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(71) Applicant: **Pneumax S.p.A.**
20129 Milan (IT)

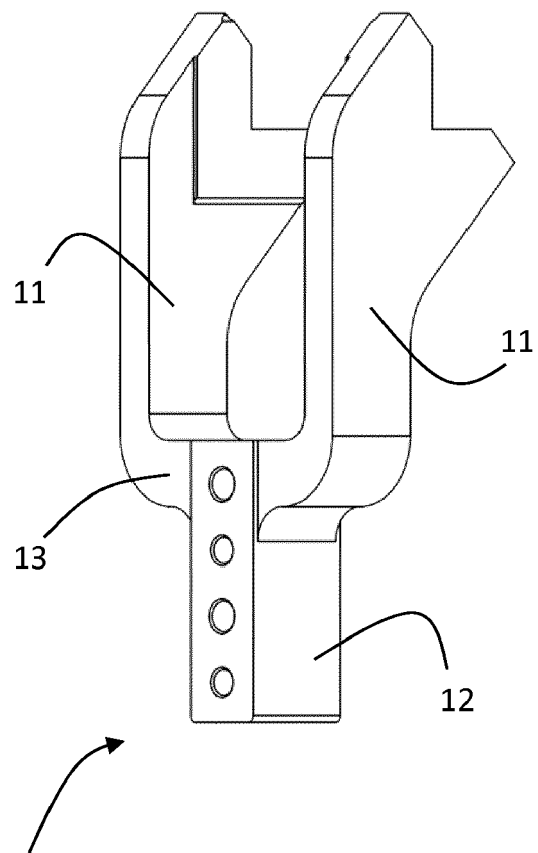
(72) Inventor: **BOTTACINI, Roberto**
I-24050 LURANO (BG) (IT)

(74) Representative: **Mati, Silvia et al**
Studio Legale Bird & Bird
Via Borgogna, 8
20122 Milano (IT)

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(54) **PRESSURE ELEMENT FOR CLAMPING UNIT, CLAMPING UNIT COMPRISING THE SAME AND METHOD FOR MANUFACTURING SUCH PRESSURE ELEMENT**

(57) The present invention relates to a pressure element for use in a clamping unit typically used in the field of sheet metal processing, for example for manufacturing bodies for motor vehicles. The present invention also relates to a clamping unit comprising such a pressure element and a to a method for manufacturing the same. In detail, the pressure element (10,10',10'',10''') for clamping unit comprises a pair of parallel elongated stems (11,11',11'',11''') connected to each other by means of a bridge element (13,13',13'',13''') arranged at a first end or at an intermediate position of the stems (11,11',11'',11'''), at the first end there being further provided at least one elongated end portion (12,12',12'',12'''), the pressure element (10,10',10'',10''') being made of an aluminium alloy and is characterized in that the aluminium alloy is for extrusion and has a modulus of elasticity (T) less than or equal to 69,000 MPa.



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FIG. 1

Description

[0001] The present invention relates to a pressure element for use in a clamping unit typically used in the field of sheet metal processing, for example for manufacturing bodies for motor vehicles. The present invention also relates to a clamping unit comprising such a pressure element and a method for manufacturing the same.

[0002] In the construction of bodies for motor vehicles, it is known to use clamping units for keeping the sheets into position during the process. Such mechanical processes require extremely accurate positioning of the elements to be machined and that such a positioning is kept over time. To this end, clamping units comprise a closing device able to bring a pressure element, connected to such a device, to an exact operating angular position of closure and, once achieved, keep it in such a position, triggering a mechanism of irreversibility able to guarantee the position even in the absence of control (for example, in the absence of air in the case of pneumatic control).

[0003] The stroke of the closing device and thereby of the pressure element is precisely defined, so that the device reaches the working condition, that is, the point at which the mechanism of irreversibility triggers, only upon the complete reaching, by the pressure element, of the work or closed position, that is, the location in which it is ensured the pressure element keeps the workpiece clamped in the exact processing position. Clearly, with variations in the thickness of the workpiece and provided tolerances are minimal, the interference needed between the sheet and the pressure element to generate the tightening torque must be defined from time to time depending on such a thickness. In case of thickness larger than the maximum acceptance range of the clamping unit, the mechanism of irreversibility is not able to trigger.

[0004] The pressure elements are typically made of steel through precision lost wax casting, sand casting or chill casting, or aluminium using sand casting, chill casting or solid casting. The characteristics required for these elements are resistance and lightweight. In particular, for applications of clamping units on robotic handling systems, it is preferred to use pressure elements of aluminium alloys with good strength properties.

[0005] The Applicant noted that the trend in the production lines in the automotive field aims to make the assembly and processing equipment increasingly modular, so that multiple vehicle models or multiple versions of the same model can be assembled on the same line. Therefore, nowadays, it happens that on the same equipment, vehicle parts are assembled, the sheet metal thickness of which varies beyond the currently allowed tolerance limits to ensure the closure of the clamping unit and thus the clamping of the workpiece.

[0006] The Applicant also noted that, at present, die-cast structural components characterized by greater tolerances are increasingly being processed in the production lines.

[0007] The Applicant has therefore identified the need

to manufacture clamping units able to function properly even in the presence of differences in the thicknesses of the workpieces greater than 1.5 mm, ensuring the achievement of the closed position of the pressure element and the triggering of the irreversibility condition of the device for each thickness within the tolerance range in the absence of command.

