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Remarks:

Amended claims in accordance with Rule 86 (2) EPC.

(54) **Quick upper tool coupling and uncoupling device of a press brake**

(57) The rapid coupling and uncoupling device consists essentially of a plunger element 12 capable of being inserted into the clamp 4 or into the top beam/intermediary 1 of the press brake, or into the tool connection 2,

having a cursor 14 with a terminal part of a tapered form pressed by a spring to engage within a groove 16 present in the tool connection or in the clamp or in the top beam/intermediary, respectively.

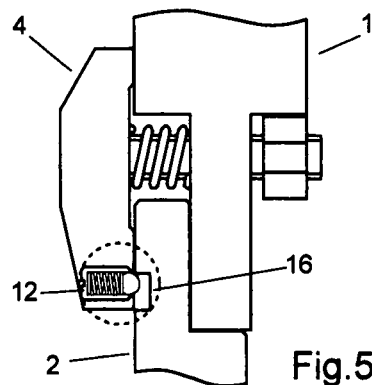


Fig.5

Description

[0001] The present invention refers to a quick upper tool coupling and uncoupling device of a press brake.

PRIOR ART

[0002] Press brakes are normally fitted with a safety device to prevent installed upper tools from falling off, whenever the tool clamps are placed in an opening position.

[0003] Because of the presence of such a fall-preventing safety device, the assembling and disassembling of a tool to the top beam or to an intermediary (extension unit of the tool connection fitted between tool connection and top beam) occurs in a horizontal direction, meaning that the tool, with the tool connection clamp in an opening position, is allowed to slide laterally along the cavity of the top beam or the intermediary in which the tool connection is inserted.

[0004] As this need for a tool sliding motion in a horizontal direction renders the machine setting-up periods rather lengthy, fall-preventing safety devices have been developed so as to be capable of allowing tool assembly and disassembly in a vertical direction, and therefore notable reduction of machine setting up time. However, most of these solutions require an additional installation of a pneumatic or hydraulic tool assembling and disassembling system, thus considerably inflating the operating costs.

[0005] Wholly mechanical systems for vertical assembling and disassembling tools are also available. However, these are rather complex and force the operator to hold the punch with a single hand during the uncoupling step, while having to use the other hand to actuate a device capable of uncoupling the tool. One of these latter systems, shown below in reference to Figure 2A, is described in document EP 494 714.

SCOPE OF THE INVENTION

[0006] The scope of this invention is to create a quick tool coupling and uncoupling device of a press brake, capable of consenting at least one of the following advantages:

- have a rather simple structure,
- allow it to be installed without appreciably affecting the structure of the tool and of the press brake and/or intermediary,
- allow it to be installed on a vast range of press brakes and tools, and to update existing press brakes by applying small modifications to the existing tools and/or clamps,
- allow it to also be utilized on tools weighing over 12.5 kg,
- allow it to be utilized even on tools of little dimensions,
- allow the tool, upon detaching, to be grasped in the most appropriate manner, without simultaneously actuating any releasing device.

SUMMARY OF THE INVENTION

[0007] The invention refers to a quick upper tool coupling and uncoupling device of tools to the top beam of a press brake, where each tool can be attached to the top beam or to an intermediary, by clamping/unclamping clamps. The device is characterized by the presence of a plunger comprising:

- an outer seat, fitted with an aperture on one side,
- a cursor capable of sliding within said seat, with a terminal part of a tapered shape, and capable of partially projecting said terminal part outside said aperture,
- a spring pressing the cursor to project outside said aperture with said terminal part.

It is also characterized by the presence of a groove with a horizontal axis parallel to the front of the press, which is allocated:

- according to a first variant, on a vertical surface of the part of the tool connection inserted into the cavity of the top beam or of the intermediary destined to seat the tool connection,
- according to a second variant, on the top beam or on the intermediary, inside the cavity seating the tool connection,
- according to a third variant, on the clamp assembling/disassembling the tool, inside the cavity seating the tool connection.

It is further characterized in that the plunger is allocated:

- according to said first variant, inside the clamp clamping/unclamping the tool or inside the top beam or inside the intermediary, with its aforesaid aperture opening up to a part of the surface of the clamp or of the top beam or of the intermediary, which is opposite said groove when the tool is installed,
- according to said second and third variant, inside the tool connection, with its aforesaid aperture opening up to a

part of the tool connection surface, which is opposite said groove when the tool is installed.

It is further characterized in that:

- the plunger is placed so as to allow the aforesaid terminal part of the cursor to enter within said groove and push against a rim of the groove, so as to prevent the tool from falling off, while the spring is chosen and calibrated so that, when said terminal part is in contact with the groove in its innermost entry position, the pressure exerted by it on the cursor is such as to prevent the tool from falling off, when the relative clamp is in a releasing position,
- said groove rim is in the first variant the upper rim, while in the second and third variant is the lower rim.

DRAWINGS

[0008] The characteristics and advantages of the invention will be more evident from the following description relating to a few preferred embodiments of a non limiting nature and drawn up with reference to the enclosed drawings, whose figures show:

- Figs. 1, 2, 3: typical examples of tool connections to a press top beam, providing tool assembling and disassembling operations in a lateral direction,
- Fig.2A: a known device allowing the connection of Figure 2 to be modified into a connection of a frontal type, meaning that it allows coupling and uncoupling of the tool in a vertical direction,
- Figs. 4, 5, 6, 7, 8: preferred examples of embodiment of the invention according to several variants,
- Figs. 9, 9A, 9B, 9C: application example of the invention, capable of converting a connection of a lateral type such as in Figure 2 into a frontal connection;
- Figs. 10, 10A, 10B, 10C, 10D: application examples of the invention, capable of converting a connection of a lateral type such as in Figure 1 into a frontal connection,
- Figs. 11, 11A, 11B, 11C, 11D: application examples of the invention, capable of converting a lateral connection such as in Figure 3 into a frontal connection.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0009] The Figures 1, 2, 3 show typical examples of connections of a tool to the top beam or to the intermediary of a press brake, connections that provide coupling and uncoupling operations of the tool which require a sliding motion of the tool in a lateral direction.

