119
119
Gm
115
120
Gc
120
113
C
Ga
G
119
119
127a
127
126
Gca

Fig. 7c

Fig. 8a


124b
124
122
124a
115
121
116
128
123
112
111
2
U
118
127
126
3

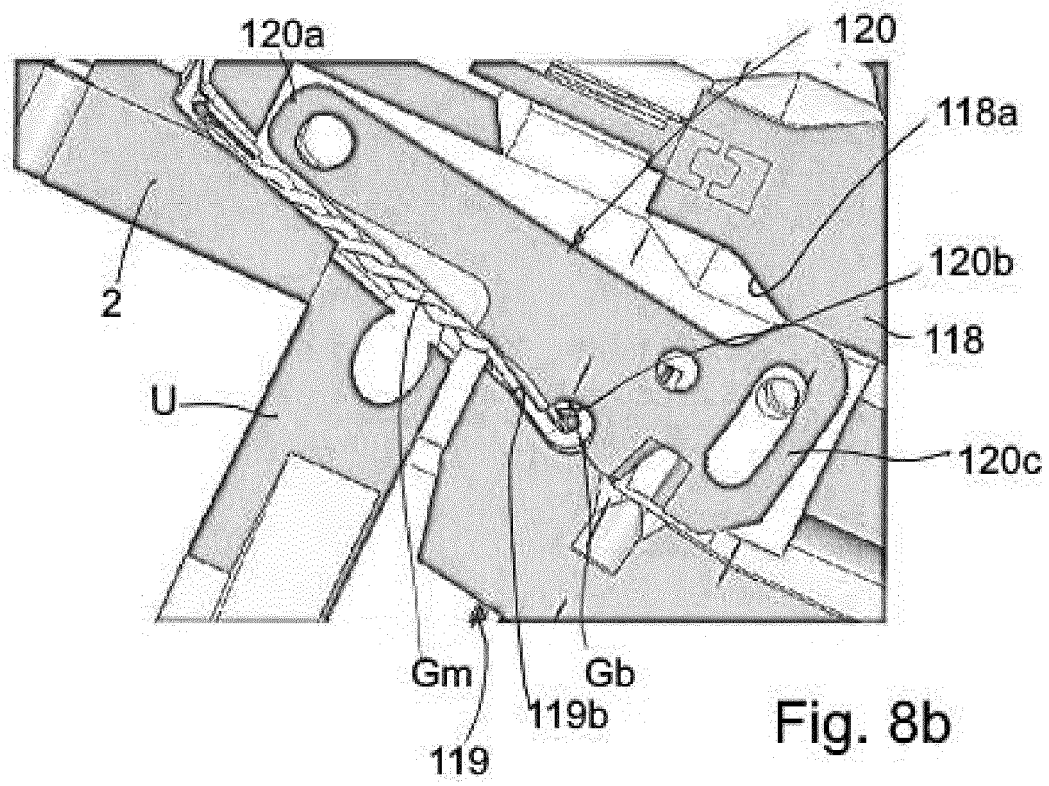

120a
120
118a
120b
2
118
U
120c
Gm
Gb
119b
119

Fig. 8b

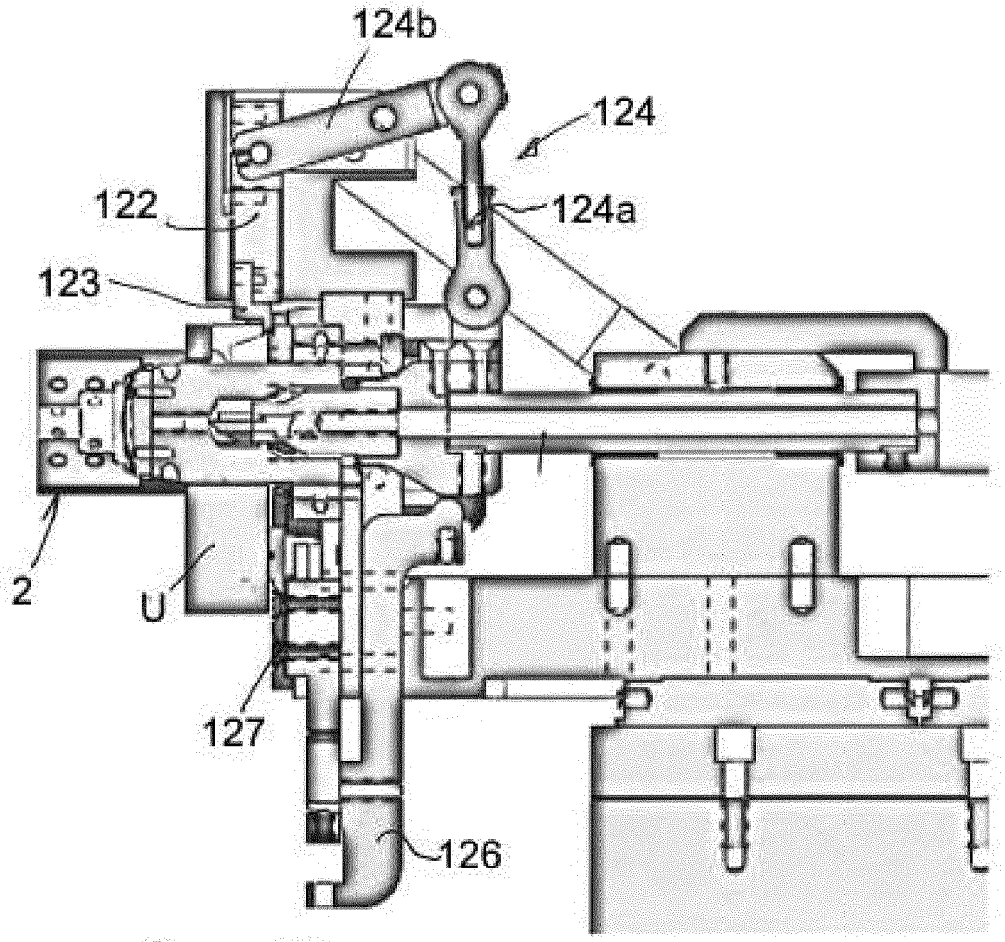

124b
124
122
124a
123
2
U
127
126

Fig. 9a

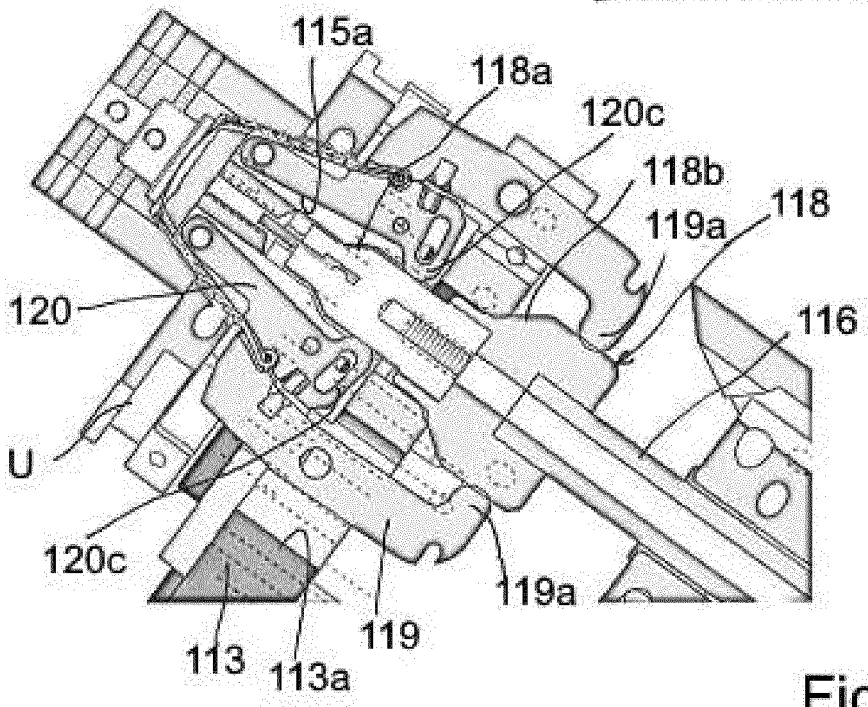

115a
118a
120c
118b
118
119a
120
116
U
120c
119a
119
113
113a

Fig. 9b

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# EUROPEAN SEARCH REPORT

Application Number
EP 18 21 0698

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
|---|---|---|---|
| A | IT 1 072 710 B (ICAS S A S DI GIOVANNI POMA & [IT]) 10 April 1985 (1985-04-10) * page 25, paragraph 4; figure 37 * | 1 | INV. B21F45/04 |
| A | EP 0 808 794 A1 (GEFIN SRL [IT]) 26 November 1997 (1997-11-26) * column 2, lines 26-51; figures 3-4 * | 1 | |
| A | IT TO20 100 600 A1 (NUOVA TECNOLOGIA MECCANICA S R L) 13 January 2012 (2012-01-13) * claim 1; figure 3a * | 1 | |

TECHNICAL FIELDS SEARCHED (IPC)
B21F

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| Munich | 12 April 2019 | Augé, Marc |

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12-04-2019

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