[0008] In order to ensure proper operation even in the presence of considerable differences in the thicknesses of the workpieces, it is known to integrate elastic elements in the closing device that moves the pressure element or a blocking device which compensates by about $\pm 1.2^\circ$ at the end stop. The negative compensation serves to compensate possible wear of the outer abutments on which the workpiece is placed before clamping. It is a bearing sliding track machined with a curve that allows developing a higher and steady force before reaching the end stop.

[0009] Alternatively, the clamping unit described in document DE 10 2011 102 905 is also known, which on the end portion of the pressure element and at the sides of the unit is provided with an oscillating guiding system and a slide to compensate for different thicknesses.

[0010] The known solutions therefore involve structural changes to the clamping unit, thus modifying and/or integrating the elements that compose it. This leads to greater structural complexity and high related costs.

[0011] The Applicant has therefore felt the need to find an alternative solution, less complex and less costly to the need to manufacture a clamping unit able to work properly even in the presence of significant differences in the thicknesses of the workpieces.

[0012] The Applicant has therefore identified the possibility to modify the pressure elements in order to make them suitable to compensate for possible differences in the thicknesses of the workpieces even to a large extent, such as greater than 1.5 mm.

[0013] In light of the above, the problem underlying the present invention therefore is to devise a pressure element that allows controlling its own deformation, acting on its geometry and thus ensuring a greater compensation range than the currently known solutions, while ensuring the irreversibility of the working condition in the absence of command.

[0014] According to a first aspect thereof, the invention therefore relates to a pressure element for a clamping unit comprising a pair of parallel elongated stems connected to each other by means of a bridge element arranged at a first end or at an intermediate position of the stems, at the first end there being further provided at least one elongated end portion, the pressure element being made of an aluminum alloy, characterized in that the aluminum alloy is by extrusion and has a modulus of elasticity (T) less than or equal to 69,000 MPa.

[0015] In the present description and in the claims, where reference is made to a value of a modulus of elasticity, this value is to be considered as measured according to the method defined in the UNI EN ISO 6892-1:2009

standard "Metallic materials -- Tensile testing -- Part 1: Method of test at room temperature".

[0016] The Applicant has surprisingly found that using an extrusion alloy having a modulus of elasticity of less than or equal to 69,000 MPa, a pressure element is obtained which, if used in a clamping unit, is able to effectively compensate for possible differences in the thickness of the workpieces up to 2.5 mm, depending on the size of the clamping unit, while ensuring the triggering of the mechanism of irreversibility of the same clamping unit.

[0017] In particular, it was verified that with clamping unit sizes equal to Ø 50 mm cylinder, the pressure elements according to the present invention allow reliably compensating for thicknesses up to 2 mm; up to 2,3 mm with clamping unit sizes equal to Ø 63 mm cylinder, and up to 2.5 mm with clamping unit sizes equal to Ø 80 mm cylinder.

[0018] The Applicant has further noted that the use of an extrusion aluminum alloy having an elasticity modulus less than or equal to 69,000 MPa ensures a better compactness of the material, leading to a less fragile pressure element characterized by higher bending values.

[0019] Last but not least, the Applicant has found that the use of the extrusion technique for making the pressure element has a multiplicity of advantages, including the ability possibility to make pressure elements of different sizes and shapes (right, left and center version with several offset measurements) without the need of a special mold for each variant. This is clearly related to a remarkable flexibility, as well as to great savings in terms of cost. In fact, from a single die it is possible to derive any offsets and left and right pressure elements.

[0020] In addition, the equipment used to work the pressure elements and make the reference planes and the drilling surfaces are extremely simplified. Therefore, a pressure element thus created additionally offers a remarkable ease of stocking in a work center to proceed with processing. Specifically, the simplicity of stocking of pressure elements made by extrusion is linked to the fact that there are no drafts and that the shape of the pressing planes is much more homogeneous than that of a pressure element made according to the known techniques, which in any case involve the need for draft angles. In fact, in a pressure element made by extrusion all the planes are parallel or orthogonal to each other and there are no deformations of the workpiece caused by the shrinkage of the material which, instead, in precision casting pressure elements must be compensated with duly designed equipment.

[0021] According to a second aspect thereof, the invention relates to a clamping unit comprising a pressure element and a closing device for moving the pressure element between an open position and an operating closed position, wherein the closing device comprises a mechanism of irreversibility of the movement of the pressure element in closed position in absence of command, characterized in that the pressure element is made as

described above.

[0022] Advantageously, the clamping unit according to the invention achieves the technical effects described above in relation to the pressure element for clamping unit.

[0023] According to a third aspect thereof, the invention relates to a method for manufacturing a pressure element for use in a clamping unit comprising a pair of parallel elongated stems connected to each other by means of a bridge element arranged at a first end or at an intermediate position of the stems, at the first end there being further provided at least one elongated end portion, comprising the steps that consist in obtaining the pressure element by extrusion of an aluminum alloy having a modulus of elasticity (T) less than or equal to 69,000 MPa.

[0024] Advantageously, the manufacturing method of a pressure element for use in a clamping unit according to the invention achieves the technical effects described above in relation to the pressure element for clamping unit.

[0025] The present invention may have at least one of the following preferred features; the latter may in particular be combined with each other as desired to meet specific application requirements.