[0010] The various symbols in the figures represent:

- 1a, 1b, 1c: top beams or intermediaries of the press,
- 2a, 2b, 2c: tools,
- 3a, 3b, 3c: tool connections,
- 4a, 4b, 4c: tool clamps on the top beam or on the intermediary,
- 5a, 5b, 5c: reliefs extending along the lower rim of the clamp,
- 6a, 6b: reliefs extending along a flank of the tool connection,
- 7: cylindrical pins fastened to the flanks of the tool connection,
- 8a, 8b: grooves present on the top beam,
- 9: relief projecting from a flank of the tool connection.

[0011] In Figure 1 the safety device against the falling of the tool is represented by the parts 5a and 6a. When the tool connection is released as a result of unclamping the clamp 4a, the tool 2a will in fact not fall, as the relief 5a remains engaged in the groove 6a. In order to disassemble the tool, the same must be made to slide horizontally along the front of the press, until the groove 6a disengages from the relief 5a.

[0012] In Figure 2 the safety device against the falling of the tool is represented by the parts 7 and 8a. When the tool connection is released after unclamping the clamp 4b, the tool 2b will in fact not fall, as the cylindrical pins 7 remain engaged in the grooves 8a. Even in this case, a disassembling of the tool requires that it be made to slide horizontally along the front of the press, until the groove 8a disengages from the pins 7.

[0013] In Figure 3 the safety device against the falling of the tool is represented by the parts 5c and 9. When the tool connection is released after unclamping the clamp 4c, the tool 2c will not fall, as the relief 9 remains engaged with the relief 5c (if the tool were mounted with the relief 9 to the right, it would not fall because of its engagement with the groove 8b). In order to disassemble the tool, it must be made to slide horizontally along the front of the press, until the relief 9 disengages from the relief 5c.

[0014] Figure 2A schematically shows a section view of a known device which allows modifying the lateral type

connection in Figure 2 into a front type connection, meaning that it allows tool coupling and uncoupling operations in a vertical direction. According to this device, the pins 7 are eliminated and replaced by a tooth 10 capable of horizontally sliding within a cavity of the tool connection, and of being pressed by a spring 12 to remain in an engaged position with one of the two cavities 8a. When the clamp 4b is shifted to the left into a releasing position, the tool will not fall because of said engagement.

[0015] In order to deactivate the fall-preventing device, the push-button 11 must be pressed (so as to disengage the tooth 10 from the cavity 8a) and the tool must at the same time be supported with one hand, to prevent it from falling. The tool, supported by the operator by hand, may then be disassembled with a vertical motion toward the bottom.

[0016] The Figures 5, 6, 7, 8 schematically show schematic view of preferred forms of embodiment of the invention according to several variants.

[0017] Each of these figures schematically shows the lower extremity 1 of the top beam of a press (or of an intermediary installed there), the upper extremity 2 of an installed tool, a clamp 4, and a rapid coupling and uncoupling device according to the invention, essentially consisting of a plunger element 12 capable of being inserted into the clamp 4 or into the tool connection 2 or into the top beam / intermediary, comprising a cursor capable of sliding and having a terminal part of a tapered form, capable of engaging within a groove (16, 17, 18, 19) present in the tool connection, or in the clamp, or in the top beam/intermediary, respectively.

[0018] In particular, the plunger element 12, shown in Figure 4 on an enlarged scale according to a preferred form of embodiment, comprises:

- a seat 13 with an aperture on one side,
- a metallic cursor 14 with the shape of a sphere, capable of sliding within said seat and of partially projecting from said opening with a part acting as a tip,
- a spring 15 pressing the cursor to project from said aperture with said tip.

[0019] According to the aforesaid preferred embodiment, said seat has a cylindrical form. It could however also be of another form, for instance of a prismatic form.

[0020] The cursor spherical form is also not essential. It could in fact be a cursor with a terminal part of a differently tapered form, for instance of a cylindrical form, or with a vertical cross-section having the shape of a V or of an isosceles trapeze.

[0021] As to the groove, it has a horizontal axis on the front of the press and is allocated:

- according to a first variant (Figures 5, 5B and 7, 7B) on a vertical surface of the part of the tool connection inserted in the cavity of the top beam destined to seat the tool connection (see the groove 16 with a rectangular cross section in Figure 5, and the groove 18 with a V-shaped cross section in the Figures 7, 7B and 5B; in the Figures 5A and 7A see the enlargements of the parts drawn with a dotted line in the Figures 5 and 7;
- according to a second variant (Figure 6), on the top beam/intermediary within the seating cavity of the tool connection (see the groove 17 with a rectangular cross section in the part drawn with a dotted line in Figure 6 and shown enlarged in Figure 6A);
- according to a third variant (Figure 8) on the tool coupling and uncoupling clamp (see the V-shaped groove 19 in the part drawn with a dotted line in Figure 8 and shown enlarged in Figure 8A).

[0022] As evidenced in the drawings, the plunger is allocated:

- according to the aforesaid first variant, inside the tool coupling and uncoupling clamp or inside the top beam or intermediary, with its aforesaid aperture opening up to a part of the surface of the clamp or of the top beam or of the intermediary, respectively, that is opposite said groove when the tool is installed;
- according to the aforesaid second and third variant inside the tool connection, with the aforesaid aperture opening up to a part of the surface of the tool connection opposite to said groove.

[0023] Each of the drawings in the Figures 5 - 8 shows only one plunger. It is however evident that several plungers may be installed on the same clamp or on the same tool connection, all destined to engage with a same groove.

