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(54) **IMPROVED DISMOUNTING TOOL**

(57) The present invention relates to an abutment body (20) for attachment to a tool yoke (2) of a dismounting tool for use in pulling, pushing or separating components associated with drive shafts and/or wheel shafts, said abutment body (20) comprising a main portion (22) and two connecting portions (24), wherein each connecting portion having an elongated opening (38) extending along a common curved path. The present invention further relates to an improved dismounting tool comprising a tool yoke (2), two abutments bodies (20) and two pairs of securing bolts (46) for securing either one of said two abutment bodies to said tool yoke.

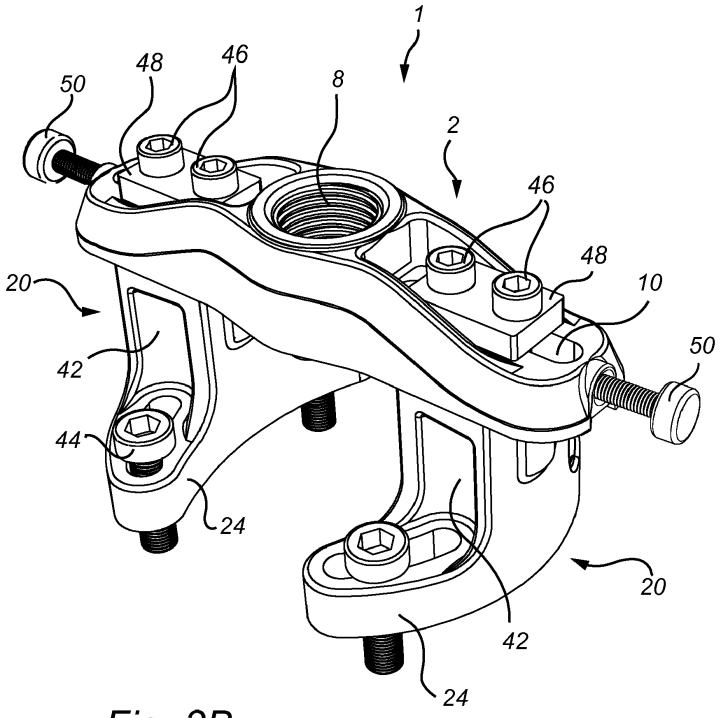

Fig. 3B

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Description

TECHNICAL FIELD OF THE INVENTION

[0001] The present invention relates to tools for vehicles (such as cars, buses, trucks, etc.). More specifically the present invention relates to an improved dismounting tool for use in vehicle repairs and maintenance or vehicle dismantling.

BACKGROUND

[0002] There is an ever present need to reduce costs and to facilitate the life of workshop (vehicle repair shop) operators, i.e. mechanics. The immense number of manufacturers in the automotive industry often leads to an even larger number of tools and equipment within the workshops. Many times this problem originates from the fact that a specific vehicle component will have different dimensions, number of bolts or other structural details depending on which manufacturer it originates from.

[0003] Consequently, workshops are oftentimes forced to have a large number of tools which essentially serve the same purpose which can be both costly and inconvenient. Examples of vehicle components that differ in dimensions and other structural details, as mentioned in the foregoing are, e.g. wheel bearings, wheel hubs, drive shaft hubs, support bearings, etc.

[0004] However, it has proven to be difficult to make tools that are to some extent universal, i.e. compatible with a component or vehicle part from a number of different manufacturers. This is not only due to the fact that the tools need to be versatile and/or adjustable in order to fit a number of different dimensions, but the tools also need to be robust and durable as many of the abovementioned components tend to get stuck, due to contamination or corrosion, which makes them extremely hard to remove. Further, many of the currently available tools or tool kits include many individual parts which should be assembled upon every use, which is a work intensive step for the mechanics and consequently not very cost effective for the repair shop nor the consumers buying the service. Examples of such work intensive tools can be found in e.g. EP 1 790 437 or DE102012006700.

[0005] There is therefore a need for a new and improved dismounting tool for various vehicle repair applications which is universal, cost effective, space efficient and at the same time easy to use.

SUMMARY OF THE INVENTION

[0006] An object of the present invention is therefore to alleviate the abovementioned problems and provide an abutment body and an improved dismounting tool, wherein the abutment body is configured so that it may be used in a dismounting tool and the improved dismounting tool is configured to remove hubs or flanges associated with suspension and transmission assemblies having different bolt configurations. The assemblies having different bolt configurations is to be understood as meaning that the improved dismounting tool can be used to remove components and/or assemblies that have various hole profiles. The hole profiles refer to the relative placement of the through-holes of an assembly or component which are arranged to connect the assembly or component with another component of a vehicle.

[0007] The above and other objects which will be evident from the following description are achieved by an improved dismounting tool according to the present invention.

[0008] According to a first aspect of the present invention, an abutment body for attachment to a tool yoke of a dismounting tool for use in pulling, pushing or separating components associated with drive shafts and/or wheel shafts is provided, the abutment body comprising: a main portion extending along a first axis, the main portion having a first end and a second end, and a pair of threaded securing holes arranged adjacent to the first end, wherein the pair of threaded securing holes are configured to receive a pair of securing bolts for securing the abutment body to the tool yoke; and two connecting portions extending from the second end of the main portion, each connecting portion having an elongated opening extending along a common curved path in a geometric plane perpendicular to the first axis, wherein each one of the elongated openings is configured to receive a connecting bolt for connecting the abutment body to the component that is to be separated.

[0009] It is to be understood that any reference to one element of the invention being perpendicular to another element means that the first element is substantially perpendicular to the second element. For example, a deviation of a few degrees from a right angle is considered perpendicular in the case of the direction in which the connecting portions extend. The first end is to be understood as being the end that is closest to the tool yoke when the abutment body is secured thereto. The second end is to be understood as being the end that is closest to the component that is to be separated when the abutment body is connected thereto.

[0010] By having the abutment body comprise a main body and two connecting bodies extending from one end of the main body, a T-shaped abutment body is achieved.

[0011] A pair of the abovementioned abutment bodies can for example be used together with a tool yoke in a dismounting tool to remove a vehicle's wheel hub. In such an arrangement, the abutment bodies are connected to either side of the tool yoke and secured at a distance from each other so to align with the wheel hub bolts of the wheel hub that is to be removed. The abutment bodies are then connected to the wheel hub so that a force can be applied such that the wheel hub is pulled off its shaft. The force can for example be applied to the abutment bodies via the tool yoke using a hydraulic cylinder. An example of such a hydraulic cylinder is disclosed in the currently unpublished and pending European Patent Ap-

plication No. 15189415.1, by the same Applicant, incorporated herein by reference.

[0012] By having a pair of threaded securing holes, the abutment body can be secured to a tool yoke by means of two securing bolts, thus providing a more secure and stable connection therebetween. Having two securing bolts increases both the strength of the connection in a direction parallel with the first axis, as well as the connection's capacity to prevent the abutment body from turning about the first axis. The stronger connection achieved is beneficial if the abutment body is to be used in a pulling operation.

[0013] By having the abutment body comprise a main portion, a reinforcement is provided that strengthens the connecting portions so that they are less likely to deform when the abutment body is used as part of a dismounting tool. Thus, a more durable abutment body is achieved.

[0014] It should be understood that the elongated opening has a width that is greater than the diameter of the connecting bolt, but smaller than the diameter of the head of the connecting bolt. In other words, a connecting bolt may move freely along the length of the elongated opening and a user may therefore connect the abutment body to wheel hubs having a number of different bolt configurations. Thus, a universal wheel hub dismounting tool may be achieved by using the abovementioned abutment body.

[0015] By having the elongated opening extend along a curved path, a more space efficient abutment body is achieved. Having an elongated opening that extends along a straight path would require more space than having the elongated opening extend along a curved path, provided that the abutment body is to be used in a wheel hub dismounting tool arranged to dismount wheel hubs of varying diameters and bolt configurations. Thus, the abutment body, when used in a wheel hub dismounting tool, provides a more space efficient solution to the problem of dismounting wheel hubs of a vehicle.