[0026] Preferably, the aluminum alloy comprises or consists of the following ingredients in the following percentages by weight:

- Aluminum (Al) at least equal to 92%;
- Silicon (Si) ranging from 0.20% to 1.40%;
- Iron (Fe) ranging from 0.10% to 0.70%;
- Copper (Cu) ranging from 0.10% to 0.50%;
- Manganese (Mn) ranging from 0.10% to 0.40%;
- Magnesium (Mg) ranging from 0.35% to 1.20%;
- Chromium (Cr) ranging from 0.04% to 0.35%;

and optionally further comprises

- Zinc (Zn) $\leq$ 0.30%;
- Titanium (Ti) $\leq$ 0.20%;
- Lead (Pb) $\leq$ 0.40%;
- Bismuth (Bi) $\leq$ 0.8%.

[0027] More preferably, the aluminum alloy comprises or consists of the following ingredients in the following percentages by weight:

- Aluminum (Al) ranging from 97.65% to 98.50%;

- Silicon (Si) ranging from 0.20% to 0.60%;
- Iron (Fe) approximately equal to 0.35%;
- Copper (Cu) approximately equal to 0.10%;
- Manganese (Mn) approximately equal to 0.10%;
- Magnesium (Mg) ranging from 0.45% to 0.90%;
- Chromium (Cr) approximately equal to 0.10%;
- Zinc (Zn) approximately equal to 0.10%;
- Titanium (Ti) approximately equal to 0.10%.

[0028] Preferably, the stems converge into a single elongated end portion or continue merging into a pair of parallel elongated end portions.

[0029] More preferably, the single elongated end portion in which the stems converge is central or arranged in such a way as to define an extension of a stem.

[0030] Preferably, the stems converge, at the end opposite to the first one, in a fixing portion suitable for mounting on a closing device of the clamping unit in a rotatable configuration with respect to the closing device.

[0031] Preferably, the closing device for moving the pressure element comprises a piston connected to a fork in turn connected to a toggle lever, wherein the toggle lever is the mechanism of irreversibility of movement of the pressure element in closed position in the absence of command on the piston.

[0032] Preferably, the step that consists in obtaining the pressure element by extrusion of an aluminum alloy comprises the steps of:

- extruding a die of said aluminum alloy;
- cutting to size the extruded die, thereby obtaining the pressure element;
- processing at least one surface of the pressure element so as to increase the deformability thereof.

[0033] More preferably, the extrusion step takes place under the following operating conditions:

- Billet heating temperature of between 480° -520 °C;
- Work start pick up pressure equal to about 180bar (18Mpa);
- Work pressure equal to about 160bar (16Mpa).

[0034] Even more preferably, the extrusion step takes place in an extrusion plant comprising a press having capacity of 2800t, and a container having a diameter equal to 0330 mm.

[0035] More preferably, the processing step of the at least one surface of the pressure element takes place by milling and/or removal of material.

[0036] Even more preferably, the at least one surface of the pressure element subject to machining to increase the deformability thereof is a lower surface and/or an upper surface of at least one elongated stem of the pressure element.

[0037] Further features and advantages of the present invention will appear more clearly from the following detailed description of some preferred embodiments thereof, made with reference to the accompanying drawings.

[0038] The different features in the single configurations may be combined with one another as desired according to the description above, to make use of the advantages resulting in a specific way from a particular combination.

[0039] In such drawings,

- figure 1 is an axonometric view of a first preferred embodiment of a pressure element for a clamping unit according to the present invention;
- figure 2 is a first lateral plan view of the pressure element in figure 1 where the surfaces that contribute to the deformation of the pressure element are indicated;
- figure 3 is a second lateral plan view of the pressure element in figure 1, related to the opposite side than that shown in figure 2, where the surfaces that contribute to the deformation of the pressure element are indicated;
- figures 4a and 4b are axonometric views of the clamping unit using the pressure element of figure 1;
- figures 5a, 5b and 5c are axonometric views of further preferred embodiments of a pressure element for a clamping unit according to the present invention.

[0040] With reference to figures 1-3, reference numeral 10 globally denotes a pressure element for a clamping unit. In particular, the pressure element for clamping unit shown in figures 1-3 is of the central type.

[0041] The central pressure element 10 consists of a pair of parallel elongated stems 11 - also known by the name of shoulders - which, at a first end, converge into a single central end elongated portion 12, through a bridge element 13 that connects them at a first end.

[0042] With reference to the operating closed position of the pressure element 10, when mounted in a clamping unit, the lower and/or upper surfaces 11 a, 11b of the elongated stems 11 constitute the working surfaces of the pressure element 10.

[0043] In particular, as better shown in figures 4a and 4b, the stems 11 converge, at the end opposite to the

first, in a fixing portion suitable for mounting on a closing device 20 of the clamping unit 100 in a rotatable configuration with respect to the closing device 20.

[0044] Such pressure element 10 is made of an aluminum alloy by extrusion and has a modulus of elasticity (T) of less than or equal to 69,000 MPa, where the method of measurement used for measuring the modulus of elasticity was that defined in the UNI EN ISO 6892-1: 2009 standard, "Metallic materials - Tensile testing - Part 1: Method of test at room temperature".

[0045] The aluminum alloy with which the pressure element is made comprises the following ingredients in the following percentages by weight:

- Aluminum (Al) at least equal to 92%;
- Silicon (Si) ranging from 0.20% to 1.40%;
- Iron (Fe) ranging from 0.10% to 0.70%;
- Copper (Cu) ranging from 0.10% to 0.50%;
- Manganese (Mn) ranging from 0.10% to 0.40%;
- Magnesium (Mg) ranging from 0.35% to 1.20%;
- Chromium (Cr) ranging from 0.04% to 0.35%;

and optionally further comprises

- Zinc (Zn) $\leq$ 0.30%;
- Titanium (Ti) $\leq$ 0.20%;
- Lead (Pb) $\leq$ 0.40%;
- Bismuth (Bi) $\leq$ 0.8%.