[0024] The plunger is positioned so as to allow the cursor tip to enter into the groove and to press against one rim of the groove itself. Moreover, the spring is chosen and calibrated so that, when the tip in contact with the groove is in a position of maximum entry, the pressure exerted by the same on the cursor is such as to prevent the tool from falling when the relative clamp is in a clamping position.

[0025] In the aforesaid first variant, the rim of the groove the cursor tip is pressing against is the upper rim, while in the aforesaid second and third variant it is the lower rim.

[0026] As relates to the preferred forms of embodiment shown in the Figures 5 - 8, the following criteria are preferred:

- maximum projection of the spherical cursor from the aperture of the plunger seat: a projection in the range of 30% to 33% of the diameter of the sphere;
- angular distance of the two flat surfaces forming the V-shaped grooves of the Figures 7 and 8 : 90°, as the inclination of the two surfaces is 45° and -45°, respectively:

- aperture (distance between the rims) of the V-shaped grooves: about 90% of the diameter of the spherical cursor;
- vertical element of the force exerted by the tip on the groove: at least equal to P/n, where "P" is the weight of the tool and "n" is the number of plungers on the clamp, which are pressing against the groove;
- number of plungers installed on the same clamp or tool connection: one every 1.5 kg of tool weight.

[0027] As relates to the ways of manually assembling and disassembling the tools fitted with the device according to the invention, it was observed that the easiest procedure is to assemble and disassemble the tool by turning it with respect to its operating axis by about 30%, before exerting an upward (loading) force or a downward (unloading) force.

[0028] The Figures 9A, 9B, 9C show an application example of the invention, capable of converting a lateral connection of the type of Figure 2 (shown in Figure 9) into a frontal connection.

[0029] This application in fact provides for eliminating the cylindrical pins 7, and replacing them with a plunger 12 inserted into the tool connection.

[0030] The Figure 9A shows the tool clamped by the clamp 4b.

[0031] The Figure 9B shows the position of the tool after the clamp has moved to a clamping position: instead of falling, the tool has in fact been kept suspended by the action of the plunger against the lower rim of the groove 8a.

[0032] The figure 9C shows how the plunger appears during the manual tool disassembling operation.

[0033] The Figures 10A, 10B, 10C and 10D show application examples of the invention, capable of converting a lateral connection of the type used in Figure 1 (shown in Figure 10) into a frontal connection.

[0034] According to these examples the relief 5a of the clamp 4a is eliminated and replaced:

- by a V-shaped groove provided in the clamp and by a plunger inserted into the tool connection according to the example of Figure 10A;
- by a V-shaped groove provided in the tool connection and by a plunger inserted into the clamp according to the example in Figure 10B;
- by a plunger inserted into the clamp in a position capable of engaging the tip of the plunger with the upper rim of the groove 6a of the tool connection, according to the example of Figure 10c;
- by a V-shaped groove provided in the tool connection and by a plunger inserted into the top beam/intermediary according to the example of Figure 10D.

[0035] The Figures 11A, 11B, 11C and 11D show application examples of the invention capable of converting a lateral connection of the type used of Figure 3 (shown in Figure 11) into a frontal connection.

[0036] According to these examples, the relief 9 in the tool connection is eliminated and replaced:

- by a V-shaped groove provided in the tool connection and by a plunger inserted into the clamp according to the example of Figure 11A (in Figure 11A, two opposed grooves are provided on the tool connection, so as to allow installing the tool in two possible positions: that indicated in the figure and that obtained by turning the tool 180° around the axis of the tool connection);
- by a V-shaped groove provided in the clamp and a plunger inserted into the tool connection according to the example in Figure 11B (Figure 11B shows with dotted lines a second groove on the top beam/intermediary, which is to be provided if an installation of the tool according to two possible positions as in Figure 11A is desired;
- by a plunger inserted into the tool connection in a position capable of engaging the tip of the plunger with the lower rim of the groove 8b of the top beam/intermediary, according to the example of Figure 11c;
- by a V-shaped groove provided in the tool connection and a plunger inserted into the top beam/intermediary according to the example of Figure 11D.

[0037] It is evident that the examples of embodiment described above for descriptive and non limiting purposes are susceptible of many obvious modifications adaptations, variants and substitutions of some elements with others of a functionally equivalent type, without thereby departing from the spirit of the invention and the scope of the following claims.

Claims

1. A quick coupling and uncoupling device of tools to the top beam of a press brake, where each tool can be attached

to the top beam or to an extension unit of the tool connection, named intermediary, by clamping/unclamping clamps, **characterized by** the presence of a plunger comprising:

- an outer seat, fitted with an aperture on one side,
 - a cursor capable of sliding within said seat, with a terminal part of a tapered shape, and capable of partially projecting said terminal part outside said aperture,
 - a spring pressing the cursor to project outside said aperture with said terminal part,
- further **characterized by** the presence of a groove with a horizontal axis parallel to the front of the press, which is allocated:
- according to a first variant, on a vertical surface of the part of the tool connection inserted into the cavity of the top beam or of the intermediary destined to seat the tool connection,
 - according to a second variant, on the top beam or on the intermediary, inside the cavity seating the tool connection,
 - according to a third variant, on the clamp assembling/disassembling the tool, inside the cavity seating the tool connection,
- further **characterized in that** the plunger is allocated:
- according to said first variant, inside the clamp clamping/unclamping the tool or inside the top beam or inside the intermediary, with its aforesaid aperture opening up to a part of the surface of the clamp or of the top beam or of the intermediary, which is opposite said groove when the tool is installed,
 - according to said second and third variant, inside the tool connection, with its aforesaid aperture opening up to a part of the tool connection surface, which is opposite said groove when the tool is installed,
- and further **characterized in that**:
- the plunger is placed so as to allow the aforesaid terminal part of the cursor to enter within said groove and push against a rim of the groove, so as to prevent the tool from falling off, while the spring is chosen and calibrated so that, when said terminal part is in contact with the groove in its innermost entry position, the pressure exerted by it on the cursor is such as to prevent the tool from falling off, when the relative clamp is in a releasing position,
 - said groove rim is in the first variant the upper rim, while in the second and third variant is the lower rim.