[0016] The connecting portions may be curved, in order to achieve a more space efficient abutment body. Having connecting portions that extend along a straight path would require more space than having connecting portions extending along a curved path, provided that the abutment body is to be used in a wheel hub dismounting tool arranged to dismount wheel hubs of varying diameters and bolt configurations. Thus, the abutment body, when used in a wheel hub dismounting tool, provides a more space efficient solution to the problem of dismounting wheel hubs of a vehicle.

[0017] The main portion may be provided with a central recess coaxially aligned with the first axis, the central recess extending in a direction from the second end towards the first end. This recess is to be understood as extending into the abutment body starting from the surface of the abutment body which is arranged to face and come into contact with the wheel hub that is to be dismounted. The recess can for example extent about 25 % - 50 % of the length of the main portion of the abutment body.

[0018] This enables the abutment body to accommodate a bolt head located on the wheel hub that is to be dismounted, thus improving the usability of the abutment body. Having this recess also provides an improved balance between mass and strength of the abutment body. As the main portion is arranged to be subjected to forces coaxially aligned with the first axis of the abutment body, the main portion of the abutment body can be provided with a recess as described above without lower the strength of the abutment body to such an extent that the structural integrity of the abutment body is compromised.

[0019] The pair of threaded securing holes may extend in a direction substantially parallel with the first axis. In doing so, a stronger and more durable abutment body is achieved. When the abutment body is used in a wheel hub dismounting tool, the majority of the force experienced by the abutment body is substantially parallel with the first axis. Thus, the securing holes being parallel with the first axis allows for an orientation of the securing bolts which provides a stronger connection of the abutment body to the tool yoke than what would have been possible if the securing holes had been perpendicular to the first axis.

[0020] The central axes of the pair of threaded securing holes may be laterally offset or otherwise not coaxially aligned. According to one exemplary embodiment of the present invention, the central axes of the threaded securing holes may be parallel with each other and aligned with a plane that bisects the main portion and which extends between the connecting portions of the abutment body. The plane which the threaded securing holes are aligned with is substantially perpendicular to the direction in which the connecting portions extend from the main portion of the abutment body.

[0021] The abutment body being provided with laterally offset threaded securing holes provides a more secure connection of the abutment body to the tool yoke. By having the securing holes be laterally offset, the securing bolts arranged to be fitted therein have a larger capacity to take up any force couple, or bending or twisting moment acting on the abutment body.

[0022] According to one exemplary embodiment of the first aspect of the present invention, the main portion is at least 75 mm, measured in a direction from the first end to the second end. The main portion may be at least 75 mm, preferably at least 85 mm and most preferably at least 90 mm.

[0023] By having a main portion that extends at least 75 mm, the abutment body can be effectively used in wheel hub dismounting tools in such a way that wheel hubs of varying bolt configurations can be dismounted. When using an abutment body having a main portion that extends at least 75 mm in a dismounting tool, the tool yoke can be distanced from the wheel hub sufficiently to accommodate components of the vehicle that might otherwise be in the way and prevent connection of the dismounting tool to the wheel hub.

[0024] The main portion of the abutment body may be provided with two recesses arranged on a respective lateral surface facing a respective one of the two connecting portions, the two recesses being provided adjacent to the second end of the main portion and being arranged to receive at least a portion of a head of a respective connecting bolt for connecting the abutment body to the wheel hub that is to be dismounted. The recesses arranged on either side of the abutment body are arranged such that the range of positions in which a connecting bolt can be received by the elongated opening on the connecting portions of the abutment body is increased. Thus, the recesses are such that a more usable abutment body is achieved, i.e. an abutment body which, when used in a dismounting tool, can be connected wheel hubs having a wider range of dimensions and/or different bolt configurations.

[0025] The abutment body may be symmetric in order to achieve a more universally applicable dismounting tool when using this abutment body. Also, the abutment body being symmetric increases its usability and the users of the dismounting tool are therefore spared of any unnecessary workloads caused by an asymmetrical and non-user friendly product design. The abutment body being symmetrical is to be understood as meaning that it has a plane of symmetry that is parallel with a respective central axis of the pair of threaded securing holes, i.e. that the plane of symmetry is aligned with the first axis of the main portion and also bisects the main portion.

[0026] The curved path may be aligned with a portion of an elliptical path, thus achieving a more space efficient abutment body. Having an elongated opening that extends along a straight path would require more space than having the elongated opening extend along a curved path, provided that the abutment body is to be used in a wheel hub dismounting tool arranged to dismount wheel hubs of varying diameters and bolt configurations. Having the curved path follow a portion of an elliptical path is beneficial and space efficient. Thus, the abutment body, when used in a wheel hub dismounting tool, provides a more space efficient solution to the problem of dismounting wheel hubs of a vehicle.

[0027] According to a second aspect of the present invention, an improved dismounting tool is provided, the improved dismounting tool comprising a tool yoke, two abutments bodies according to any one of the preceding claims and two pairs of securing bolts for securing either one of the two abutment bodies to the tool yoke, the tool yoke having two side portions and a central threaded through hole, wherein each one of the two side portions comprises a securing slit arranged to receive a pair of securing bolts for securing the abutment body to the tool yoke, each one of the securing slits extending in a direction parallel with a longitudinal axis of the tool yoke.

[0028] With this aspect of the invention, similar advantages and preferred features are present as in the previously discussed first aspect of the invention and vice versa.

[0029] A tool yoke is in the present context to be interpreted as a part that secures two or more components so that they move together. The tool yoke will however be further exemplified and described in the detailed description.

[0030] Further, the slits are to be interpreted as elongated openings of a generally rectangular shape (which may or may not have rounded corners). The hole openings of the slits are arranged on the same two sides of the tool yoke as those of the central through hole, so that the hole axis of each slit and the hole axis of the central through hole are parallel.

[0031] The present invention is based on the realization that currently available tools used for dismounting wheel hubs are often difficult to operate and/or not particularly versatile which increases costs for conventional workshops. Thus, by providing an improved dismounting tool having two abutment bodies and a tool yoke that are configured such that the dismounting tool can be used with a large variety of different wheel hubs and is furthermore robust and simple to handle, many of the problems associated with currently known products can be overcome.

[0032] By having the securing slits extend in a direction that is parallel to the longitudinal axis of the tool yoke, the abutment bodies can be secured to the tool yoke in a number of different positions corresponding to wheel hubs having a number of different bolt configurations. For small wheel hubs, the abutment bodies are preferably secured close to the central threaded through hole of the tool yoke, and for large wheel hubs, the abutment bodies are preferably secured further apart. Thus, the distance between the elongated openings of the connecting portions of the abutment bodies can be controlled by securing the abutment bodies at varying positions in the securing slits of the tool yoke.

[0033] The central threaded through hole of the tool yoke is to be understood as being configured to receive a tool for applying an axial force to a shaft of a vehicle and an oppositely directed force to the tool yoke.

[0034] According to one exemplary embodiment of the second aspect of the present invention, the improved dismounting tool further comprises two washers, wherein each one of the two washers is arranged to connect one of the two pairs of securing bolts. When using the dismounting tool, e.g. engaging a correspondingly threaded hydraulic cylinder in the central through hole, it is advantageous to secure each one of the abutment bodies units with the respective pair of securing bolts in order to further increase robustness and make the tool compatible with repair or maintenance operations requiring the use of larger forces. Furthermore, by using a single washer having two openings (i.e. one washer for each pair of securing bolts) the abutment bodies can be made more compact, and the overall dismounting tool is easier to assemble.

[0035] In order to achieve a more balanced dismounting tool, the circular path may be coaxially aligned with

the central threaded through hole. Thus, an axially directed force used to remove or dismount a wheel hub is evenly distributed among the two abutment bodies. Thereby, the risk of the dismounting tool failing and causing irreparable damage to either the vehicle, the dismounting tool, or the operator is diminished. Thus, a safe and reliable dismounting tool is achieved.

[0036] Each one of the two securing slits may be configured so that each one of the two pairs of securing bolts prevents a respective one of the two abutment bodies from rotating about the first axis when the abutment body is secured to the tool yoke by means of the securing bolts. The securing slits being arranged so that the abutment bodies are prevented from rotating is to be understood as meaning that the securing slits have a width that is greater than the diameter of the securing bolts, but smaller than the diameter of the head of the securing bolts. This, in combination with having the abutment body comprise two threaded securing holes, creates a rotationally inhibiting effect when the abutment bodies are secured to the tool yoke. This is due to the fact that the two securing bolts are both provided inside the securing slits, and they are distanced from each other at a distance that is greater than the width of the slit. Thus, the abutment bodies are prevented from rotating.