[0046] Examples of aluminum alloys comprising the above ingredients in the respective percentages are the Series 6000 aluminum alloys. Such alloys are extrudable and have a modulus of elasticity generally less than or equal to 69,000 MPa.

[0047] This allows on the one hand obtaining the pressure elements in a simple manner by means of extrusion, thus without the need of making dedicated molds for the single versions: central, right and left and with different offsets.

[0048] On the other hand, the pressure element 10 thus obtained is able to compensate thicknesses of the workpieces of even more than 1.5 mm through a deformation of its shoulders 11 and therefore also of the end portion 12 thereof. Specifically, the deformation mainly involves the upper 11a and lower 11b surfaces of shoulders 11 shown in figures 2 and 3 by means of dashed lines.

[0049] In particular, subsequent to the extrusion step, the upper and lower surfaces 11 a, 11b of shoulders 11

are machined, for example lightened or weakened, in order to facilitate a deformation of the same such as to ensure the compensation of considerable thicknesses. The lightening or weakening steps are obtained by milling and/or removal of material.

[0050] The Applicant has in particular found that, within the set of the Series 6000 aluminum alloys, the alloy most suitable for use as material of construction of the pressure elements for clamping units is the alloy designated by designation EN AW-6063, characterized by the following ingredients in the following percentages by weight:

- Aluminum (Al) ranging from 97.65% to 98.50%;
- Silicon (Si) ranging from 0.20% to 0.60%;
- Iron (Fe) approximately equal to 0.35%;
- Copper (Cu) approximately equal to 0.10%;
- Manganese (Mn) approximately equal to 0.10%;
- Magnesium (Mg) ranging from 0.45% to 0.90%;
- Chromium (Cr) approximately equal to 0.10%;
- Zinc (Zn) approximately equal to 0.10%;
- Titanium (Ti) approximately equal to 0.10%.

[0051] Due to the deformability of shoulders 11 that is reflected on the end portion 12, given in particular by the specific aluminum alloy by extrusion used for making the pressure element 10, reaching the closed position of the pressure element 10 and the trigger of the condition of irreversibility in the absence of command are ensured for each thickness in a tolerance range of about 1.5 mm.

[0052] With reference to figures 4a and 4b, there is shown a clamping unit 100 comprising a pressure element 10 of the central type according to the present invention associated to a closing device 20 for moving the pressure element 10 between an open position and an operating closed position.

[0053] The closing device 20 comprises a mechanism of irreversibility (not shown) of the movement of the pressure element in the closed position in the absence of command.

[0054] In particular, the closing device 20 for moving the pressure element 10 comprises a piston connected to a fork in turn connected to a toggle lever, wherein the toggle lever is the mechanism of irreversibility of movement of the pressure element 10 in closed position in the absence of command on the piston. These elements are not shown in the figures since they are known to a man skilled in the art.

[0055] Figures 5a-5c show pressure elements 10', 10'', 10''' for clamping units of the left, right and "H" shaped type, respectively.

[0056] The pressure element 10' of the left type shown in figure 5a comprises a pair of parallel elongated stems 11' which, at a first end, converge in a single lateral left end portion 12' through a bridge element 13' which connects them at such a first end.

[0057] The pressure element 10" of the right type shown in figure 5b comprises a pair of parallel stems 11" which, at a first end, converge in a single lateral right end portion 12" through a bridge element 13" which connects them at such a first end.

[0058] Finally, the pressure element 10''' of the H-shaped type shown in figure 5c comprises a pair of parallel stems 11''' connected to each other by a bridge element 13''' placed at an intermediate position of the stems 11'''. The stems 11''' continue beyond the bridge element 13''', each delineating an extension which ends in respective parallel end portions 12'''.

[0059] In all the pressure elements shown in figures 5a-5c, the lower and/or upper surfaces of stems 11', 11", 11''', with reference to the operating closed position of the pressure element 10', 10", 10''', constitute the working surfaces of such pressure element 10', 10", 10'''.

[0060] Moreover, the stems 11', 11", 11''' converge, at the end opposite to the first, in a fixing portion suitable for mounting on a closing device 20 of a clamping unit 100 in a rotatable configuration with respect to the closing device 20.

[0061] The manufacturing method of a pressure element for use in a clamping unit therefore comprises the following steps.

[0062] Firstly, a die is obtained by extrusion of an aluminum alloy having a modulus of elasticity (T) of less than or equal to 69,000 MPa.

[0063] This step preferably takes place by means of an extruder plant comprising a press having a capacity of 2800 t and a container having a diameter of 0330 mm diameter, under the following operating conditions:

- Billet heating temperature of between 480°-520°;
- Work start pick up pressure substantially equal to 180bar (18Mpa);
- Work pressure substantially equal to 160bar (16Mpa).

[0064] Subsequently, the die is cut to size to obtain the pressure element of the desired size.

[0065] Finally, the work surfaces of the pressure element 10,10',10",10''' are machined so as to lighten or weaken them in order to increase the deformability thereof. Such processing takes place by milling and/or removal of material from the indicated surfaces.

