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(71) Applicant: **van Leeuw, Jon Otegui  
Wheatley, Oxford OX33 1SF (GB)**

(72) Inventor: **van Leeuw, Jon Otegui  
Wheatley, Oxford OX33 1SF (GB)**

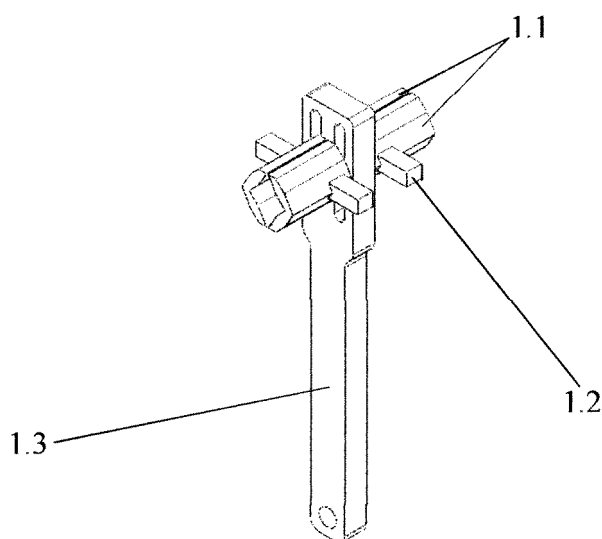
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(54) **Multifunctional spanner designs**

(57) This application concerns a set of multi-size spanner designs which use the force applied by the user on the spanner in order to increase not only the turning moment of the spanner, but also the force applied by the spanner on the workpiece concerned, hence guaranteeing the spanner's position around the workpiece without the need of time adjusting components, as being featured on alley keys. The set of multi-size spanner designs allows the user to be able to lock the tool onto the geometry

of the workpiece concerned and to then turn the workpiece by simultaneously guaranteeing that the tool is locked onto the workpiece without changing the turning direction of the spanner. The main advantage of the spanner designs concerned is that these can be used to turn a work piece of any size within a range of sizes and simultaneously decreasing the usage time per operation compared to conventional single size spanners.

Figure 1:



## Description

### Technical field:

Product design, mechanical engineering

### Description:

[0001] This application concerns a set of multi-size spanner designs which use the force applied by the user on the spanner in order to increase not only the turning moment of the spanner, but also the force applied by the spanner on the workpiece concerned, hence guaranteeing the spanner's position around the workpiece without the need of time adjusting components, as being featured on alley keys. The set of multi-size spanner designs allows the user to be able to lock the tool onto the geometry of the workpiece concerned and to then turn the workpiece by simultaneously guaranteeing that the tool is locked onto the workpiece without changing the turning direction of the spanner. The main advantage of the spanner designs concerned is that these can be used to turn a work piece of any size within a range of sizes and simultaneously decreasing the usage time per operation compared to conventional single size spanners.

[0002] Many spanner designs have been already invented. However, none of them offer the ability to apply a force on the workpiece in order to keep these well locked to the tool while simultaneously being able to turn the workpiece, as well as being able to fit to virtually any size and to offer the user a fitting time as short as the one to fit a single-size spanner onto the workpiece.

[0003] Alley keys are multi-size and can hence be fitted to a work piece of any size within a range of sizes, but the time taken to fit the tool to the workpiece is much longer than that to fit a single-size tool due to the fact that the movable Archimedes screw has a very low angle in order to minimise the displacements of the tool's locks when turning the workpiece with the spanner. So, the number of revolutions is significantly large, and hence time consuming.

[0004] On the other hand, single-size spanners take a very short time to be fitted to the workpiece, but due to the fact that these can only be fitted to a single workpiece size, any workshop would need a whole set of spanners in order to turn workpieces of all sizes. Furthermore, the time taken by the user to find the spanner with the required size in between two operations can be time consuming.

[0005] The present invention concerns a spanner tool which comprises two oppositely positioned sliding locking components which are positioned such that these can slide on a set of two parallel positioned slots, slits, cavities, hollow channels, narrow openings, or groves, and whose position can be adjusted by a set of adjusting bars.

[0006] The preferred embodiments of the invention are the following.

[0007] A spanner tool as described above, which features two sliding locking components (7.2) comprising at least one sliding locking element (7.1, 7.3) each.

[0008] A spanner tool as described above in which the sliding locking elements are connected through the slots by a preferably circular connecting element.

[0009] A spanner tool as described above which comprises two sliding locking components, each comprising two oppositely positioned sliding locking elements which are each positioned in front of one of the two sides of the set of slots.

[0010] A spanner tool as described above which comprises a handle being connected to the set of slots, hence forming a single piece component comprising the two said elements.

[0011] A spanner tool as described above which comprises a multifunctional geometry on the outer areas of at least one pair of its four sliding locking elements, comprising two surfaces whose planes are positioned at 270 (or 90) degrees perpendicular to each other along its outer geometry while comprising two surfaces whose planes are positioned at 240 (or 120) degrees perpendicular to each other along its inner geometry.

[0012] A spanner tool as described above which comprises a multifunctional geometry on the inner areas of at least one pair of its four sliding locking elements, comprising two surfaces whose planes are positioned at 120 (or 240) degrees perpendicular to each other along its outer geometry while comprising two surfaces whose planes are positioned at 90 (or 270) degrees perpendicular to each other along its inner geometry.

[0013] A spanner tool as described above which comprises two sliding locking components, in which each comprises a multifunctional square-shaped geometrised sliding locking element on at least one of its sides, which comprises two surfaces whose planes are positioned at 90 (or 270) degrees perpendicular to each other along both its inner and outer areas.

[0014] A spanner tool as described above which comprises two sliding locking components, in which each comprises a multifunctional hexagonal-shaped geometrised sliding locking element on at least one of its sides, which comprises two surfaces whose planes are positioned at 120 (or 240) degrees perpendicular to each other along both its inner and outer areas.

[0015] A spanner tool as described above which comprises two multifunctional sliding locking components, in which each comprise said feature stated on claim 8 on one of its two sliding locking elements while comprising said feature stated on claim 9.

[0016] A spanner tool as described above further comprising an element which comprises the set of slots, a rod which is attached to the set of slots at an angle from about 90 to less than 180 degrees, as well as a handle positioned at the other end of the rod, hence forming a single piece component.

[0017] A spanner tool as described above which is made from a plastic material, a wood-based material, or

a metal such as aluminium, titanium, iron or steel, preferably high carbon steel such as tool steel.

**[0018]** A spanner tool as described above which is manufactured using an industrial process such as plate cutting (preferably laser cutting methods), plastic injection moulding processes, resin transfer moulding processes, sintering processes (preferably laser sintering processes), and/or casting processes, preferably investment casting processes.

**[0019]** Additionally, the spanner designs concerned in this application offer the possibility of being not only multi-size but also to be able to be fitted to at least two types of workpiece geometries (e.g. hexagonal and/or square sized) while simultaneously offering a multi-size design for each of the two types of workpiece geometries.

**[0020]** The workpieces to which the spanner designs concerned are designed to be fitted to should be preferably nuts, bolts and screws.

Figure 1 shows an isometric view of a multi-size spanner design which can be fitted to both hexagonal and square shaped workpieces on both sides of the spanner's handle.

Figure 2 shows a zoomed isometric view of the mechanism of the spanner design comprised on Figure 1.

Figure 3 shows a trimetric view of the handle with the slots and the circular cavity.

Figure 4 shows an isometric view of the set of connected adjusting bars, which connects the two sliding locking elements together.