[0037] Each one of the securing slits may be circumferentially defined by a respective side portion of the tool yoke, i.e. each slit may be enclosed within a respective side portion of the tool yoke. As such, the securing slits are not open, but closed slits. The present inventors realize that by arranging a threaded central through hole and two slits on each side of the central through hole, the slits being enclosed within the side portions of the tool yoke, the dismounting tool is made more user friendly and most of all safe-to-use since the risk of having the tool yoke deform such that the abutment bodies slide outwards and ultimately detach from the tool yoke is diminished.

[0038] The tool yoke may further comprise two threaded lateral securing holes arranged on a lateral surface of the tool yoke, the threaded lateral securing holes having a central axis parallel with the longitudinal axis of the tool yoke, and wherein each one of the threaded lateral securing holes is arranged to receive a correspondingly threaded securing fastener having a bottom surface configured to abut against the pair of securing bolts within the securing slit, in order to prevent the two abutment bodies from moving away from each other during operation of the improved dismounting tool. The tool yoke may also comprise two correspondingly threaded securing fasteners.

[0039] Compared to prior solutions, having the lateral securing holes allows the dismounting tool to have a larger operating range (i.e. the abutment bodies can move across larger distances since the securing fastener does not press against or abut the head of the bolt used to secure the abutment bodies to the tool yoke) and reduces the risk of an operator being clamped between the lateral securing fasteners and the securing bolts. This also provides a benefit over EP2163347, in which the components connected to the tool yoke may slide outwards and cause harm to an operator or equipment.

[0040] Generally, all terms used in the claims are to be interpreted according to their ordinary meaning in the technical field, unless explicitly defined otherwise herein. All references to "a/an/the [element, device, component, means, step, etc.]" are to be interpreted openly as referring to at least one instance of said element, device, component, means, step, etc., unless explicitly stated otherwise.

BRIEF DESCRIPTION OF THE DRAWINGS

[0041] The above, as well as additional objects, features and advantages of the present invention, will be better understood through the following illustrative and non-limiting detailed description of exemplary embodiments of the present invention, with reference to the appended drawing, wherein:

Figure 1A is a perspective view of a tool yoke according to one exemplary embodiment of the present invention,
Figure 1 B is another perspective view of the tool yoke of Figure 1A,
Figure 1C is a bottom view of the tool yoke of Figure 1A,
Figure 1 D is a top view of the tool yoke of Figure 1 A,
Figure 2A is a perspective view of an abutment body according to one exemplary embodiment of the present invention,
Figure 2B is another perspective view of the abutment body of Figure 2A,
Figure 2C is a side view of the abutment body of Figure 2A,
Figure 2D is a bottom view of the abutment body of Figure 2A,
Figure 3A is a perspective view showing an improved dismounting tool comprising the tool yoke of Figure 1A and two of the abutment bodies of Figure 2A,
Figure 3B is another perspective view of the improved dismounting tool of Figure 3A,
Figure 4A illustrates the improved dismounting tool of Figure 3A in a first configuration,
Figure 4B illustrates the improved dismounting tool of Figure 3A in a second configuration,
Figure 4C illustrates the improved dismounting tool of Figure 3A in a third configuration,
Figure 5A shows a securing bolt, and
Figure 5B shows a connecting bolt.

DETAILED DESCRIPTION OF CURRENTLY PREFERRED EMBODIMENTS

[0042] In the present detailed description, embodiments of an improved dismounting tool according to the

present invention are mainly discussed with reference to drawings showing an improved dismounting tool with components and portions being relevant in relation to various embodiments of the invention. It should be noted that this by no means limits the scope of the invention, which is also applicable in other circumstances for instance with other types or variants of dismounting tools than the embodiments shown in the appended drawings. Further, that specific features are mentioned in connection to an embodiment of the invention does not mean that those components cannot be used to an advantage together with other embodiments of the invention. Any reference signs in the claims should not be construed as limiting the scope.

[0043] In some instances, well known constructions or functions are not described in detail, so as not to obscure the present invention. The improved dismounting tool to be discussed and presented in the following is preferably made from a rigid material such as any metal or alloys. It can, however, be made from other materials depending on the desired application as will be obvious for one skilled in the art. The method for manufacturing such an improved dismounting tool using a metallic material is considered to be well known in the art and for the sake of brevity omitted in the following.

[0044] The invention will now by way of example be described in more detail by means of embodiments and with reference to the accompanying drawings.

[0045] Fig. 1A and Fig. 1 B illustrate different perspective views of a tool yoke 2 according to an embodiment of the present invention. The tool yoke 2 has an elongated body which extends along a longitudinal axis of the tool yoke 2 (ref. 101 in Figs. 1C and 1 D). The tool yoke comprises a first side portion 4 and a second side portion 6 arranged on either side of a central threaded through hole 8. Further, there are two slits 10 arranged on each side of the threaded central through hole 8. The slits 10 are enclosed within the elongated body and have a main extension along the first axis 101. The slits 10 form a passage from a top side 12 of the tool yoke 2, through the tool yoke 2, and to a bottom side 14 of the tool yoke 2, same as the central through hole 8.

[0046] Furthermore, the tool yoke 2 has a pair of threaded lateral securing holes 16 arranged on a flank surface 18 of each side of the tool yoke 2. A flank surface 18 is in the present context to be interpreted as the surface arranged on either short side of the elongated body of the tool yoke 2. The threaded lateral securing holes 16 have a central axis which is parallel to the first axis 101. In this embodiment, the central axis of the lateral securing holes 16 extends along the first axis 101. Moreover, the threaded lateral securing holes 16 provide a passage from the flank surface 18, through the tool yoke 2, and into each slit 10.

[0047] Fig. 2A and Fig. 2B illustrate different perspective views of an abutment body 20 according to an embodiment of the present invention. The abutment body 20 comprises a main portion 22 extending along a first axis (ref. 201 in Figs. 2C and 2D), and two connecting portions 24 extending from the main portion 22. The main portion 22 of the abutment body 20 has a first end 26 and a second end 28, and the connecting portions 24 extend from the second end 28. I.e., the abutment body is substantially T-shaped. The first end 26 is the end that is closest to an upper surface 30 of the abutment body 20, the upper surface 30 being the surface that is to come into contact with the tool yoke 2 when the abutment body 20 is used in a dismounting tool 1. The second end 28 is the end that is closest to a lower surface 32 of the abutment body 20, the lower surface 32 being the surface that is to come into contact with the wheel hub or any similar component that is to be dismounted. Both the upper surface 30 and the lower surface 32 are substantially flat, so as to allow a tight connection with the tool yoke 2 and the component that is to be dismounted, respectively.

[0048] A pair of threaded securing holes 34 are arranged adjacent to the first end 26 of the main portion 22, on the upper surface 30. The threaded securing holes 34 extend from the upper surface 30 and down, towards the second end 28 of the abutment body 20. A central axis of the threaded securing holes 34 is substantially parallel with the first axis 201 of the abutment body 20. Furthermore, the threaded securing holes 34 are laterally offset from each other in a direction that is substantially perpendicular to the directions in which the connecting portions 24 extend.

[0049] The main portion 22 of the abutment body 20 is further provided with a central recess 36 extending from the lower surface 32 and towards the first end 26 of the abutment body 20. The central recess 36 extends more than halfway through the main portion 22 of the abutment body 20, but may also extend less than so. Thus, the central recess 36 and the threaded securing holes 34 are arranged on opposite sides of the abutment body 20 and extend in opposite directions. Furthermore, the central recess 36 is also substantially parallel with the first axis 201.

[0050] The two connecting portions 24 are both curved in the same direction and are curved along a common circular path (ref. 203 in Figs. 2C and 2D). As such, the respective concave potions 33 of each one of the two connecting portions 24 do not face opposite directions. The circular path 203 along which the two connecting portions 24 extend lies in a geometric plane that is perpendicular to the first axis 201 of the abutment body 20. As such, the lower surface 32 of the abutment body 20 is also perpendicular to the first axis 201.