2. A device as in Claim 1, **characterized in that** said outer seat is of a cylindrical form and said cursor is of a spherical form.
3. A device as in Claim 2, **characterized in that** the maximum projection of the cursor from the aperture of the outer seat of the plunger is in the range of 30% to 33% of the diameter of the cursor.
4. A device as in Claim 1, **characterized in that** said terminal part of the cursor is of a cylindrical form, or has a cross section with the shape of a V or of an isosceles trapeze.
5. A device as in Claim 1, **characterized in that** said groove has a V-shaped cross section and the angular distance of the two flat surfaces forming the V-shaped groove is 90°, the inclination of the two surfaces being 45° and -45°, respectively.
6. A device as in Claims 2 and 5, **characterized in that** the distance of the rims of the V-shaped grooves is equal to about 90% of the diameter of the spherical cursor.
7. A device as in Claim 1, **characterized in that** when the aforesaid terminal part of the cursor pressing against a rim of the groove in order to prevent the tool from falling is in a maximum entry position, the pressure exerted by the same on the cursor is such that the vertical component of the force exerted on the groove is at least equal to P/n , where "P" is the weight of the tool and "n" is the number of plungers present on the clamp and pressing against the groove.
8. A device as in Claim 1, **characterized in that** the number of plungers installed on the same clamp, tool connection, top beam or intermediary is one every 1,5 kg of tool weight.

Amended claims in accordance with Rule 86(2) EPC.

1. A quick coupling and uncoupling device of tools to the top of a press brake, where each tool (2a, 2b, 2c) can be

attached to the top beam or to an extension unit of the tool connection, named intermediary, (1a, 1b, 1c) by clamping/
unclamping clamps (4a, 4b, 4c),
wherein the device comprises a plunger (12), which plunger (12) comprises:

- an outer seat (13), fitted with an aperture on one side,
- a cursor (14) capable of sliding within said seat (13), with a terminal part of a tapered shape, and capable of partially projecting said terminal part outside said aperture,
- a spring (15) pressing the cursor (14) to project outside said aperture with said terminal part,

wherein the device further presents a groove (18) with a horizontal axis parallel to the front of the press, which is allocated on a vertical surface of the part of the tool connection (3a, 3b, 3c) inserted into the cavity of the top beam (1a, 1b, 1c),

wherein the plunger (12) is allocated inside the clamp (4a, 4b, 4c) clamping/unclamping the tool (2a, 2b, 2c), with its aforesaid aperture opening up to a part of the surface of the clamp (4a, 4b, 4c), which is opposite said groove (18) when the tool (2a, 2b, 2c) is installed,

and wherein the plunger (12) is placed so as to allow the aforesaid terminal part of the cursor (14) to enter within said groove (18) and push against a rim of the groove (18), so as to prevent the tool (2a, 2b, 2c) from falling off, while the spring (15) is chosen and calibrated so that, when said terminal part is in contact with the groove (18) in its innermost entry position, the pressure exerted by it on the cursor (14) is such as to prevent the tool (2a, 2b, 2c) from falling off, when the relative clamp (4a, 4b, 4c) is in releasing position,
said groove rim being the upper rim;
wherein said cursor (14) is of a spherical form and said groove (18) has a V-shaped cross section.

2. A quick coupling and uncoupling device of tools to the top of a press brake, where each tool (2a, 2b, 2c) can be attached to the top beam or to an extension unit of the tool connection, named intermediary, (1a, 1b, 1c) by clamping/
unclamping clamps (4a, 4b, 4c),

wherein the device comprises a plunger (12), which plunger (12) comprises:

- an outer seat (13), fitted with an aperture on one side,
- a cursor (14) capable of sliding within said seat (13), with a terminal part of a tapered shape, and capable of partially projecting said terminal part outside said aperture, said cursor (14) being of a spherical form,
- a spring (15) pressing the cursor (14) to project outside said aperture with said terminal part,

wherein the device further presents a groove (18) with a horizontal axis parallel to the front of the press, which is allocated on a vertical surface of the part of the tool connection (3a, 3b, 3c) inserted into the cavity of the top beam (1a, 1b, 1c),

wherein the plunger (12) is allocated inside the top beam or inside the intermediary (1a, 1b, 1c), with its aforesaid aperture opening up to a part of the surface of the top beam or of the intermediary (1a, 1b, 1c), which is opposite said groove (18) when the tool (2a, 2b, 2c) is installed,

wherein the plunger (12) is placed so as to allow the aforesaid terminal part of the cursor (14) to enter within said groove (18) and push against a rim of the groove (18), so as to prevent the tool (2a, 2b, 2c) from falling off, while the spring (15) is chosen and calibrated so that, when said terminal part is in contact with the groove (18) in its innermost entry position, the pressure exerted by it on the cursor (14) is such as to prevent the tool (2a, 2b, 2c) from falling off, when the relative clamp (4a, 4b, 4c) is in releasing position,
said groove rim being the upper rim;
said groove (18) having a V-shaped cross section.