[0066] The following embodiment example is provided only for describing the present invention and does not limit the scope of protection defined by the appended claims.

EXAMPLE:

[0067] A die of EN AW-6063 type aluminum alloy was extruded under the operating conditions stated above.

5 From the die thus obtained, a pressure element of length equal to 144 mm was cut from the end of the center of rotation of the crank of the clamping unit.

10 [0068] The pressure element thus obtained was mounted on a pneumatic clamping unit, Ø50 mm cylinder of C1P50 type and sheets with variable thickness between 1.5 and 2 mm were locked, each time reaching the point of closure or locking of the sheet and therefore the irreversibility condition of the clamping unit.

15 [0069] The features of the pressure element object of the present invention as well as the relevant advantages are clear from the above description:

[0070] Additional variations of the embodiments described above are possible without departing from the teaching of the invention.

20 [0071] Finally, it is clear that several changes and variations may be made to the pressure element thus conceived, all falling within the invention; moreover, all details can be replaced with technically equivalent elements. In the practice, the materials used as well as the sizes, can be whatever, according to the technical requirements.

Claims

- 30
1. Pressure element (10,10',10",10''') for clamping unit comprising a pair of parallel elongated stems (11,11',11",11''') connected to each other by means of a bridge element (13,13',13",13''') arranged at a first end or at an intermediate position of the stems (11,11',11",11'''), at the first end there being further provided at least one elongated end portion (12,12',12",12'''), the pressure element (10,10',10",10''') being made of an aluminium alloy **characterized in that** the aluminium alloy is for extrusion and has a modulus of elasticity (T) less than or equal to 69,000 MPa.
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 2. Pressure element (10,10',10",10''') according to claim 1, wherein the aluminium alloy comprises or consists of the following ingredients in the following percentages by weight:
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- Aluminium (Al) at least equal to 92%;
- Silicon (Si) ranging from 0.20% to 1.40%;
- Iron (Fe) ranging from 0.10% to 0.70%;
- Copper (Cu) ranging from 0.10% to 0.50%;
- Manganese (Mn) ranging from 0.10% to 0.40%;
- Magnesium (Mg) ranging from 0.35% to 1.20%;
- Chromium (Cr) ranging from 0.04% to 0.35%;

and optionally further comprises

- Zinc (Zn) $\leq 0.30\%$;
 - Titanium (Ti) $\leq 0.20\%$;
 - Lead (Pb) $\leq 0.40\%$;
 - Bismuth (Bi) $\leq 0.8\%$.
3. Pressure element (10,10',10",10''') according to claim 2, wherein the aluminium alloy comprises or consists of the following ingredients in the following percentages by weight:
- Aluminium (Al) ranging from 97.65% to 98.50%;
 - Silicon (Si) ranging from 0.20% to 0.60%;
 - Iron (Fe) approximately equal to 0.35%;
 - Copper (Cu) approximately equal to 0.10%;
 - Manganese (Mn) approximately equal to 0.10%;
 - Magnesium (Mg) ranging from 0.45% to 0.90%;
 - Chromium (Cr) approximately equal to 0.10%;
 - Zinc (Zn) approximately equal to 0.10%;
 - Titanium (Ti) approximately equal to 0.10%.
4. Pressure element (10,10',10",10''') according to any one of claims 1 to 3, wherein the stems (11,11',11",11''') converge into a single elongated end portion (12,12',12'') or continue merging into a pair of parallel elongated end portions (12'').
5. Pressure element (10,10',10",10''') according to claim 4, wherein the single elongated end portion (12,12',12'') in which the stems (11,11',11",11''') converge is central (12) or arranged in such a way as to define an extension (12',12'') of a stem (11',11'').
6. Clamping unit (100) comprising a pressure element (10,10',10",10''') and a closing device (20) for moving the pressure element between an open position and an operative closed position, wherein the closing device (20) comprises a mechanism of irreversibility of movement of the pressure element (10,10',10",10''') in closed position in the absence of command, **characterized in that** the pressure element (10) is obtained according to any one of claims 1 to 5.
7. Clamping unit (100) according to claim 6, wherein the closing device (20) for moving the pressure element (10,10',10",10''') comprises a piston connected to a fork in turn connected to a toggle lever, wherein the toggle lever is the mechanism of irreversibility of movement of the pressure element (10,10',10",10''') in closed position in the absence of command on the piston.
8. Method for manufacturing a pressure element (10,10',10",10''') for use in a clamping unit (100) comprising a pair of parallel elongated stems (11,11',11",11''') connected to each other by means of a bridge element (13,13',13",13''') arranged at a

first end or at an intermediate position of the stems (11,11',11",11'''), at the first end there being further provided at least one elongated end portion (12,12',12",12''), comprising the steps consisting of obtaining the pressure element (10,10',10",10''') by extrusion of an aluminium alloy having a modulus of elasticity (T) less than or equal to 69.000 MPa.

9. Method for manufacturing a pressure element (10,10',10",10''') according to claim 8, wherein the aluminium alloy comprises or consists of the following ingredients in the following percentages in weight:

- Aluminium (Al) at least equal to 92%;
- Silicon (Si) ranging from 0.20% to 1.40%;
- Iron (Fe) ranging from 0.10% to 0.70%;
- Copper (Cu) ranging from 0.10% to 0.50%;
- Manganese (Mn) ranging from 0.10% to 0.40%;
- Magnesium (Mg) ranging from 0.35% to 1.20%;
- Chromium (Cr) ranging from 0.04% to 0.35%;

and optionally further comprises

- Zinc (Zn) $\leq 0.30\%$;
- Titanium (Ti) $\leq 0.20\%$;
- Lead (Pb) $\leq 0.40\%$;
- Bismuth (Bi) $\leq 0.8\%$.