Figure 5 shows an isometric inner view of one of the two sliding locking components of the spanner design comprised on Figures 1 and 2.

Figure 6 shows an isometric outer view of one of the two sliding locking components of the spanner design comprised on Figures 1 and 2.

Figure 7 shows an isometric view of a multi-size spanner design which can be fitted to both hexagonal and square shaped workpieces on which one side is used to be fit hexagonal shaped workpieces only while the other is used to fit square shaped workpieces only.

Figure 8 shows a zoomed isometric view of the mechanism of the spanner components comprised on Figure 7.

Figure 9 shows an isometric inner view of one of the two sliding locking components of the spanner design comprised on Figures 7 and 8.

Figure 10 shows an isometric outer view of one of the two sliding locking components of the spanner design comprised on Figures 7 and 8.

Figure 11 shows an isometric view of a multi-size spanner design which can be fitted to only one workpiece geometry (in this case hexagonal shaped workpieces).

Figure 12 shows a zoomed isometric view of the mechanism of the spanner design comprised on Figure 11.

Figure 13 shows an isometric inner view of one of the two sliding locking components of the spanner design comprised on Figures 11 and 12.

Figure 14 shows an isometric outer view of one of the two sliding locking components of the spanner design comprised on Figures 11 and 12.

Figure 15 shows an isometric view of a spanner featuring the same design concept as that shown on Figure 1, but with a vertically-oriented handle.

Figure 16 shows an isometric view of the vertical element of the spanner design featured on Figure 15.

**[0021]** The spanner design concerned is composed by a handle [1.3], two sliding locking components [1.1] and a set of connected adjusting bars [1.2].

**[0022]** The spanner design's functionality is guaranteed thanks to the design of the featured components. The handle [1.3] features a set of two hollow slots [2.3] which are used to guide the two sliding locking elements [1.1]. So, the sliding locking elements [1.1] are allowed to be displaced until reaching the ends of the slots [2.4]. The maximum inner size (or inner diameter) of the workpieces that the spanner can accommodate is the inner size (or inner distance) between the inner surfaces of the two sliding locking elements [1.1] when these [1.1] are slid to the ends of the slots [2.4]. The set of connected adjusting bars [1.2] adjusts the position of the sliding locking elements [1.1] by the means of its two bars [2.2], which are each positioned through the cavities of the sliding locking elements [1.1]. The sliding locking elements [1.1] feature each two cavities (one at each side of the handle [1.3]). The cavities of the sliding locking elements [1.1] are surrounded by a layer of material [2.1] to ensure that the high stresses applied by the adjusting bars [1.2] do not change the required orientation of the sliding locking elements [1.1].

**[0023]** The set of adjusting bars [1.2] can also be used as handles to open and close the sliding locking elements [1.1] of the spanner. So, each bar [2.2] can be moved towards either side to open or close the sliding locking elements [1.1] of the spanner, depending on the tool's orientation and the side of the sliding locking elements

[1.1] on which the workpiece is locked to.

**[0024]** The handle [1.3] not only features the set of slots previously mentioned [3.1] and the handle itself [3.3]. It also features a circular cavity [3.2] situated between the two slots [3.1], as well as a circular cavity [3.4] situated on the lower part of the handle. The upper circular cavity [3.2] is used to maintain the set of adjusting bars [1.2] together by the means of a circular element, which is positioned inside the cavity [3.2]. So, the cavity [3.2] has to be situated in the middle of the distance of the slots [3.1] and also between the two hollow slots [3.1]. The lower cavity [3.4] is used to hang the spanner to a spanner hanging device.

**[0025]** The set of connecting adjusting bars [1.2] feature the two bars [4.1] and the connecting element [4.3]. The connecting element [4.3] is positioned inside the handle's cavity [3.2] and hence connects the two adjusting bars [4.1] while simultaneously guaranteeing the set of adjusting bars [4.1] in its required position (inside the handle's circular cavity [3.2]). Each end of the connecting element [4.3] features a stepped geometry [4.2]. The stepped geometry [4.2] avoids the displacement of the set of adjusting bars [1.2] in a direction perpendicular to the diameter of the connecting element [4.3], hence keeping the connecting element [4.3] in its required position. On each side, the distance of the connecting element [4.3] from the stepped geometries [4.2] to the bars themselves [4.1] allows the layer of material [2.1] of the sliding locking elements [1.1] to be positioned around the bars [4.1].

**[0026]** In the case of the spanners concerned on Figures 1 and 2, the sliding locking elements [1.1] are designed to accommodate both square shaped and hexagonal shaped workpieces on both sides of the handle [1.3].

**[0027]** In order to accomplish this, the inner geometry of the inner areas of the sliding locking elements [1.1] features two surfaces whose planes are positioned 90 degrees perpendicular to the other [5.2], hence accommodating square shaped workpieces. At the same time, the outer geometry of the inner part of the sliding locking elements [1.1] features two surfaces whose planes are positioned 120 degrees perpendicular to the other [5.1], hence accommodating hex shaped workpieces.

**[0028]** However, the geometry of the outer areas of the sliding locking elements [1.1] is different to that of the inner areas. The inner geometry of the outer areas of the sliding locking elements [1.1] features two surfaces (one at each end) whose planes are positioned 60 degrees perpendicular to the other [6.1], hence accommodating hexagonal shaped socket head cap workpieces, preferably hexagonal shaped socket head cap screws. At the same time, the outer geometry of the outer areas of the sliding locking elements [1.1] features two surfaces (one at each end) whose planes are positioned 90 degrees perpendicular to the other [6.2], hence accommodating square shaped socket head cap workpieces, preferably square shaped socket head cap screws.

**[0029]** The two locking elements [1.1] are connected together by the connecting elements [5.4,6.4], which also ensures their required position when connected to the handle [1.3]. Simultaneously, the bars [4.1] ensure that the two sets of locking elements [1.1] are constantly positioned opposite to each other, hence guaranteeing that the workpiece will be locked adequately. In order to accomplish this, each bar [4.1] of the set of adjusting bars [1.2] is positioned inside the square shaped cavities [5.3, 6.3] of the sets of sliding locking elements [1.1] in order to guarantee that the set of sliding locking elements [1.1] will be in displacement when the set of adjusting bars [1.2] will be in displacement, but that simultaneously both elements [1.1 and 1.2] will be always positioned perpendicular to the other. The cavities [5.3,6.3] each follow the profile of the cross-sectional area of the bars [4.1] in order to guarantee that the two elements [1.1 and 1.2] are locked together accurately while minimising functional error.

**[0030]** The multi-size spanner design concerned on Figure 7 features a very similar design to that concerned on Figure 1. Similarly to that concerned on Figure 1, the spanner design concerned on Figure 7 is composed by a handle [7.5], two sliding locking components [7.2] and a set of connected adjusting bars [7.4].

**[0031]** However, the spanner design featured on Figure 7 offers two different pairs of sliding locking elements [7.1, 7.3] (each pair features a different geometry). As on the spanner design featured on Figure 1, each of the sliding locking elements [7.1] situated on one side of the handle [7.5] are connected with the sliding locking elements situated opposite [7.3] on the other side of the handle [7.5]. This means that the two pairs of sliding locking elements [7.1, 7.3] (one situated at each side of the handle [7.5]) are each composed of two individual components [7.2]. Each sliding locking component [7.2] features a different sliding locking element [7.1, 7.3] at each side of the handle [7.5]. Like on the spanner design featured on Figure 6, the two sliding locking components [7.2] featured on the spanner are composed of two sliding locking elements [7.1, 7.3] (one square shaped sliding locking element on one side [7.1] and one hex shaped sliding locking element on the other side [7.3]).