3. A quick coupling and uncoupling device of tools to the top of a press brake, where each tool (2a, 2b, 2c) can be attached to the top beam or to an extension unit of the tool connection, named intermediary, (1a, 1b, 1c) by clamping/
unclamping clamps (4a, 4b, 4c),

wherein the device comprises a plunger (12), which plunger (12) comprises:

- an outer seat (13), fitted with an aperture on one side,
- a cursor (14) capable of sliding within said seat (13), with a terminal part of a tapered shape, and capable of partially projecting said terminal part outside said aperture, said cursor (14) being of a spherical form,
- a spring (15) pressing the cursor (14) to project outside said aperture with said terminal part,

wherein the device further presents a groove (18) with a horizontal axis parallel to the front of the press, which is

allocated on the top beam or on the intermediary (1a, 1b, 1c), inside the cavity seating the tool connection, wherein the plunger (12) is allocated inside the tool connection (3a, 3b, 3c), with its aforesaid aperture opening up to a part of the tool connection surface, which is opposite said groove (18) when the tool (2a, 2b, 2c) is installed, and wherein the plunger (12) is placed so as to allow the aforesaid terminal part of the cursor (14) to enter within said groove (18) and push against a rim of the groove (18), so as to prevent the tool (2a, 2b, 2c) from falling off, while the spring (15) is chosen and calibrated so that, when said terminal part is in contact with the groove (18) in its innermost entry position, the pressure exerted by it on the cursor (14) is such as to prevent the tool (2a, 2b, 2c) from falling off, when the relative clamp (4a, 4b, 4c) is in releasing position, said groove rim being the lower rim; said groove (18) having a V-shaped cross section.

4. A quick coupling and uncoupling device of tools to the top of a press brake, where each tool (2a, 2b, 2c) can be attached to the top beam or to an extension unit of the tool connection, named intermediary, (1a, 1b, 1c) by clamping/ unclamping clamps (4a, 4b, 4c), wherein the device comprises a plunger (12), which plunger (12) comprises:

- an outer seat (13), fitted with an aperture on one side,
- a cursor (14) capable of sliding within said seat (13), with a terminal part of a tapered shape, and capable of partially projecting said terminal part outside said aperture,
- a spring (15) pressing the cursor (14) to project outside said aperture with said terminal part,

wherein the device further presents a groove (18) with a horizontal axis parallel to the front of the press, which is allocated on the clamp (4a, 4b, 4c) assembling/disassembling the tool (2a, 2b, 2c), inside the cavity seating the tool connection (3a, 3b, 3c), wherein the plunger (12) is allocated inside the tool connection (3a, 3b, 3c), with its aforesaid aperture opening up to a part of the tool connection surface, which is opposite said groove (18) when the tool (2a, 2b, 2c) is installed, and wherein the plunger (12) is placed so as to allow the aforesaid terminal part of the cursor (14) to enter within said groove (18) and push against a rim of the groove (18), so as to prevent the tool (2a, 2b, 2c) from falling off, while the spring (15) is chosen and calibrated so that, when said terminal part is in contact with the groove (18) in its innermost entry position, the pressure exerted by it on the cursor (14) is such as to prevent the tool (2a, 2b, 2c) from falling off, when the relative clamp (4a, 4b, 4c) is in releasing position, said groove rim being the lower rim; wherein said cursor (14) is of a spherical form and said groove (18) has a V-shaped cross section.

5. A device as in claims 1, 2, 3 or 4, **characterized in that** the maximum projection of the cursor (14) from the aperture of the outer seat (13) of the plunger (12) is in the range of 30% to 33% of the diameter of the cursor (14).

6. A device as in claims 1, 2, 3 or 4 **characterized in that** the angular distance of the two surfaces of the V-shaped groove (18) is 45° and -45°, respectively.

7. A device as in claims 1, 2, 3, 4 or 6, **characterized in that** the distance of the rims of the V-shaped grooves (18) is equal to about 90% of the diameter of the spherical cursor (14).

8. A device as in claims 1, 2, 3 or 4 **characterized in that** when the aforesaid terminal part of the cursor (14) pressing against a rim of the groove (18) in order to prevent the tool (2a, 2b, 2c) from falling is in a maximum entry position, the pressure exerted by the same on the cursor (14) is such that the vertical component of the force exerted on the groove (18) is at least equal to P/n , where "P" is the weight of the tool (2a, 2b, 2c) and "n" is the number of plungers (12) present on the clamp (4a, 4b, 4c) and pressing against the groove (18).

9. A device as in claims 1, 2, 3 or 4 **characterized in that** the number of plungers (12) installed on the same clamp (4a, 4b, 4c), tool connection (3a, 3b, 3c), top beam or intermediary (1a, 1b, 1c) is one every 1,5 kg of tool weight.