[0051] Each one of the two connecting portions 24 is provided with an elongated opening 38. The elongated openings 38 extend from an upper surface 40 of the connecting portions 24 to the lower surface 32 of the abutment body 20. Thus, the hole axes of the elongated openings 38 are parallel with the first axis 201 of the abutment body 20. The elongated openings 38 are curved along a portion of the same circular path 203 as the connecting

portions 24 and extend from the main portion 22 of the abutment body 20 to a distal end 35 of the connecting portions 24. However, the elongated openings 38 are enclosed on all sides by the connecting portions 24, i.e. they are not open.

[0052] The main portion 22 of the abutment body 20 is provided with two recesses 42, one on each of the two surfaces 37 that face the directions in which the connection portions 24 extend. These recesses 42, having a curved shape and extending from the upper surface 40 of the connecting portions 24 and upwards towards the first end 26 of the abutment body 20, are configured so that a head of a connecting bolt (ref. 44 in Figs. 3A and 3B) that is arranged in the elongated openings 38 of the connecting portions 24 may be received therein, thus allowing the connecting bolts 44 to move more freely and across a wider range of positions. In other words, the recesses 42 are arranged to receive a portion of the head of the connecting bolt 44 when the connecting bolt 44 is arranged in the portion of the elongated opening 38 which is closest to the main portion 22 of the abutment body 20.

[0053] In the following, one embodiment of the improved dismounting tool 1 will be disclosed in reference to Figs. 3A - 4C. However, the operational principles regarding how to use the improved dismounting tool will for the sake of brevity not be described in any greater detail and are instead considered to be readily understood by the skilled artisan. Furthermore, the following is considered to serve a purpose, among others, of elucidating the versatility of the dismounting tool in how it can easily be reconfigured to be suitable for dismounting wheel hubs having different bolt configurations and dimensions.

[0054] Figs. 3A and 3B are perspective views showing an improved dismounting tool 1 comprising the tool yoke 2 of Figs. 1A - 1 D and two of the abutment bodies 20 of Figs. 2A - 2D. Here, the dismounting tool 1 comprises two pairs of connecting bolts 44 for connecting the connecting portions 24 of the abutment body 20 to the wheel hub that is to be dismounted. The dismounting tool 1 further comprises two pairs of securing bolts 46 for securing the abutment bodies 20 to the tool yoke 2 in a position that corresponds with the dimensions of the wheel hub that is to be dismounted. The dismounting tool 1 further comprises two washers 48, each one connecting a respective one of the two pairs of securing bolts 46. Also, the dismounting tool 1 further comprises two securing fasteners 50 arranged in the threaded lateral securing holes of the tool yoke.

[0055] The slits 10 have a width D_1 that is greater than the diameter D_2 of the securing bolts 46, but smaller than the diameter D_3 of the head 47 of the securing bolts 46. This, in combination with having the abutment body 20 comprise two threaded securing holes 34, creates a rotationally inhibiting effect when the abutment bodies 20 are secured to the tool yoke 2. This is due to the fact that the two securing bolts 46 are both provided inside the securing slits 10, and they are distanced from each other at a distance that is greater than the width D_1 of the slit 10. Thus, the abutment bodies 20 are prevented from rotating. Thus, the slits 10 of the tool yoke 2 are such that the two pairs of securing bolts 46 securing the abutment bodies 20 to the tool yoke 2 prevent the abutment bodies 20 from rotating.

[0056] Figs. 4A - 4C illustrate the improved dismounting tool 1 of Figs. 3A - 3B in a first, second and third configuration, respectively. In the first configuration, the abutment bodies 20 are secured to the tool yoke 2 in a position in which they are approximately as close to each other as is allowed by the securing slit 10. Furthermore, the connecting bolts 44 are arranged in their most distal position, such that the distance between two connecting bolts 44 on the same abutment body 20 is as great as possible. The two pairs of connecting bolts 44 in the improved dismounting tool 1 form a rectangle A in this first configuration. In the second configuration, the abutment bodies 20 are secured to the tool yoke 2 in a position similar to that of the first configuration. The connecting bolts 44 are arranged in an intermediate position, i.e. the connecting bolts 44 are arranged in a position substantially in the middle of the elongated openings 38. The two pairs of connecting bolts 44 in the improved dismounting tool 1 form a square B in this second configuration. In the third configuration, the abutment bodies 20 are secured to the tool yoke 2 in a position in which they are approximately as far away from each other as is allowed by the securing slit 10. Furthermore, the connecting bolts 44 are arranged in their most proximal position, such that the distance between two connecting bolts 44 on the same abutment body 20 is as small as possible. The two pairs of connecting bolts 44 in the improved dismounting tool form a rectangle C in this third configuration, wherein this rectangle C has its longest extension in a direction perpendicular to that of the rectangle A formed by the connecting bolts 44 in the first configuration.

[0057] Figure 5A shows a securing bolt 46, which has a head 47 and a threaded portion 45. The head 47 of the securing bolt 46 has a diameter D_3 and the threaded portion 45 has a diameter D_2. The diameter D_2 is larger than D_3. Figure 5B shows a connecting bolt 44, which has a head 43, a non-treaded portion 41, a threaded portion 39, and a flange 49 integrated in the head 43 of the connecting bolt 44. The flange 49 is arranged so that it abuts the upper surface 40 of the connecting portions 24 of the abutment body 20 when the abutment body 20 is connected by means of the connecting bolts 44 to a component that is to be dismounted. The head 43 of the connecting bolt 44 has a diameter D_4, the non-threaded portion 41 has a diameter D_5 and the threaded portion 39 has a diameter D_6. The diameter D_4 is larger than D_5, which in turn is larger than D_6. The non-threaded portion 41 is located between the head 43 of the connecting bolt 44 and the threaded portion 39.

Claims

1. An abutment body for attachment to a tool yoke of a dismounting tool for use in pulling, pushing or separating components associated with drive shafts and/or wheel shafts, said abutment body comprising:

    a main portion extending along a first axis, said main portion having a first end and a second end, and a pair of threaded securing holes arranged adjacent to said first end,

        wherein said pair of threaded securing holes are configured to receive a pair of securing bolts for securing said abutment body to said tool yoke; and

    two connecting portions extending from said second end of said main portion, each connecting portion having an elongated opening extending along a common curved path in a geometric plane perpendicular to said first axis,

        wherein each one of said elongated openings is configured to receive a connecting bolt for connecting said abutment body to said component that is to be separated.

2. An abutment body according to claim 1, wherein said connecting portions are curved.

3. An abutment body according to any one of the preceding claims, wherein said main portion has a central recess coaxially aligned with said first axis, said central recess extending in a direction from said second end towards said first end.

4. An abutment body according to any one of the preceding claims, wherein said pair of threaded securing holes extend in a direction substantially parallel with said first axis.

5. An abutment body according to any one of the preceding claims, wherein said main portion is at least 75 mm, measured in a direction from said first end to said second end.

6. An abutment body according to any one of the preceding claims, wherein said main portion has two recesses arranged on a respective lateral surface facing a respective one of said two connecting portions, said two recesses being provided adjacent to said second end of said main portion and being arranged to receive at least a portion of a head of a respective connecting bolt for connecting said abutment body to said wheel hub that is to be dismounted.

7. An abutment body according to any one of the preceding claims, wherein said abutment body is symmetric.

8. An abutment body according to any one of the preceding claims, wherein said curved path is aligned with a portion of an elliptical path.

9. An improved dismounting tool comprising a tool yoke, two abutments bodies according to any one of the preceding claims and two pairs of securing bolts for securing either one of said two abutment bodies to said tool yoke, said tool yoke having two side portions and a central threaded through hole,
wherein each one of said two side portions comprises a securing slit arranged to receive a pair of securing bolts for securing said abutment body to said tool yoke, each one of said securing slits extending in a direction parallel with a longitudinal axis of said tool yoke.

10. An improved dismounting tool according to claim 9, wherein said improved dismounting tool further comprises two washers, wherein each one of said two washers is arranged to connect one of said two pairs of securing bolts.

11. An improved dismounting tool according to any one of claims 9 - 10, wherein said improved dismounting tool comprises two abutment bodies according to claim 7, and wherein said circular path is coaxially aligned with said central threaded through hole.

12. An improved dismounting tool according to any one of claims 9 - 11, wherein each one of said two securing slits is configured so that each one of said two pairs of securing bolts prevents a respective one of said two abutment bodies from rotating about said first axis when said abutment body is secured to said tool yoke by means of said securing bolts.