**[0032]** The set of adjusting bars [7.4] can also be used as handles to open and close the sliding locking components [7.2] of the spanner. So, each bar [7.4] can be moved towards either side to open or close the sliding locking components [7.2] of the spanner, depending on the tool's orientation and the side of the sliding locking components [7.2] on which the workpiece is locked to.

**[0033]** Similarly to that featured on Figure 2, the spanner design's functionality is guaranteed thanks to the design of the featured components. The handle [7.5] features a set of two hollow slots [8.3] which are used to guide the two sliding locking components [7.2]. So, the sliding locking components are allowed to be displaced until reaching the ends of the slots [8.4]. The maximum size of the workpieces that the spanner can accommo-

date is the size offered when the two sliding locking components [7.2] are slid to the ends of the slots [8.4]. The set of connected adjusting bars [7.4] adjusts the position of the sliding locking elements [7.2] by the means of its two bars [8.2], which are each positioned through the cavities of the sliding locking elements [7.2]. The sliding locking elements [7.2] feature each two cavities (one at each side of the handle [7.5]). The cavities of the sliding locking elements [7.2] are surrounded by a layer of material [8.1] to ensure that the high stresses applied by the adjusting bars [8.2] do not change the required orientation of the sliding locking elements [7.2].

**[0034]** In the case of the spanner design concerned on Figures 7 and 8, the sliding locking components [7.2] are designed to accommodate both square shaped and hexagonal shaped workpieces.

**[0035]** On one side, a pair of sliding locking elements [7.1] features a square shaped geometry, hence featuring an angle of 90 degrees along its inner geometry while simultaneously offering an angle of 270 degrees along its outer geometry. This means that this pair of sliding locking elements [7.1] is designed only for square shaped workpieces (bolts, screws and nuts) and square shaped socket head cap workpieces. In order to accomplish this, the inner geometry [9.1] of the sliding locking elements [7.1] features two surfaces [9.1] whose planes are positioned 90 degrees perpendicular to each other [9.1], hence accommodating square shaped workpieces. At the same time, the outer geometry [10.1] of the sliding locking elements [7.1] features two surfaces [10.1] whose planes are positioned 270 degrees perpendicular to the other [10.1], hence accommodating square shaped workpieces, preferably square shaped socket head cap screws.

**[0036]** On the other side however, the opposite pair of sliding locking components [7.3] features a hexagonal shaped geometry, hence featuring an angle of 120 degrees along its inner geometry while simultaneously offering an angle of 240 degrees along its outer geometry. This means that this pair of sliding locking components [7.3] is designed only for hexagonal shaped workpieces (bolts, screws and nuts) and hexagonal shaped socket head cap workpieces. In order to accomplish this, the inner geometry [9.2] of the sliding locking elements [7.3] features two surfaces [9.2] whose planes are positioned 60 degrees perpendicular to each other [9.2], hence accommodating hexagonal shaped workpieces. At the same time, the outer geometry [10.2] of the sliding locking elements [7.3] features two surfaces [10.2] whose planes are positioned 240 degrees perpendicular to each other [10.2], hence accommodating hexagonal shaped workpieces, and preferably hexagonal shaped socket head cap screws.

**[0037]** The two sliding locking elements [7.1, 7.3] of each of the two sliding locking components [7.2] are connected together by the connecting elements [9.4, 10.4], which also ensures their required position when connected to the handle [7.5]. Simultaneously, the bars [8.2] en-

sure that the two sets of locking elements [7.2] are constantly positioned opposite to each other, hence guaranteeing that the workpiece will be locked adequately. In order to accomplish this, each bar [8.2] of the set of adjusting bars [7.4] is positioned inside the square shaped cavities [9.3, 10.3] of the sets of sliding locking elements [7.2] in order to guarantee that the set of sliding locking elements [7.2] will be in displacement when the set of adjusting bars [7.4] will be in displacement, but that simultaneously both elements [7.2 and 7.4] will be always positioned perpendicular to the other. The cavities [9.3, 10.3] each follow the profile of the cross-sectional area of the bars [8.2] in order to guarantee that the two elements [7.2 and 7.4] are locked together accurately while minimising functional error.

**[0038]** The multi-size spanner design concerned on Figure 11 features a very similar design to that concerned on Figures 1 and 7. Similarly to that concerned on Figures 1 and 7, the spanner design concerned on Figure 11 is composed by a handle [11.3], two sliding locking components [11.1] and a set of connected adjusting bars [11.2].

**[0039]** The set of adjusting bars [11.2] can also be used as handles to open and close the sliding locking components [11.1] of the spanner. So, each bar [11.2] can be moved towards either side to open or close the sliding locking components [11.1] of the spanner, depending on the tool's orientation and the side of the sliding locking components [11.1] on which the workpiece is locked to.

**[0040]** Similarly to that featured on Figures 2 and 8, the spanner design's functionality is guaranteed thanks to the design of the featured components. The handle [11.3] features a set of two hollow slots [12.3] which are used to guide the two sliding locking components [12.2]. So, the sliding locking components are allowed to be displaced until reaching the ends of the slots [12.4]. The maximum size of the workpieces that the spanner can accommodate is the size offered when the two sliding locking components [11.1] are slid to the ends of the slots [12.4]. The set of connected adjusting bars [11.2] adjusts the position of the sliding locking elements [11.1] by the means of its two bars [12.2], which are each positioned through the cavities of the sliding locking elements [11.1]. The sliding locking elements [11.1] feature each two cavities (one at each side of the handle [11.3]). The cavities of the sliding locking elements [11.1] are surrounded by a layer of material [12.1] to ensure that the high stresses applied by the adjusting bars [12.2] do not change the required orientation of the sliding locking elements [11.1].

**[0041]** In the case of the spanner design concerned on Figures 11 and 12, the sliding locking components [11.1] are designed to accommodate hexagonal shaped workpieces only.

**[0042]** Therefore, the geometry of the sliding locking elements [11.1] is the same on both sides of the handle. So, on both sides, the pairs of sliding locking elements [11.1] features a hexagonal shaped geometry, hence featuring an angle of 120 degrees along its inner geometry

[13.1] while simultaneously offering an angle of 240 degrees along its outer geometry [14.1]. This means that both sets of sliding locking elements [11.1] are designed only for hexagonal shaped workpieces (bolts, screws and nuts) and hexagonal shaped socket head cap workpieces. In order to accomplish this, the inner geometry [13.1] of the sliding locking elements [11.1] features two surfaces [13.1] whose planes are positioned 120 degrees perpendicular to each other [13.1], hence accommodating hexagonal shaped workpieces. At the same time, the outer geometry [14.1] of the sliding locking elements [11.1] features two surfaces [14.1] whose planes are positioned 240 degrees perpendicular to the other [14.1], hence accommodating square shaped workpieces, preferably square shaped socket head cap screws.

**[0043]** The two sliding locking components [11.1] of each of the two sliding locking components [11.1] are connected together by the connecting elements [13.2, 13.3], which also ensures their required position when connected to the handle [11.3]. Simultaneously, the bars [12.2] ensure that the two sets of locking elements [11.1] are constantly positioned opposite to each other, hence guaranteeing that the workpiece will be locked adequately. In order to accomplish this, each bar [12.2] of the set of adjusting bars [11.2] is positioned inside the square shaped cavities [13.2, 14.2] of the sets of sliding locking elements [11.1] in order to guarantee that the set of sliding locking elements [11.1] will be in displacement when the set of adjusting bars [11.2] will be in displacement, but that simultaneously both elements [11.1 and 11.2] will be always positioned perpendicular to the other. The cavities [13.2, 14.2] each follow the profile of the cross-sectional area of the bars [12.2] in order to guarantee that the two elements [11.1 and 11.2] are locked together accurately while minimising functional error.