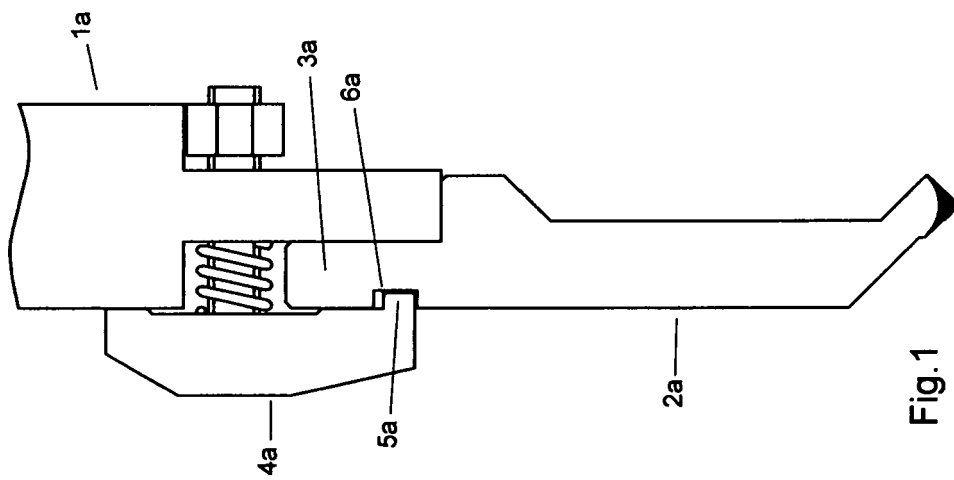


Fig. 1

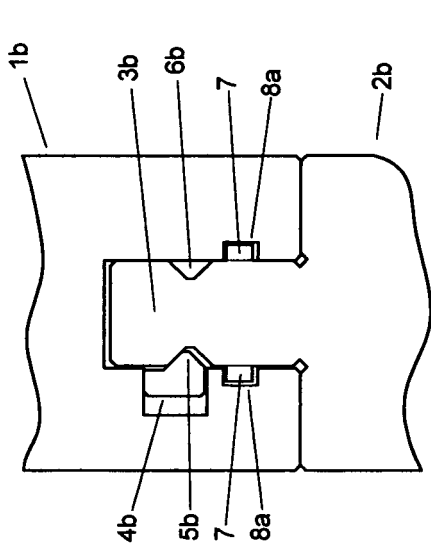


Fig. 2

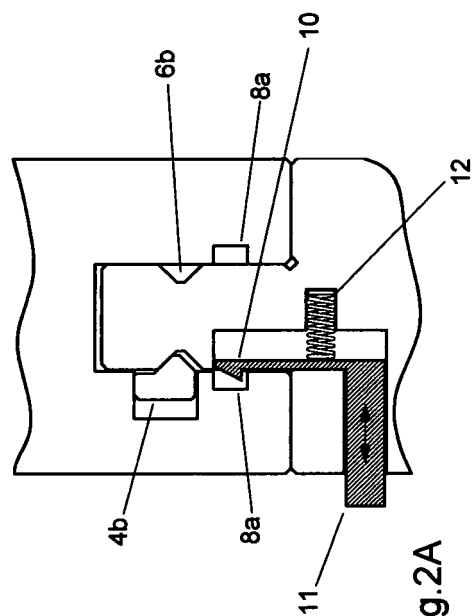


Fig. 2A

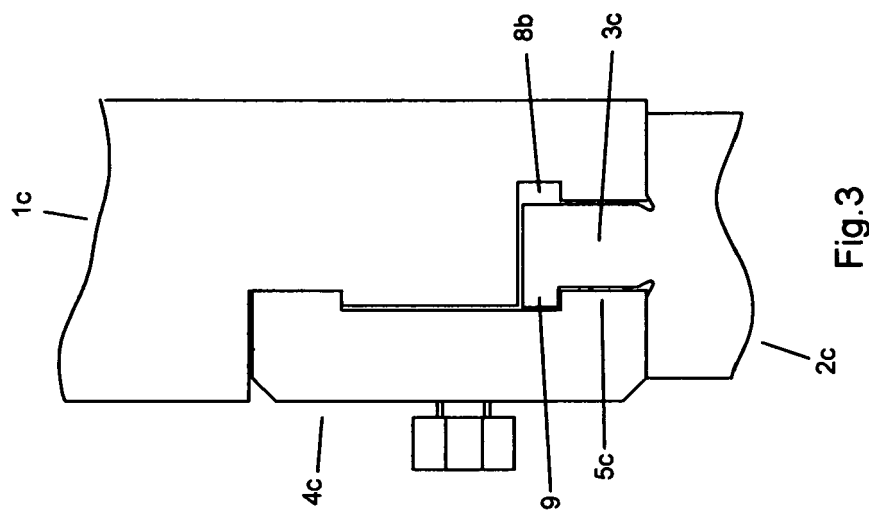


Fig. 3

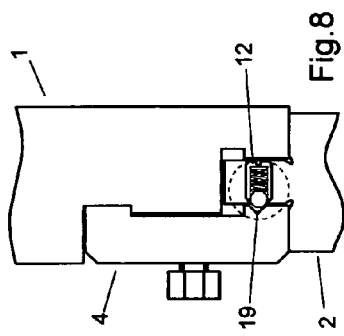


Fig. 8

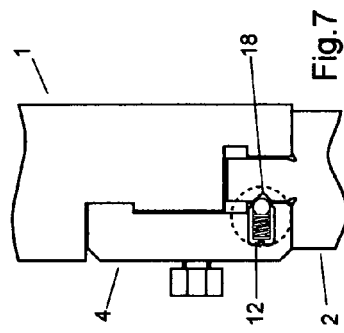


Fig. 7

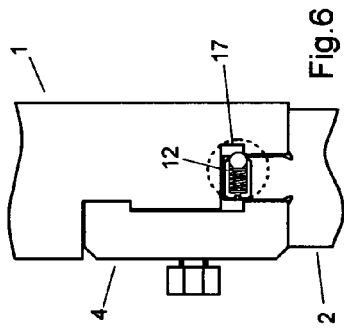


Fig. 6

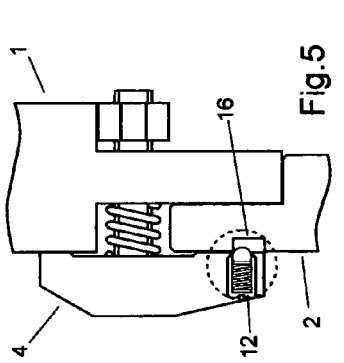


Fig. 5

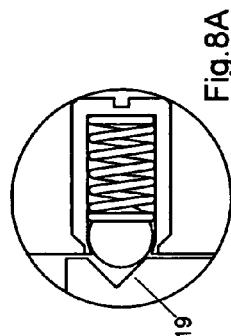


Fig. 8A

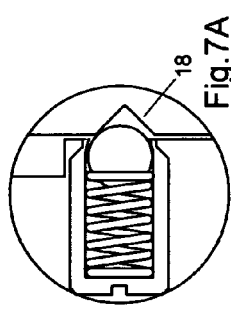


Fig. 7A

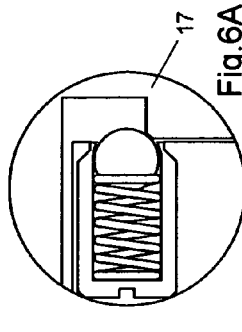


Fig. 6A

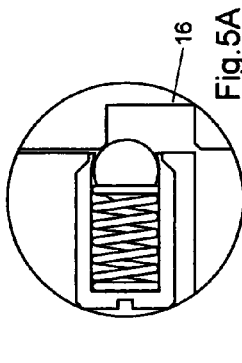


Fig. 5A

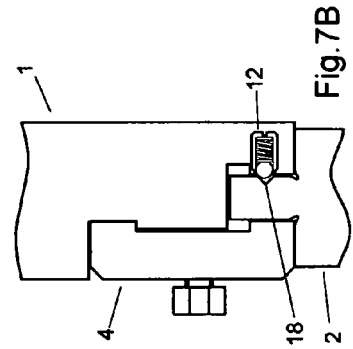


Fig. 7B

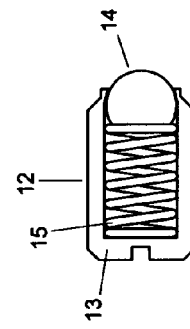


Fig. 4

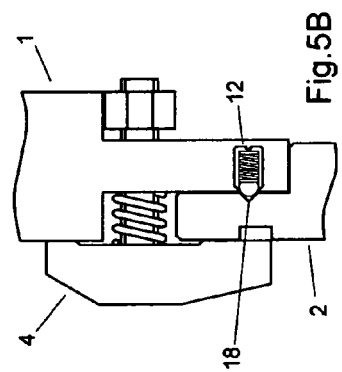


Fig. 5B

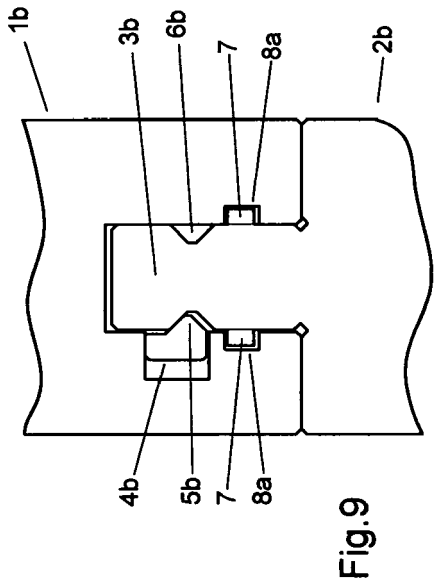


Fig. 9

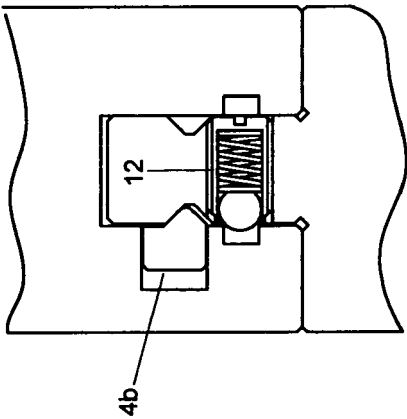


Fig. 9A

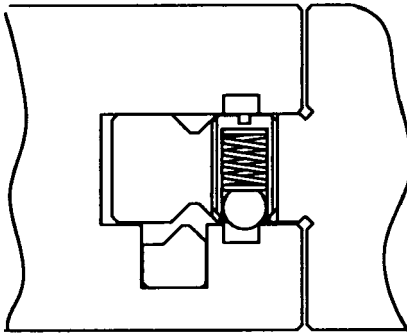


Fig. 9B

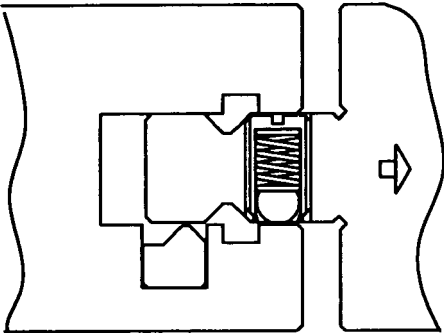


Fig. 9C

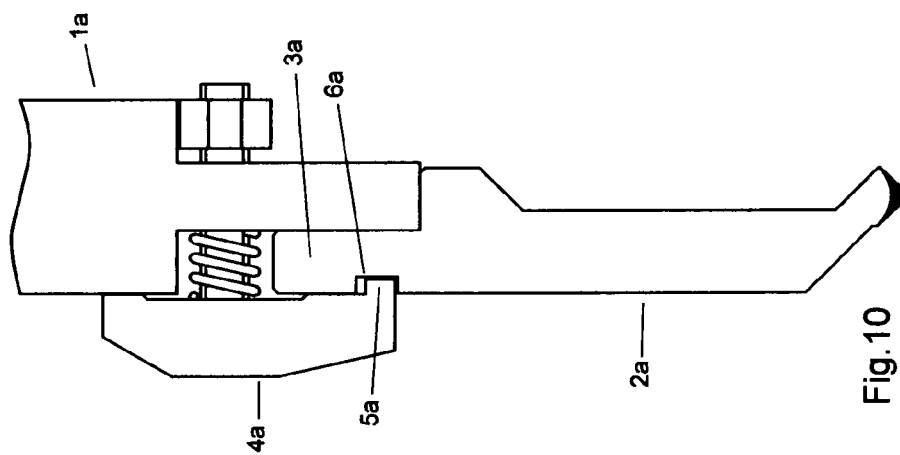


Fig. 10

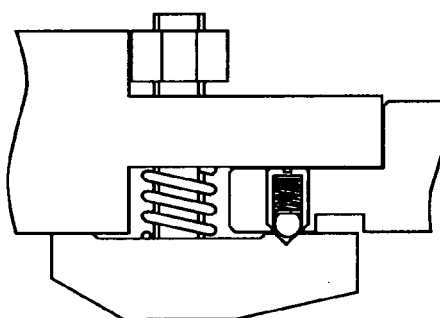


Fig. 10A