13. An improved dismounting tool according to any one of claims 9 - 12, wherein each one of said securing slits is circumferentially defined by a respective side portion of said tool yoke.

14. An improved dismounting tool according to any one of claims 9 - 13, wherein said tool yoke further comprises a two threaded lateral securing holes arranged on a lateral surface of said tool yoke, said threaded lateral securing holes having a central axis parallel with said longitudinal axis of said tool yoke, and
wherein each one of said threaded lateral securing holes is arranged to receive a correspondingly threaded securing fastener having a bottom surface configured to abut against said pair of securing bolts within said securing slit, in order to prevent said two abutment bodies from moving away from each other

during operation of the improved dismounting tool.

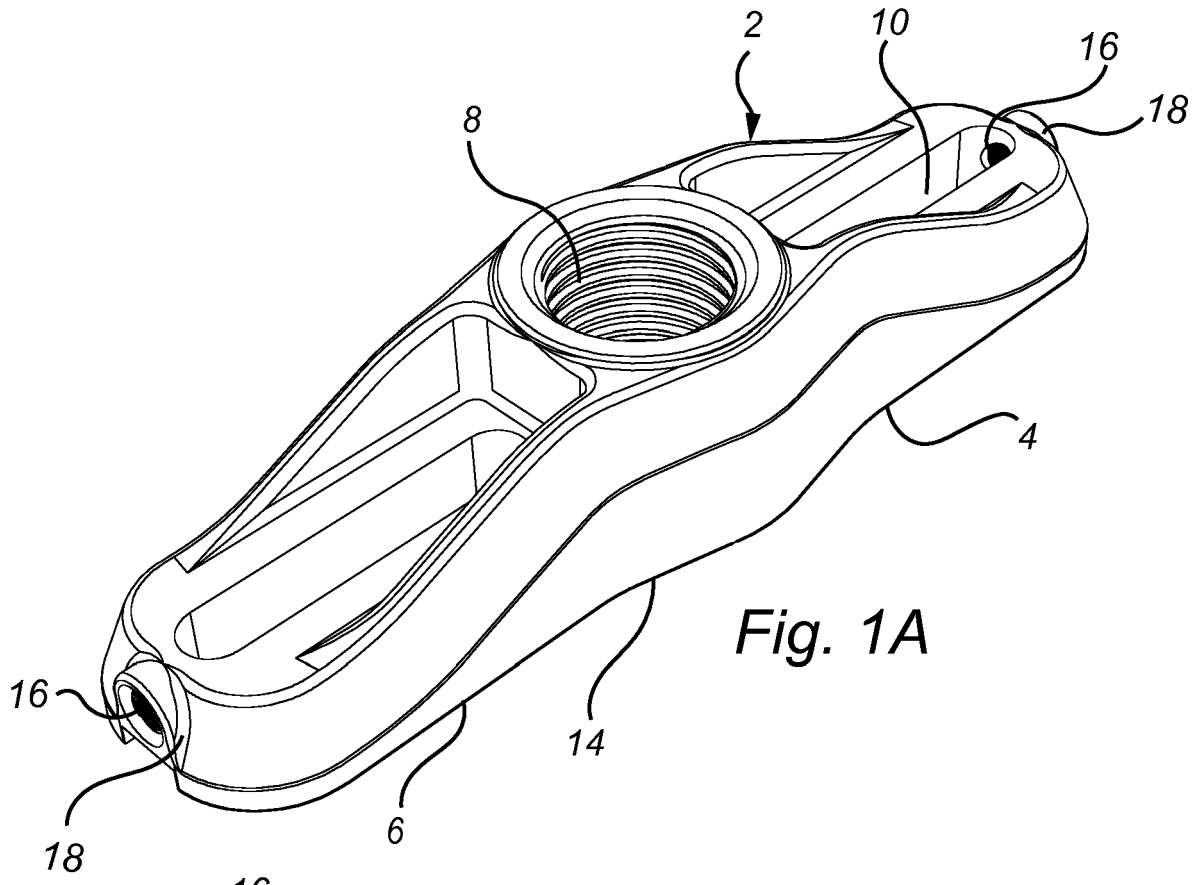

Fig. 1A

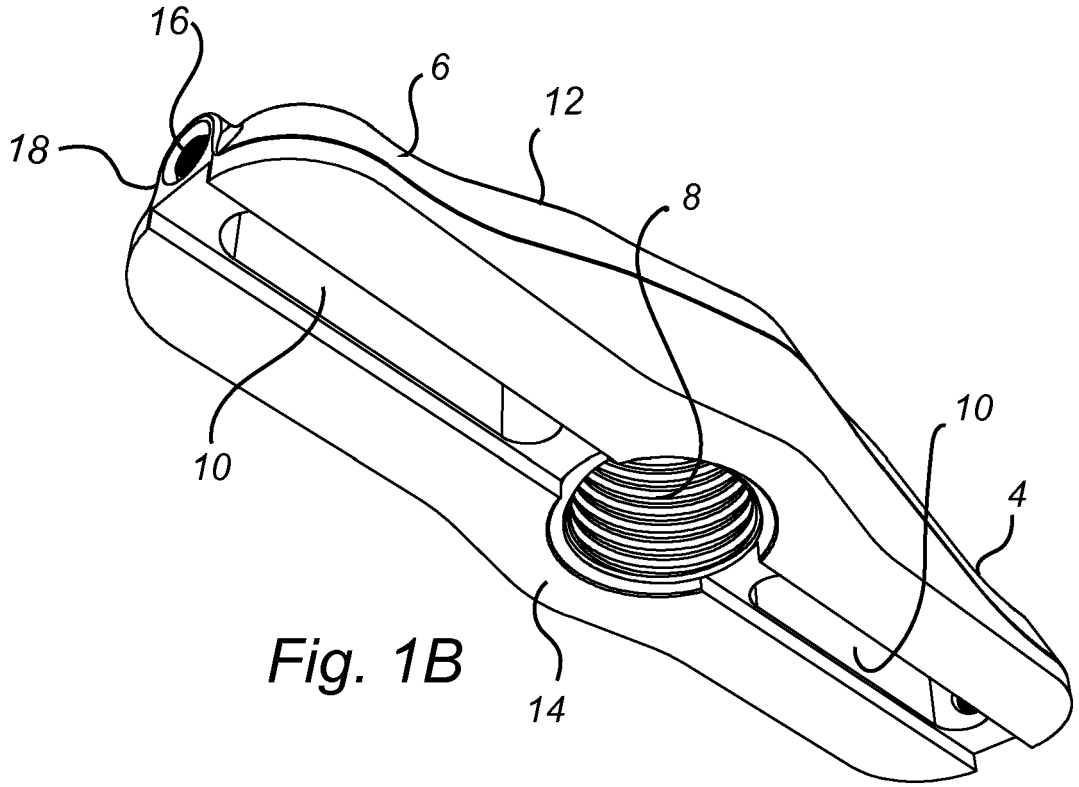

Fig. 1B

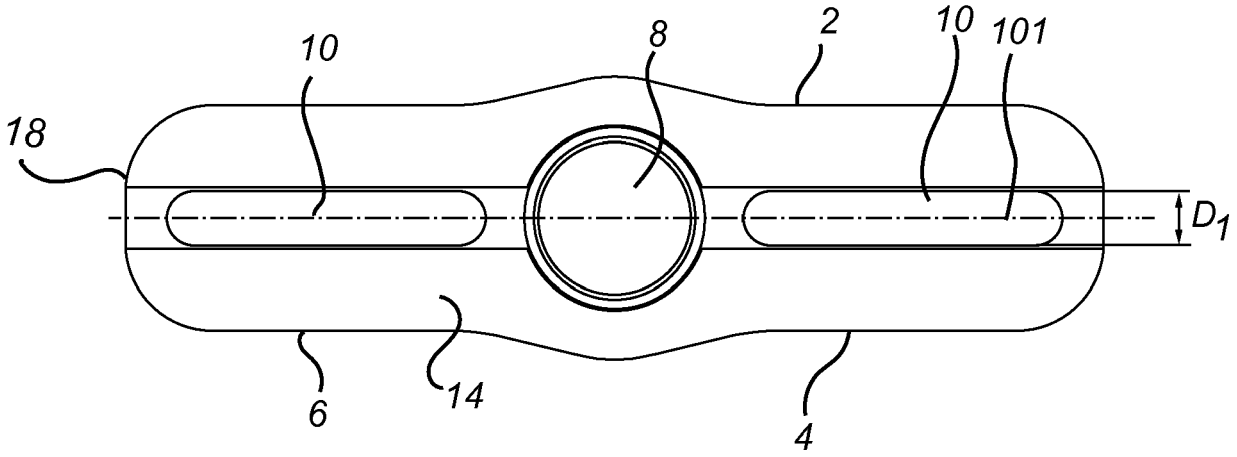

Fig. 1C

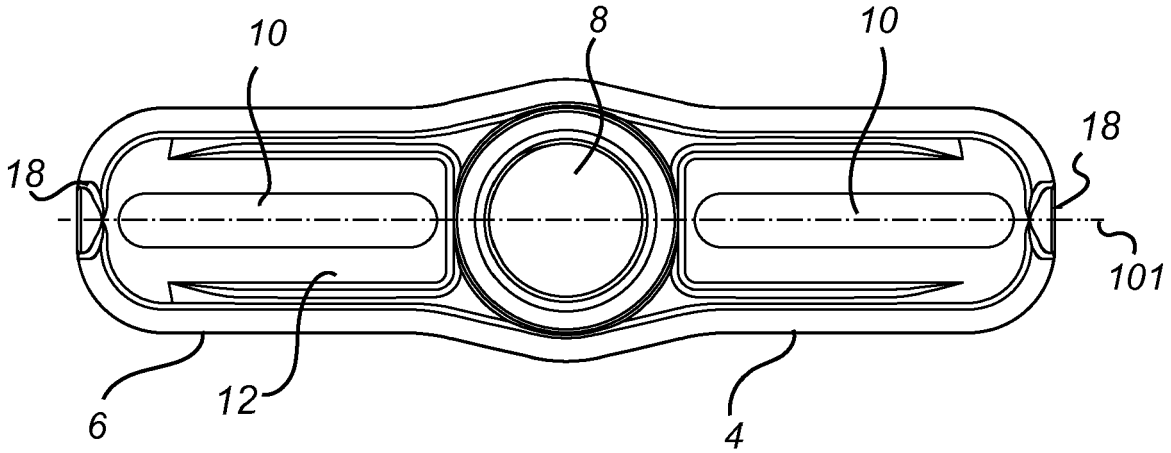

Fig. 1D

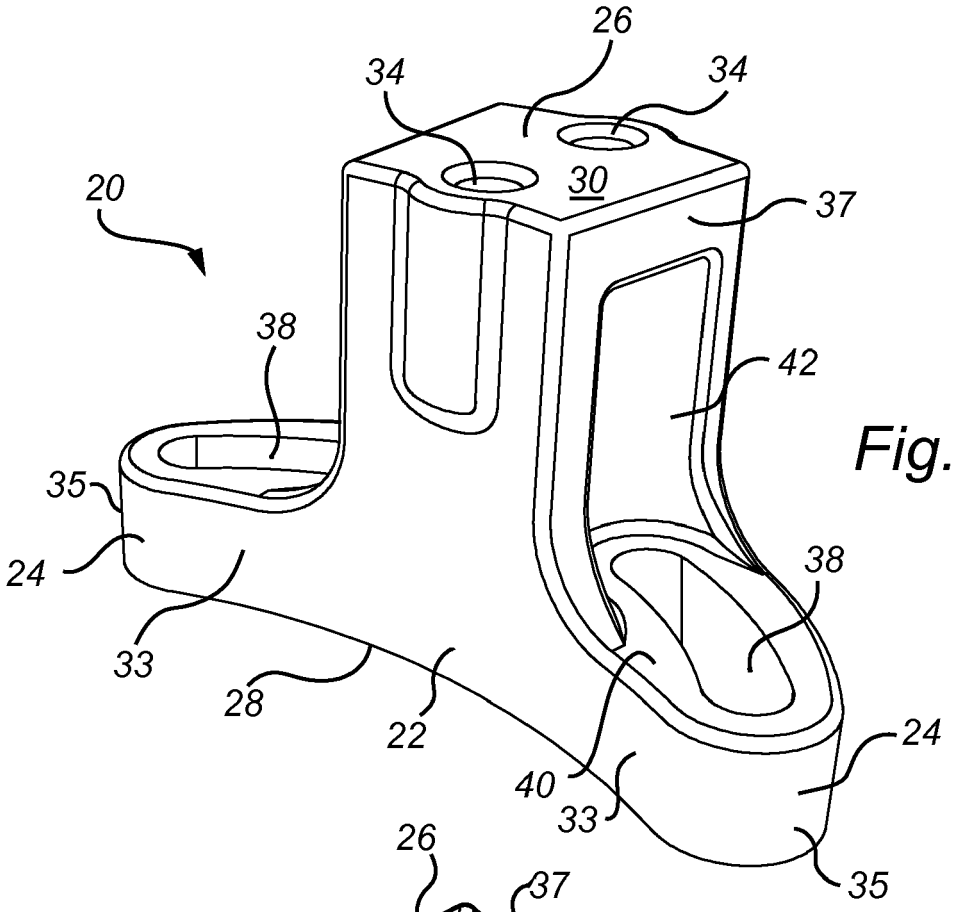
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Fig. 2A

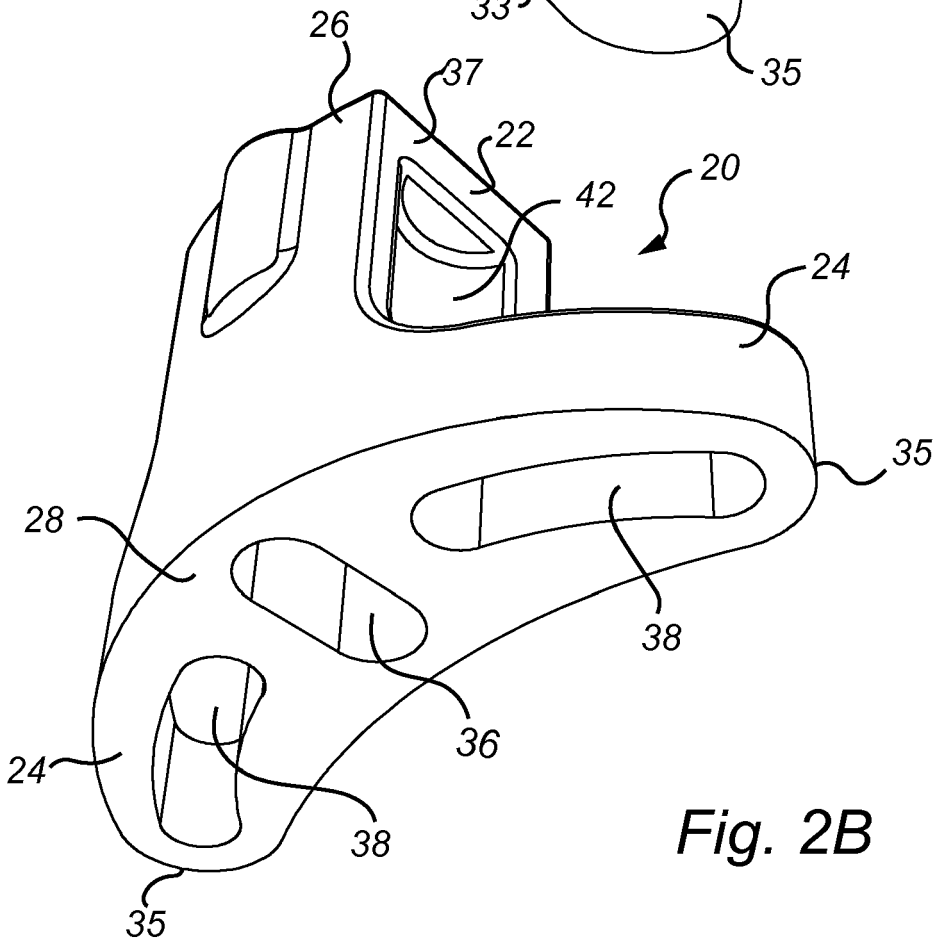
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Fig. 2B