**[0044]** The design featured on Figures 11, 12, 13 and 14 can also be used for square shaped workpieces and square shaped socket head cap workpieces only if square shaped sliding locking elements [7.1] are being used on both sides of each of the two sliding locking components [7.2] comprised on the spanner.

**[0045]** The spanner design featured on Figures 1, 7 and 11 can also be used in a spanner featuring a vertical element [15.5] comprising a vertical rod [15.3], a handle on top of the rod [15.4] and a set of slots [15.7]. This design is shown on Figures 15. The vertical element is shown on Figure 16.

**[0046]** The vertical element [15.5] offers the advantage to the user of being able to apply the turning moment to the workpiece with the two hands while simultaneously optionally pushing downwards (or pulling upwards) on the tool's handle [15.4] in order to keep the tool's sliding locking components [15.1, 15.6] in their required position, hence minimising the horizontal surface area required to apply the required torque operations on the workpiece. Furthermore, the design concerned (Figures 15 and 16) minimises the horizontal surface area needed to perform the required torque operations at the plane level of the

workpiece to be turned.

**[0047]** The user can pull or push on the handle [15.4] in order to keep the spanner's sliding locking components [15.1, 15.6] in the required position.

5 **[0048]** Each of the two sliding locking components [15.1, 15.6] comprises two sliding locking elements [15.1, 15.6]. More precisely, each comprises one upper sliding locking element [15.6] and one lower sliding locking element [15.1].

10 **[0049]** In order to position the vertical spanner into a workpiece prior of locking it with the sliding locking components [15.1, 15.6], the upper sliding locking elements [15.6] can be inserted onto the workpiece. More precisely, the spanner's sliding locking elements [15.1, 15.6] can be inserted onto the workpiece by pulling the spanner (by the means of the handle [15.4]) upwards in the case of workpiece heads that are positioned below another element, or by pushing the spanner (by the means of the handle [15.4]) downwards in the case of workpiece heads that are positioned on top of another element (in most cases).

15 **[0050]** The vertical spanner design therefore comprises a vertical element [15.5] (comprising a rod [15.3], a handle [15.4] and a set of slots [15.7]). These two elements [15.3, 15.4, and 15.7] make a single component altogether.

25 **[0051]** The vertical element [15.5], the set of adjusting bars [15.2] and the two sliding locking components [15.1, 15.6] therefore compose the vertical spanner design.

30 **[0052]** The sliding locking components [15.1, 15.6] can feature square shaped geometries on both sides of the handle, hexagonal shaped geometries on both sides of the handle (Figure 11), or multifunctional geometries (for both hexagonal and square shaped workpieces) as comprised on Figures 1 and 7. In the case of Figure 15, the sliding locking components [15.1, 15.6] feature multifunctional geometries (for both hexagonal and square shaped workpieces).

35 **[0053]** The design and functionality of the vertical spanner's system is the same as that of the spanners comprised on Figures 1-14. As on Figures 1-14, the sliding locking components [15.1, 15.6] can have locking elements of various geometries.

40 **[0054]** As can be seen on Figure 15, the sliding locking components [15.1, 15.6] feature sliding locking elements [15.1, 15.6] both on top of the set of slots [15.7] as well as below the set of slots [15.7]. This design maximises the multifunctionality of the vertical spanner, as it offers the possibility for the user to adjust vertically positioned workpieces from both downwards (hence moving the spanner upwards and pulling upwards on the handle [15.4]) and upwards (hence moving the spanner downwards and pushing downwards on the handle [15.4]).

45 **[0055]** The workpieces which have their heads facing upwards should preferably be locked with the upper sliding locking elements [15.6] while the workpieces which have their heads facing downwards should preferably be locked with the upper sliding locking elements [15.1].

However, the user can use whichever more convenient of the two pairs of locking elements [15.1 or 15.6] for each specific the desired operations.

**[0056]** As previously mentioned, the vertical element [15.5] features the handle [16.6], a beam connecting the handle with the set of slots [16.3, 16.4 and 16.5], and the set of slots [15.7]. The beam [16.3, 16.4 and 16.5] features a horizontal component [16.4] in order to keep the connecting rod of the handle [16.5] on top of the centre of the rod, hence resulting in an equal torque force being applied by the user on each of the handle's two rods [16.6]. The rod which connects the set of slots to the horizontal rod [16.3] is positioned well beside the set of sliding locking components [15.1, 15.6] in order to maximise space for the locking of workpieces (also socket head cap screws), as well as to guarantee free moving space for the sliding locking components [15.1, 15.6] along the slots, and hence to maximise the efficiency of the locking operations of the sliding locking components [15.1, 15.6] to the workpieces.

**[0057]** Similarly to the spanner designs comprised on Figures 1-14, the vertical spanner's element (Figure 16) features a central round cavity [16.2] in between the two slots [16.1] in order to position the connecting rod [4.3] of the set of adjusting bars [4.1], which in turn constantly keeps the sliding locking components [15.1, 15.6] in their required positions.

**[0058]** The spanner design comprised on Figures 1-16 as well as all the components which are composed in these design (Figures 1-16) should be made of a material which offers a high strength and preferably a very high modulus of elasticity and a low brittleness. So the material to be used should preferably a resistant material such as a polymer, a wood-based material such as MDF or plywood, a resin (preferably a polymer resin and most preferably a thermosetting resin) or a metal, and preferably of a metal, which should preferably be steel and preferably high carbon steel such as tool steel. Steel would be the most suitable material to manufacture the tooling designs concerned in this application thanks to its very high strength, particularly its very high modulus of elasticity and low brittleness. These properties would be maximised by using a very high carbon steel such as tool steel.

**[0059]** The tooling designs concerned in this application should preferably be manufactured using an industrial process which gives an accurate and precise geometry. Therefore, the most recommended manufacturing methods would be plate cutting (preferably with laser cutting methods), plastic injection moulding processes, sintering processes (preferably laser sintering processes), resin transfer moulding processes and/or casting processes (preferably investment casting thanks to the said process's ability to produce net cast parts). Due to the complexity and accuracy of the geometry of the components composed in the tooling designs concerned, the most suitable manufacturing process to use is a casting process, and most preferably the investment casting process thanks to the process's ability to produce net

cast parts, hence reducing manufacturing costs and maximising the accuracy of the geometry of the cast components.

## Claims

1. A spanner tool which comprises two oppositely positioned sliding locking components which are positioned such that these can slide on a set of two parallel positioned slots, and whose position can be adjusted by a set of adjusting bars.
2. A spanner tool according to claim 1 which features two sliding locking components (7.2) comprising at least one sliding locking element (7.1, 7.3) each.
3. A spanner tool according to claims 1 to 2 in which the sliding locking elements are connected through the slots by a preferably circular connecting element.
4. A spanner tool according to claims 1 to 3 which comprises two sliding locking components, each comprising two oppositely positioned sliding locking elements which are each positioned in front of one of the two sides of the set of slots.
5. A spanner tool according to claims 1 to 4 which comprises a handle being connected to the set of slots, hence forming a single piece component comprising the two said elements.
6. A spanner tool according to claims 1 to 5 which comprises a multifunctional geometry on the outer areas of at least one pair of its four sliding locking elements, comprising two surfaces whose planes are positioned at 270 (or 90) degrees perpendicular to each other along its outer geometry while comprising two surfaces whose planes are positioned at 240 (or 120) degrees perpendicular to each other along its inner geometry.
7. A spanner tool according to claims 1 to 6 which comprises a multifunctional geometry on the inner areas of at least one pair of its four sliding locking elements, comprising two surfaces whose planes are positioned at 120 (or 240) degrees perpendicular to each other along its outer geometry while comprising two surfaces whose planes are positioned at 90 (or 270) degrees perpendicular to each other along its inner geometry.
8. A spanner tool according to claims 1 to 7 which comprises two sliding locking components, in which each comprises a multifunctional square-shaped geometrised sliding locking element on at least one of its sides, which comprises two surfaces whose planes are positioned at 90 (or 270) degrees perpendicular

to each other along both its inner and outer areas.