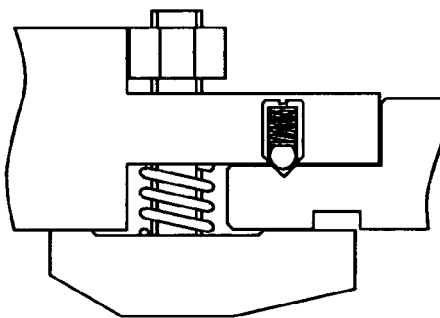


Fig. 10D

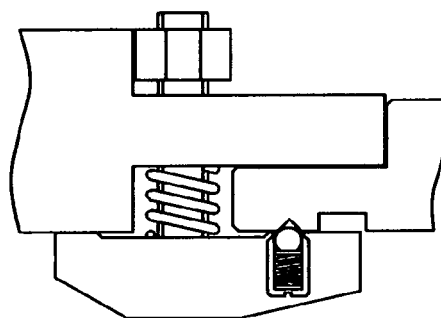


Fig. 10B

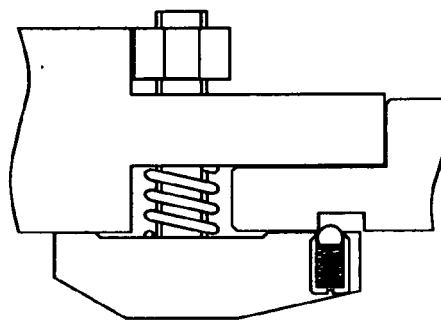


Fig. 10C

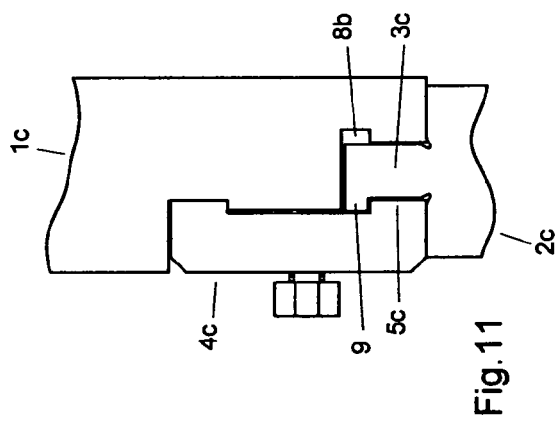


Fig. 11D

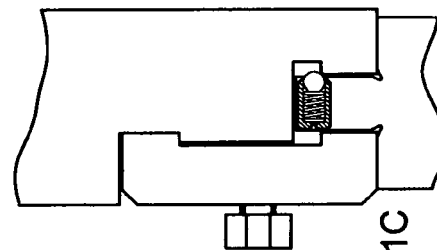


Fig. 11C

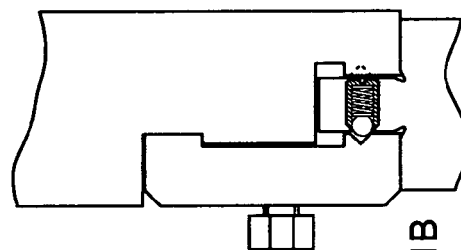


Fig. 11B

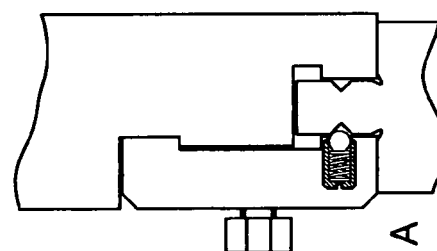


Fig. 11A



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EUROPEAN SEARCH REPORT

Application Number
EP 05 42 5638

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	PATENT ABSTRACTS OF JAPAN vol. 018, no. 524 (M-1682), 4 October 1994 (1994-10-04) & JP 06 182447 A (AMADA METRECS CO LTD), 5 July 1994 (1994-07-05)	1-8	B21D5/02
Y	* abstract *	1-8	
X	JP 06 182447 A (AMADA METRECS CO LTD) 5 July 1994 (1994-07-05)	1-8	
Y	* figures *	1-8	
Y	DE 35 24 694 A1 (MASCHINENFABRIK HILMA GMBH; MASCHINENFABRIK HILMA GMBH, 5912 HILCHENBA) 22 January 1987 (1987-01-22) * the whole document *	1-8	
Y	JP 10 277647 A (AMADA METRECS CO LTD) 20 October 1998 (1998-10-20) * paragraphs [0041] - [0044]; figures 5,6 *	1-8	
Y	PATENT ABSTRACTS OF JAPAN vol. 1999, no. 01, 29 January 1999 (1999-01-29) & JP 10 277647 A (AMADA METRECS CO LTD), 20 October 1998 (1998-10-20) * abstract *	1-8	TECHNICAL FIELDS SEARCHED (IPC) B21D
A,D	EP 0 494 714 A (MACHINEFABRIEK WILA B.V) 15 July 1992 (1992-07-15)		
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 12 January 2006	Examiner Ris, M
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ON EUROPEAN PATENT APPLICATION NO.**

EP 05 42 5638

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The members are as contained in the European Patent Office EDP file on
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12-01-2006

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
JP 06182447	A	05-07-1994	NONE	
JP 6182447	A	05-07-1994	NONE	
DE 3524694	A1	22-01-1987	NONE	
JP 10277647	A	20-10-1998	NONE	
EP 0494714	A	15-07-1992	DE 69218979 D1	22-05-1997
			DE 69218979 T2	24-07-1997
			ES 2101022 T3	01-07-1997
			JP 2771063 B2	02-07-1998
			JP 4294822 A	19-10-1992
			NL 9100034 A	03-08-1992
			US 5245854 A	21-09-1993

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 494714 A [0005]