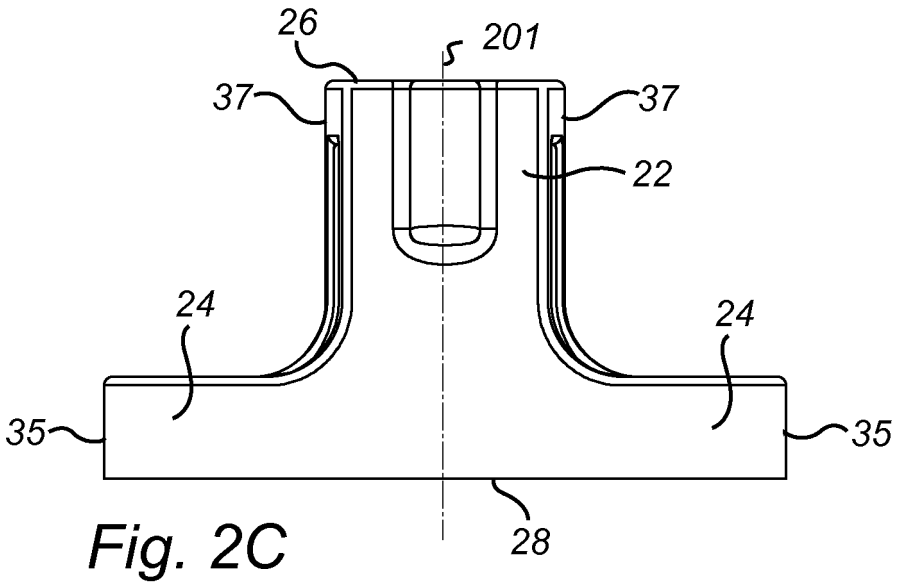

Fig. 2C

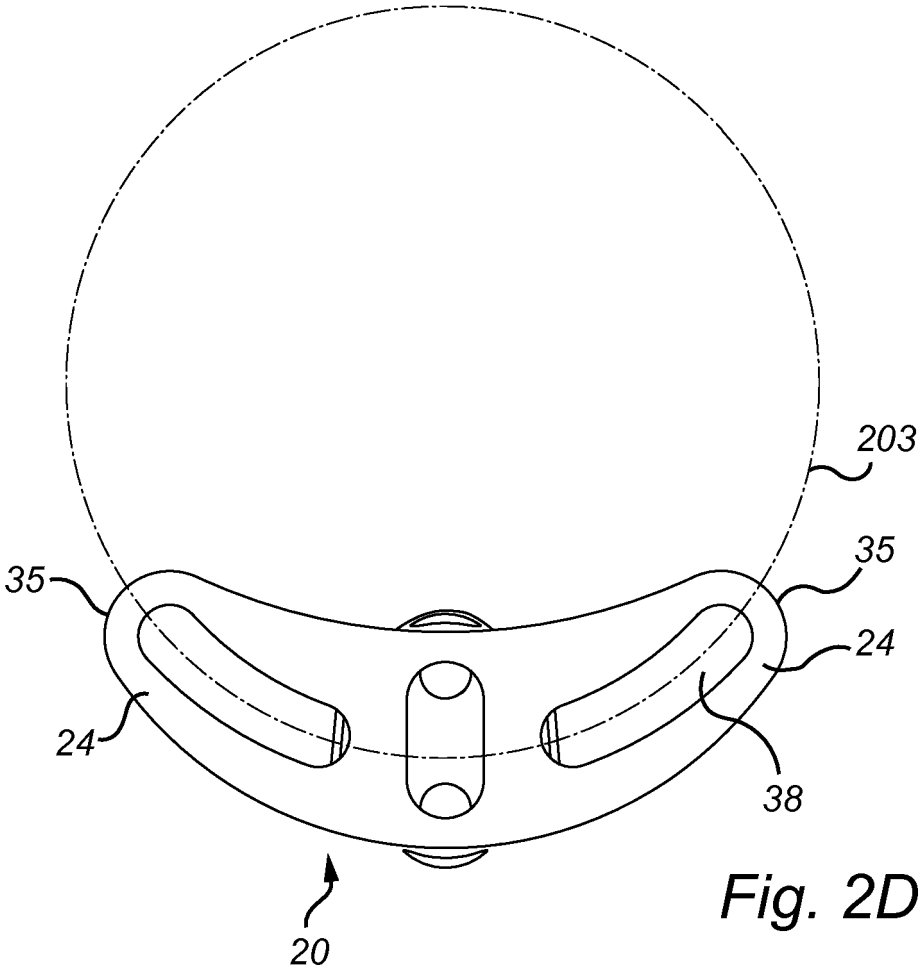

Fig. 2D

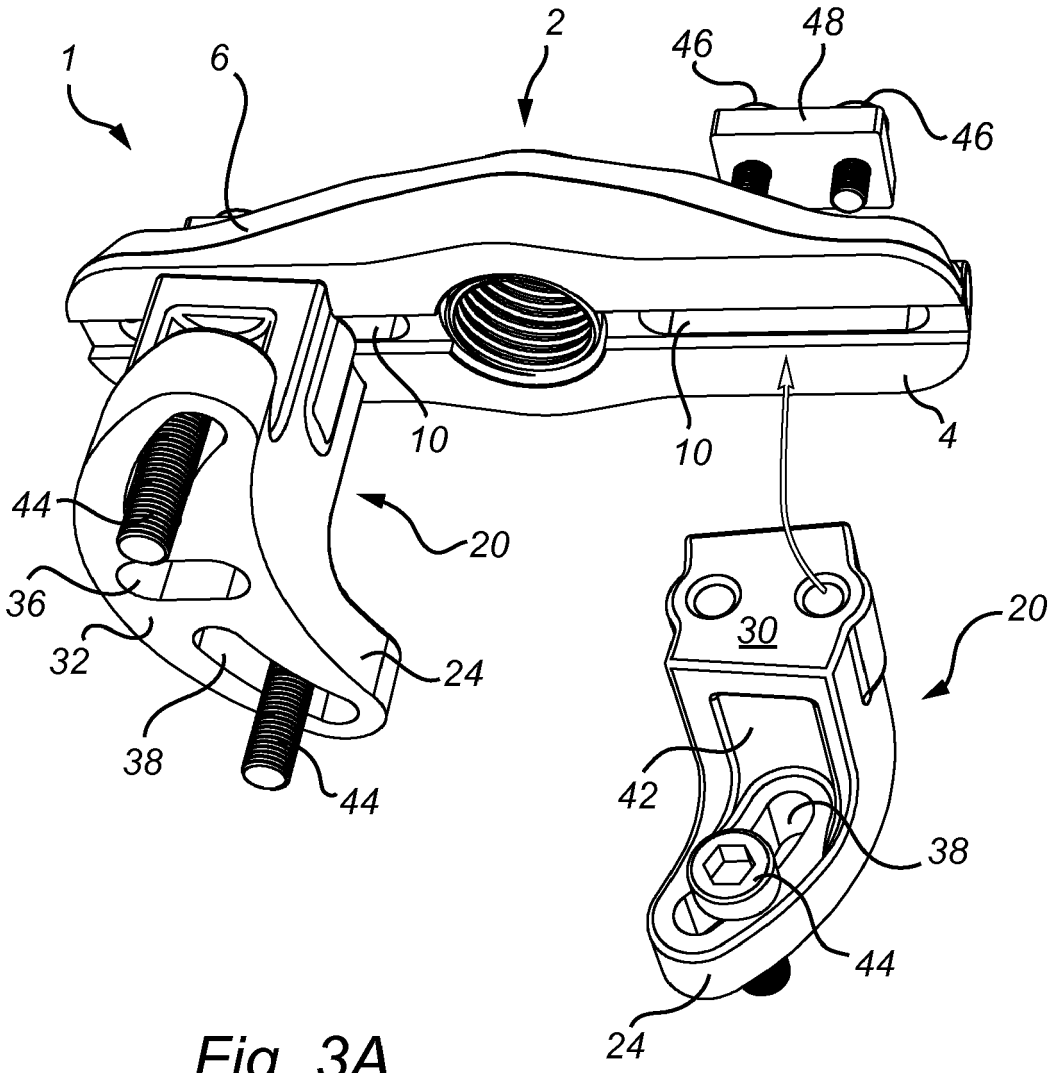

Fig. 3A

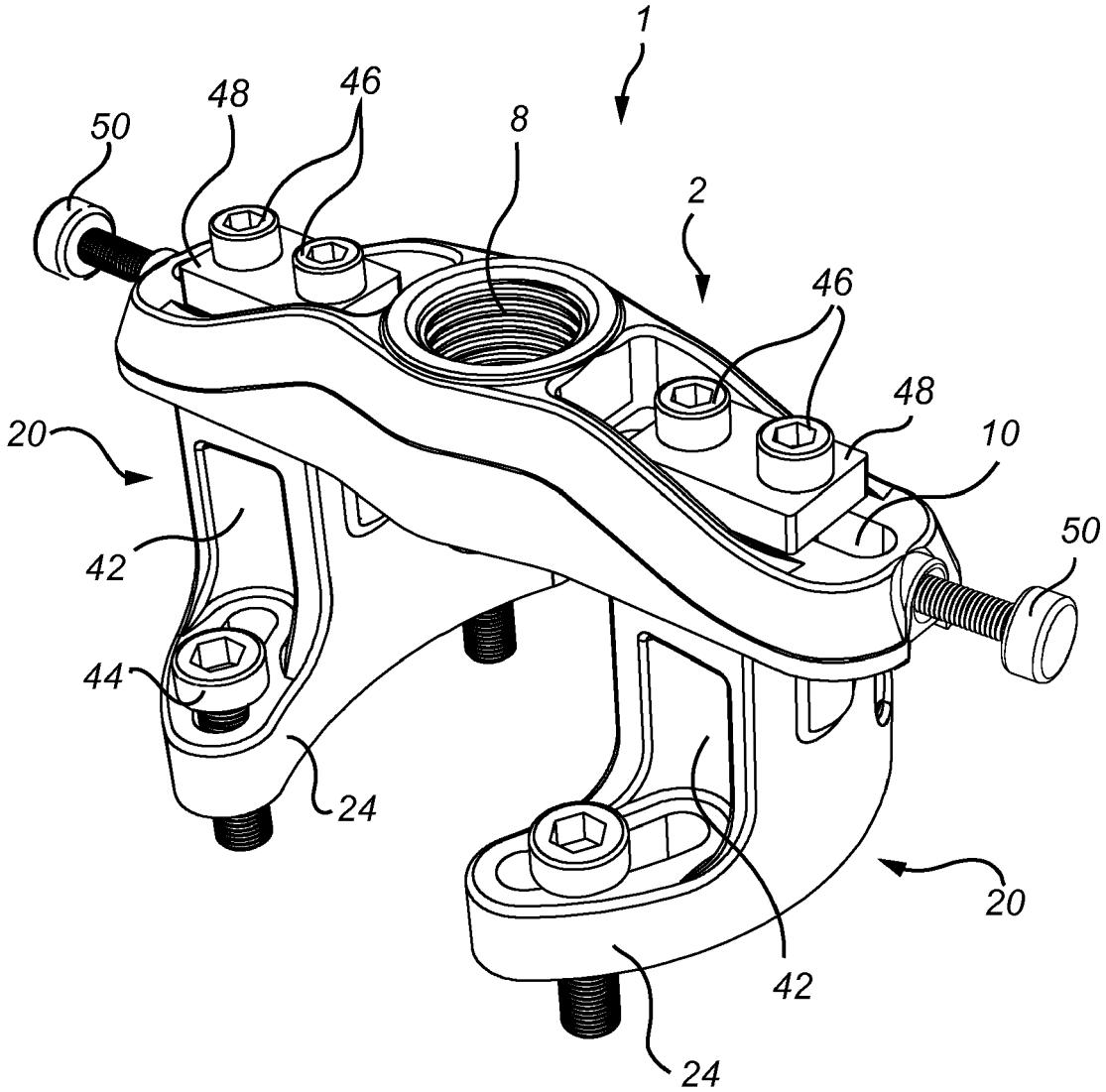