10. Method for manufacturing a pressure element (10,10',10",10''') according to claim 9, wherein the aluminium alloy comprises or consists of the following ingredients in the following percentages by weight:

- Aluminium (Al) ranging from 97.65% to 98.50%;
- Silicon (Si) ranging from 0.20% to 0.60%;
- Iron (Fe) approximately equal to 0.35%;
- Copper (Cu) approximately equal to 0.10%;
- Manganese (Mn) approximately equal to 0.10%;
- Magnesium (Mg) ranging from 0.45% to 0.90%;
- Chromium (Cr) approximately equal to 0.10%;
- Zinc (Zn) approximately equal to 0.10%;
- Titanium (Ti) approximately equal to 0.10%.

11. Method for manufacturing a pressure element (10,10',10",10''') according to any one of claims 8 to 10, wherein the step consisting of obtaining the pressure element (10,10',10",10''') by extrusion of an aluminium alloy comprises the steps of:

- extruding a die of said aluminum alloy;
- cutting to size the extruded die, thereby obtaining the pressure element (10,10',10",10''');;
- processing at least one surface (11a,11b) of

the pressure element (10,10',10",10''') so as to increase the deformability thereof.

12. Method for manufacturing a pressure element (10,10',10",10''') according to claim 11, wherein the extrusion step takes place under the following operating conditions: 5

- Billet heating temperature of between 480° 10
-520 °C;
- Work start pick up pressure equal to about 180bar (18Mpa);
- Work pressure equal to about 160bar (16Mpa).

13. Method for manufacturing a pressure element (10,10',10",10''') according to claim 11 or 12, wherein the extrusion step takes place in an extrusion plant comprising a press having capacity of 2800t, and a container having a diameter equal to 0330 mm. 15
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14. Method for manufacturing a pressure element (10,10',10",10''') according to any one of claims 11 to 13, wherein the processing step of the at least one surface (11a,11b) of the pressure element (10,10',10",10''') occurs by milling and/or removal of material. 25

15. Method for manufacturing a pressure element (10,10',10",10''') according to claim 14, wherein the at least one surface (11a,11b) of the pressure element (10,10',10",10''') subject to machining to increase the deformability thereof is a lower surface and/or an upper surface of at least one elongated stem (11,11',11",11''') of the pressure element (10,10',10",10'''). 30
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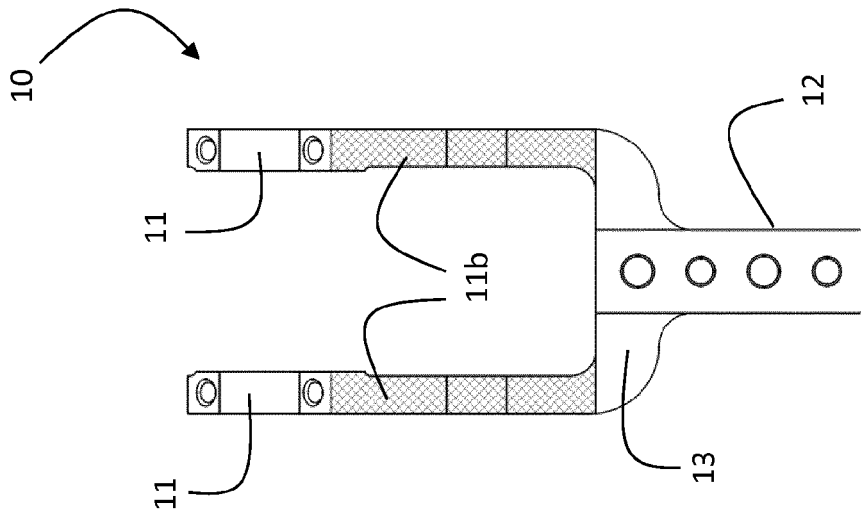