9. A spanner tool according to claims 1 to 8 which comprises two sliding locking components, in which each comprises a multifunctional hexagonal-shaped geometrised sliding locking element on at least one of its sides, which comprises two surfaces whose planes are positioned at 120 (or 240) degrees perpendicular to each other along both its inner and outer areas. 5  
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10. A spanner tool according to claims 1 to 9 which comprises two multifunctional sliding locking components, in which each comprise said feature stated on claim 8 on one of its two sliding locking elements while comprising said feature stated on claim 9. 15
  
11. A spanner tool according to claims 1 to 10 further comprising an element which comprises the set of slots, a rod which is attached to the set of slots at an angle from about 90 to less than 180 degrees, as well as a handle positioned at the other end of the rod, hence forming a single piece component. 20
  
12. A spanner tool according to claims 1 to 11 which is made from a plastic material, a wood-based material, or a metal such as aluminium, titanium, iron or steel, preferably high carbon steel such as tool steel. 25
  
13. A spanner tool according to claims 1 to 12 which is manufactured using an industrial process such as plate cutting (preferably laser cutting methods), plastic injection moulding processes, resin transfer moulding processes, sintering processes (preferably laser sintering processes), and/or casting processes, preferably investment casting processes. 30  
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Figure 1:

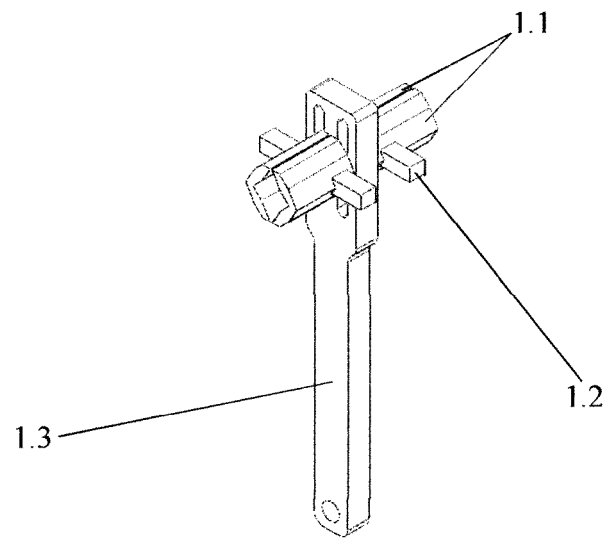


Figure 2:

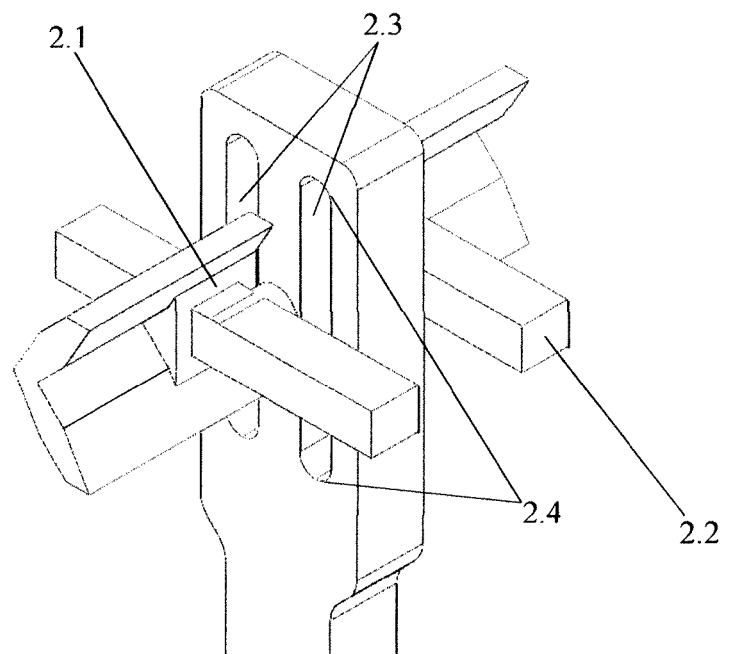


Figure 3:

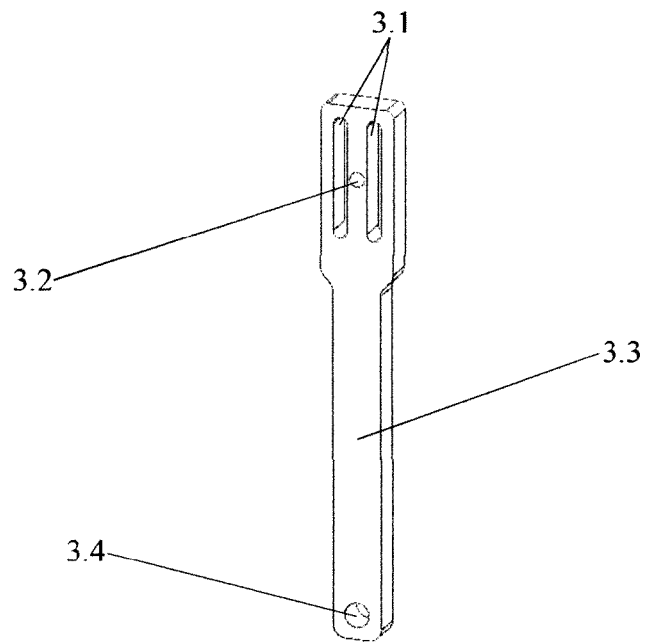


Figure 4:

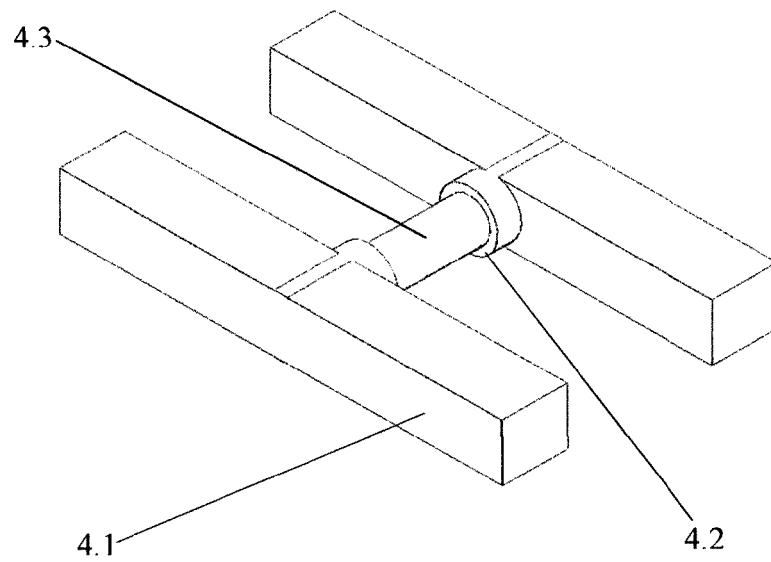


Figure 5:

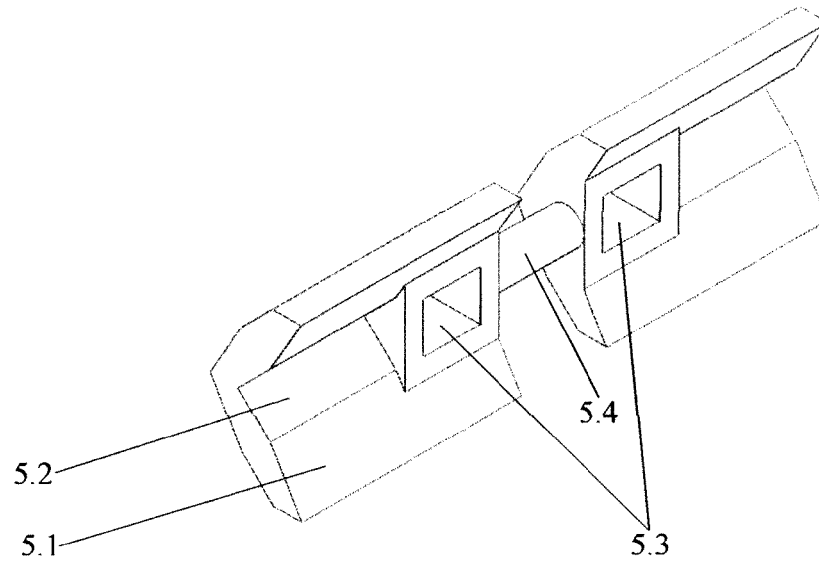


Figure 6:

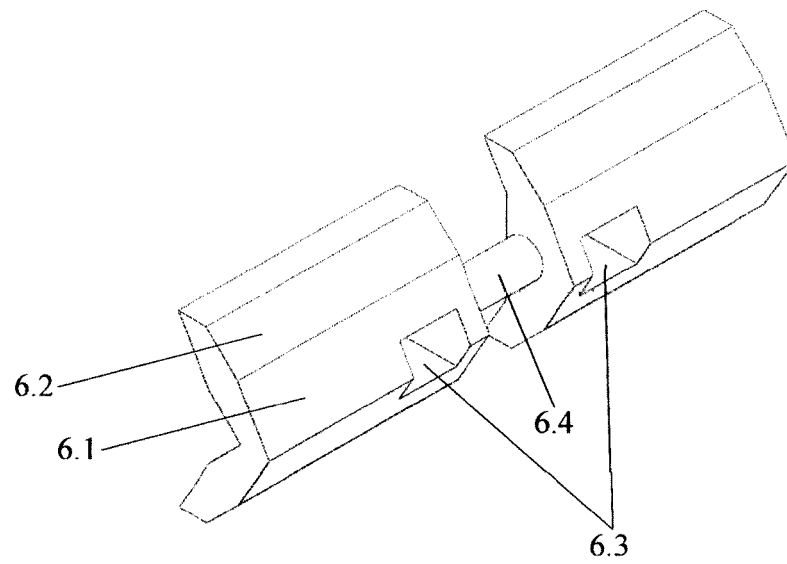


Figure 7:

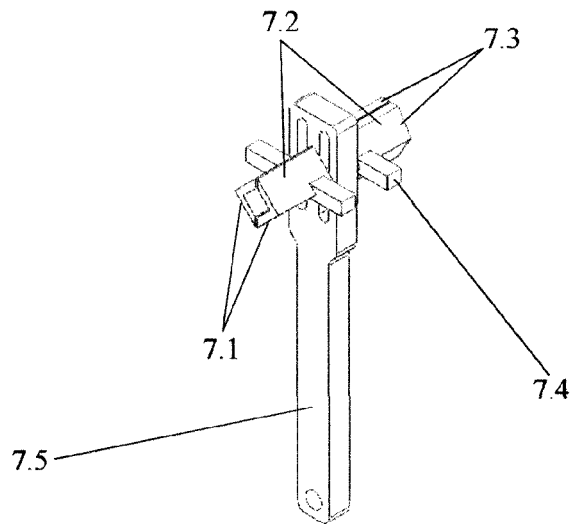


Figure 8:

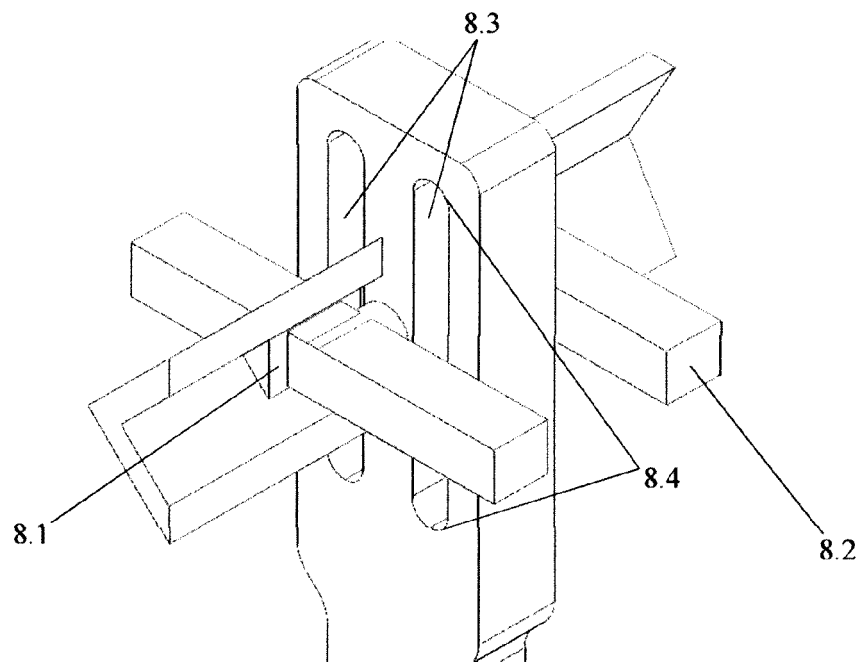


Figure 9:

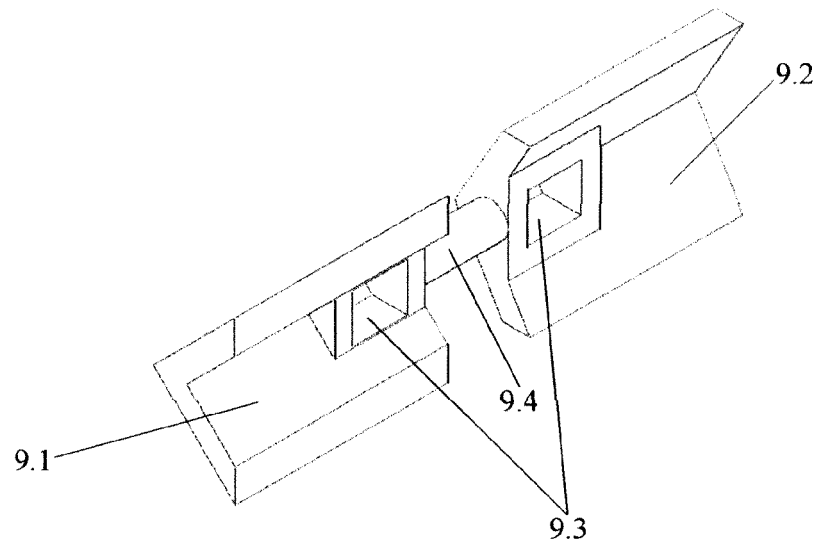


Figure 10:

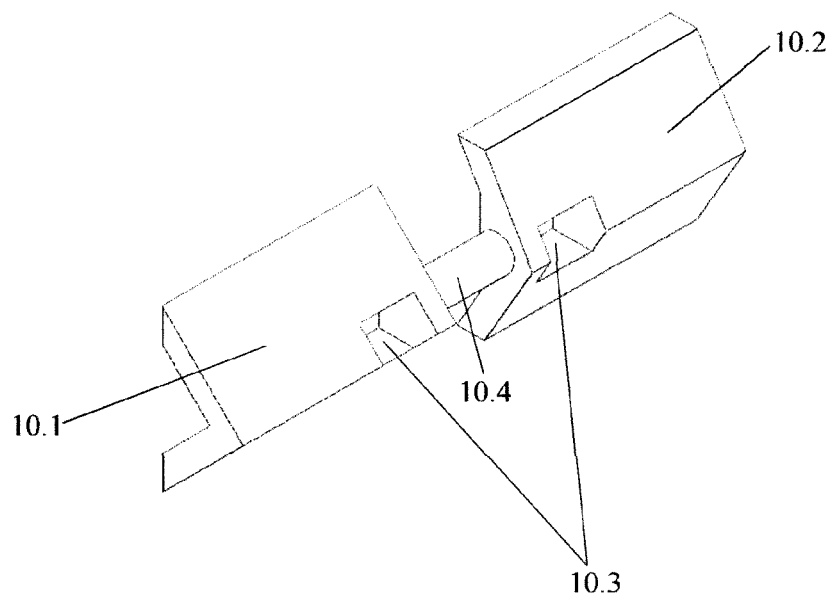


Figure 11:

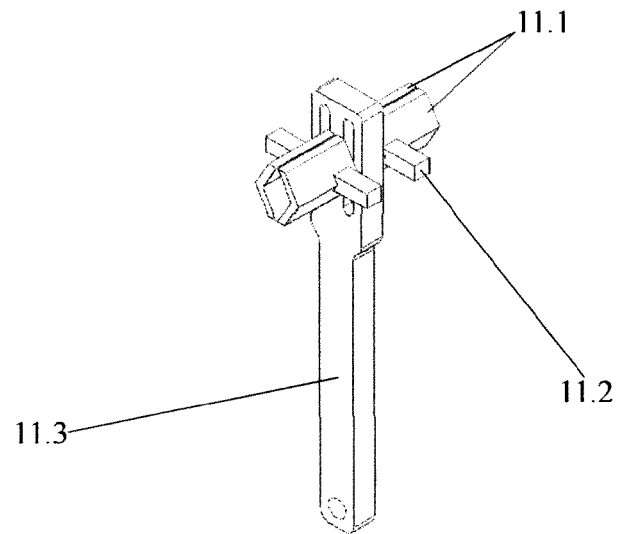


Figure 12:

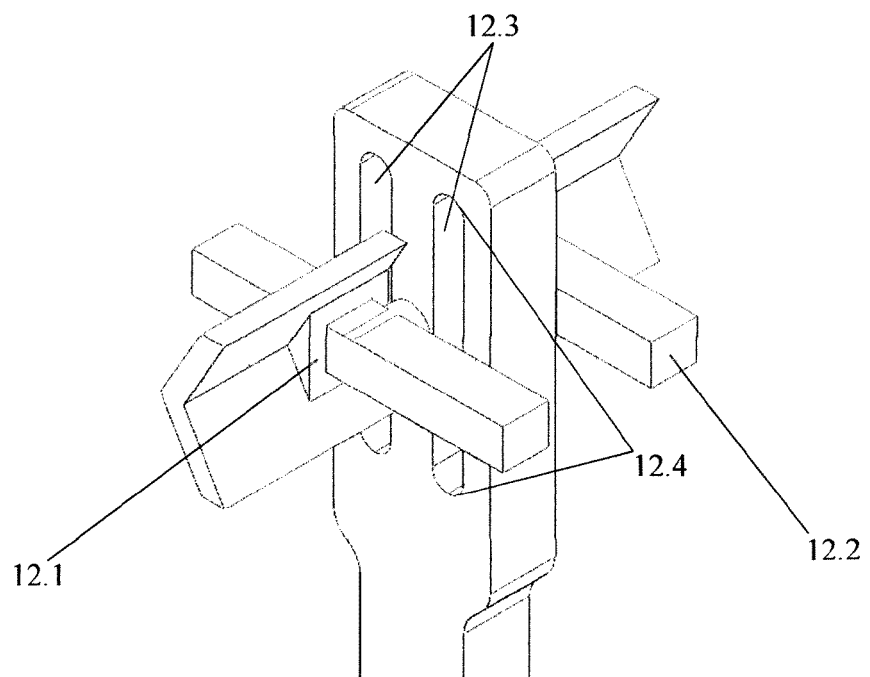


Figure 13:

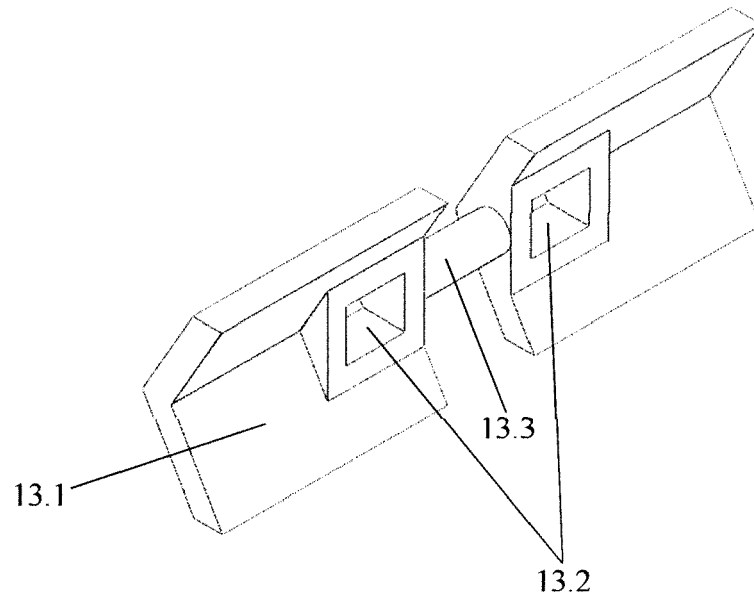


Figure 14:

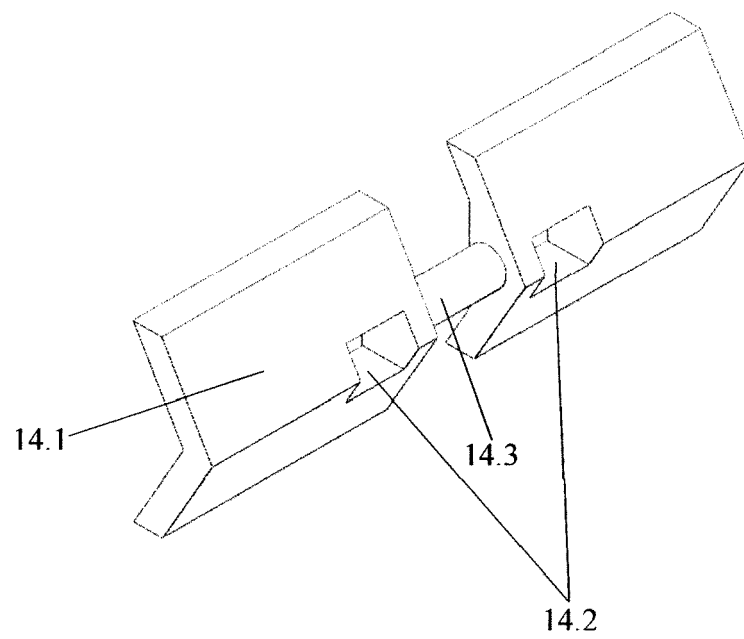


Figure 15:

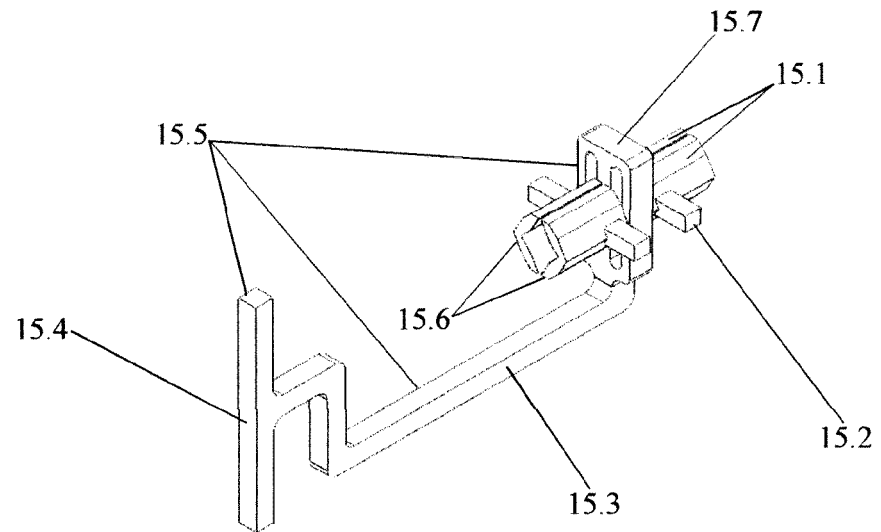
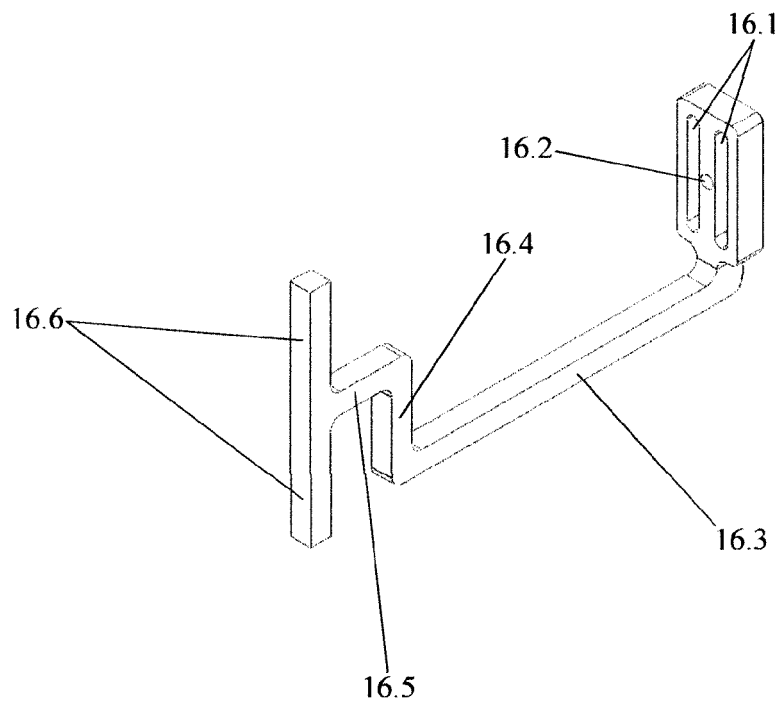


Figure 16:





## EUROPEAN SEARCH REPORT

Application Number  
EP 14 07 5052

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| 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                                                                                                                                                                                                                                                      | US 3 593 601 A (MCFARLAND FREDERICK R)<br>20 July 1971 (1971-07-20)<br>* column 2, line 28 - line 59; figures 1,3<br>* | 1-3,<br>11-13                                                                                                                                                                                                                                                                         | INV.<br>B25B13/12<br>B25B15/00                             |
| X                                                                                                                                                                                                                                                      | US 2004/182207 A1 (WU PI-LIANG [TW])<br>23 September 2004 (2004-09-23)<br>* abstract; figures 1-9 *                    | 1-4,12,<br>13                                                                                                                                                                                                                                                                         |                                                            |
| X                                                                                                                                                                                                                                                      | US 5 711 195 A (KOELLING ROBERT [US])<br>27 January 1998 (1998-01-27)<br>* abstract; figure 1 *                        | 1-4,12,<br>13                                                                                                                                                                                                                                                                         |                                                            |
| X                                                                                                                                                                                                                                                      | US 2010/064858 A1 (KINSKEY TERRY [US])<br>18 March 2010 (2010-03-18)<br>* abstract; figure 2 *                         | 1-3,12,<br>13                                                                                                                                                                                                                                                                         |                                                            |
| X                                                                                                                                                                                                                                                      | US 4 520 698 A (MARTINMAAS WERNER W [US])<br>4 June 1985 (1985-06-04)<br>* abstract; figures 1-16 *                    | 1-3,12,<br>13                                                                                                                                                                                                                                                                         |                                                            |
| X                                                                                                                                                                                                                                                      | US 1 242 097 A (ANDERSON JOHN A [US])<br>2 October 1917 (1917-10-02)<br>* the whole document *                         | 1-3,12,<br>13                                                                                                                                                                                                                                                                         | TECHNICAL FIELDS<br>SEARCHED (IPC)<br>B25B<br>B60T<br>B23B |
| The present search report has been drawn up for all claims                                                                                                                                                                                             |                                                                                                                        |                                                                                                                                                                                                                                                                                       |                                                            |
| Place of search<br>The Hague                                                                                                                                                                                                                           |                                                                                                                        | Date of completion of the search<br>15 January 2015                                                                                                                                                                                                                                   | Examiner<br>Pothmann, Johannes                             |
| CATEGORY OF CITED DOCUMENTS<br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document |                                                                                                                        | T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>.....<br>& : member of the same patent family, corresponding document |                                                            |

EPO FORM 1503 03 82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 14 07 5052

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on  
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15-01-2015

10

| Patent document<br>cited in search report |    | Publication<br>date | Patent family<br>member(s) | Publication<br>date |
|-------------------------------------------|----|---------------------|----------------------------|---------------------|
| US 3593601                                | A  | 20-07-1971          | NONE                       |                     |
| -----                                     |    |                     |                            |                     |
| US 2004182207                             | A1 | 23-09-2004          | NONE                       |                     |
| -----                                     |    |                     |                            |                     |
| US 5711195                                | A  | 27-01-1998          | NONE                       |                     |
| -----                                     |    |                     |                            |                     |
| US 2010064858                             | A1 | 18-03-2010          | NONE                       |                     |
| -----                                     |    |                     |                            |                     |
| US 4520698                                | A  | 04-06-1985          | NONE                       |                     |
| -----                                     |    |                     |                            |                     |
| US 1242097                                | A  | 02-10-1917          | NONE                       |                     |
| -----                                     |    |                     |                            |                     |

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82