FIG. 3

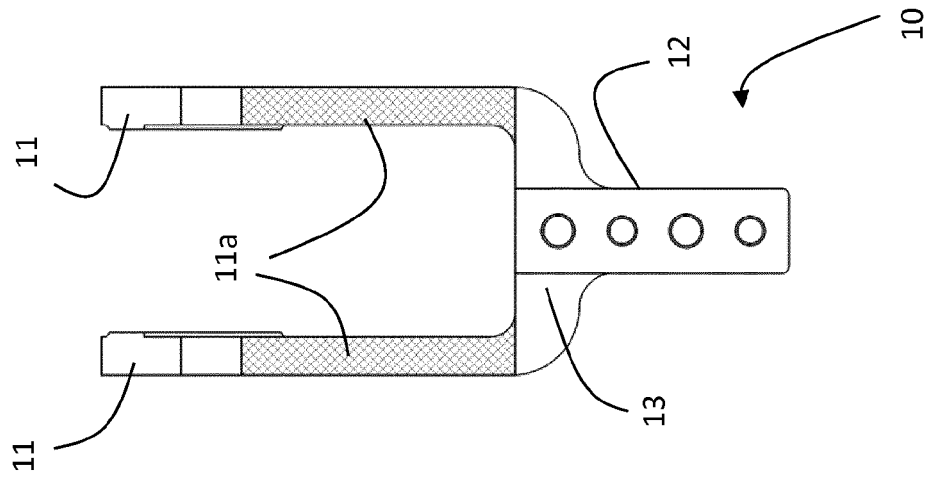


FIG. 2

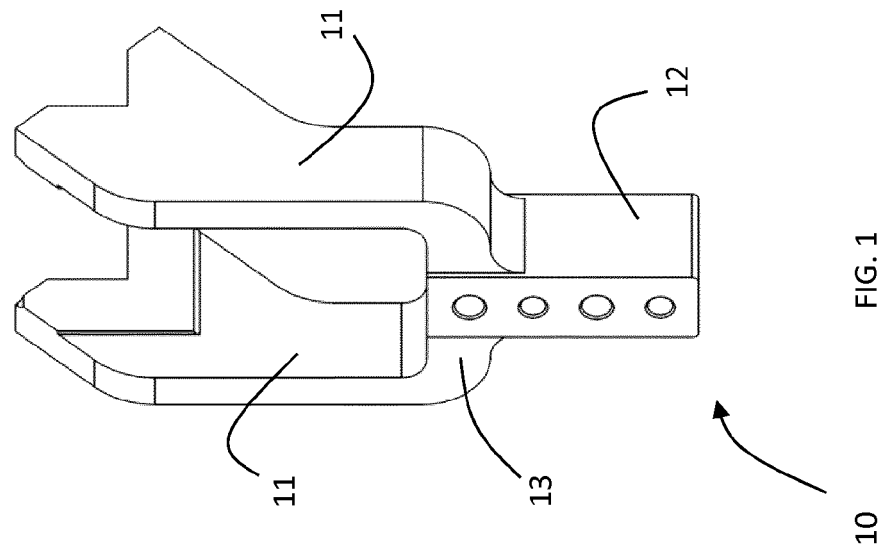
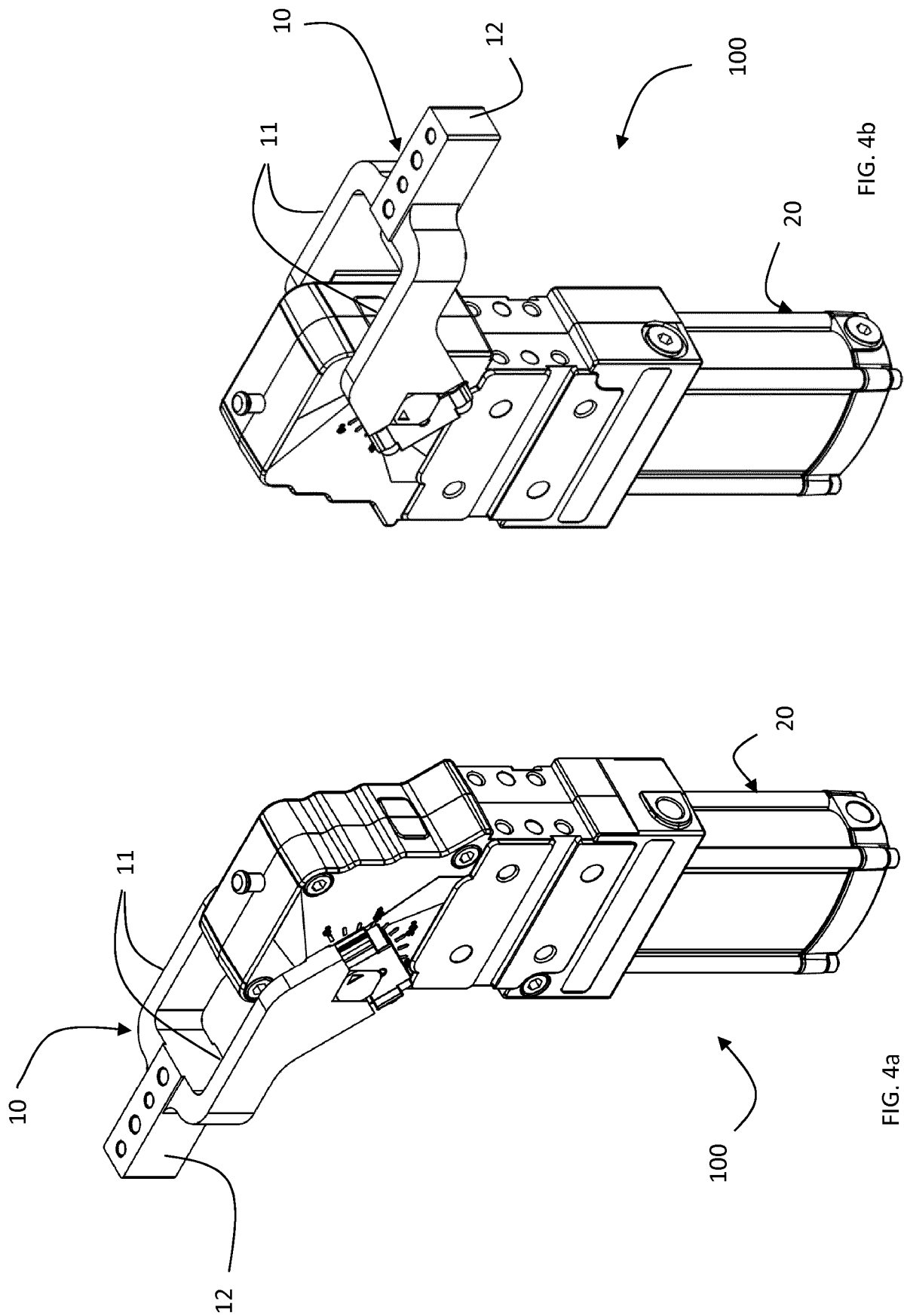


FIG. 1



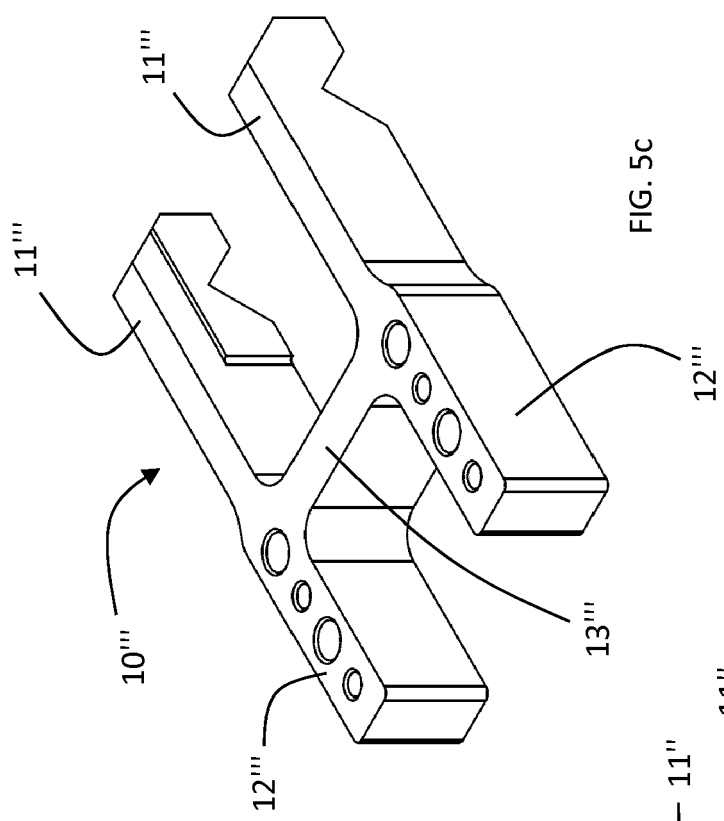


FIG. 5c

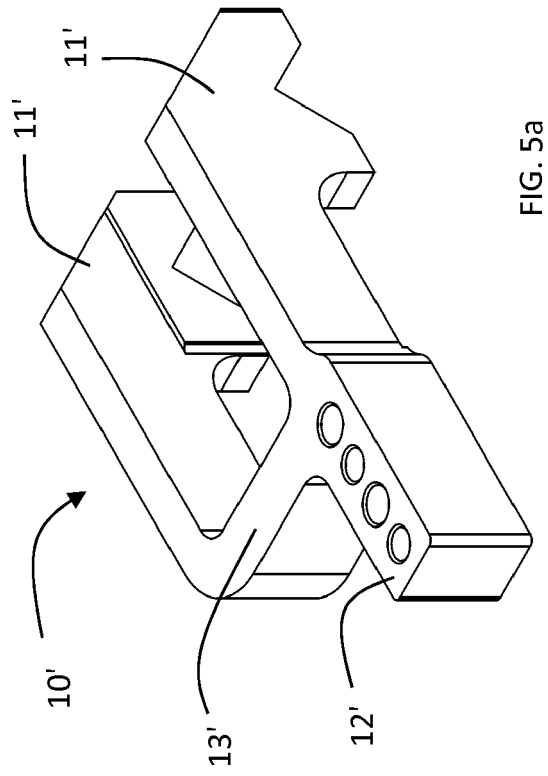


FIG. 5a

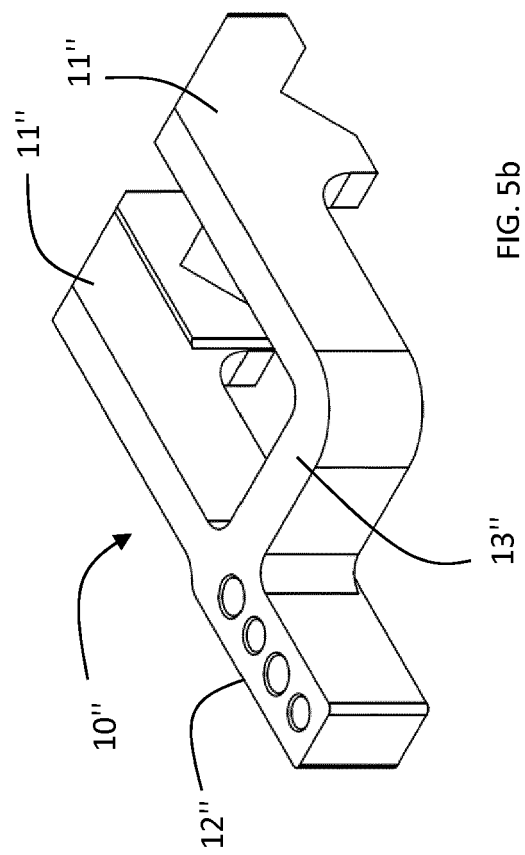


FIG. 5b



EUROPEAN SEARCH REPORT

 Application Number
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			C22C B23Q B25B
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Place of search Munich		Date of completion of the search 19 August 2016	Examiner González Junquera, J
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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