Fig. 3B

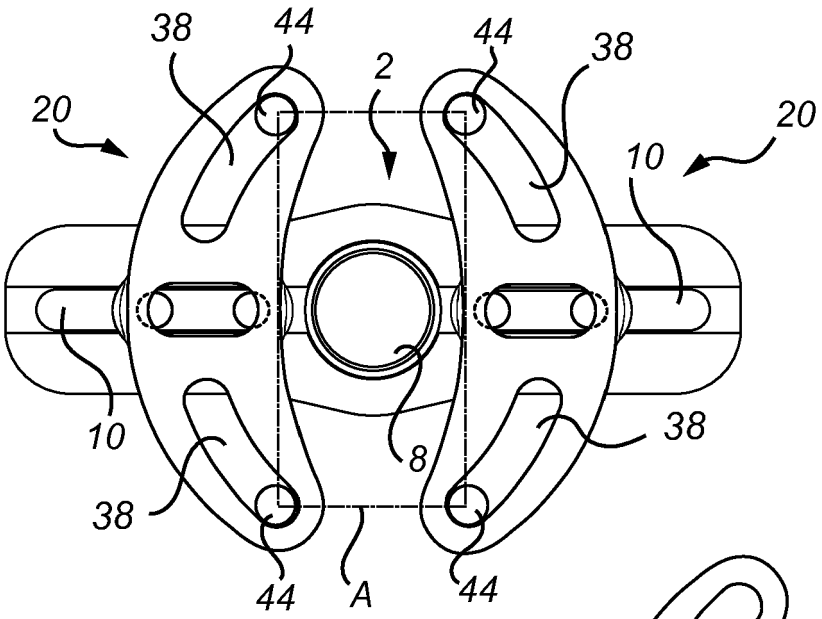

Fig. 4A

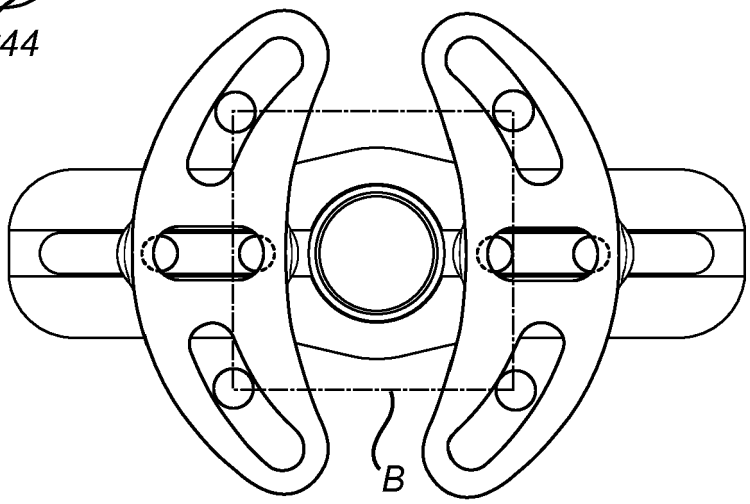

Fig. 4B

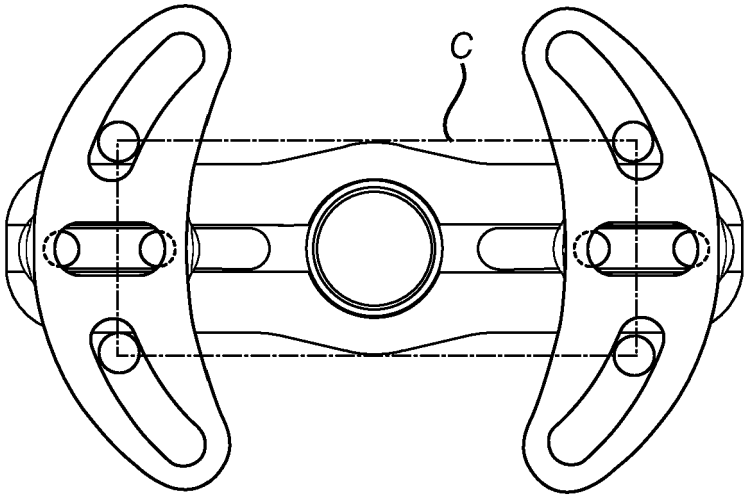

Fig. 4C

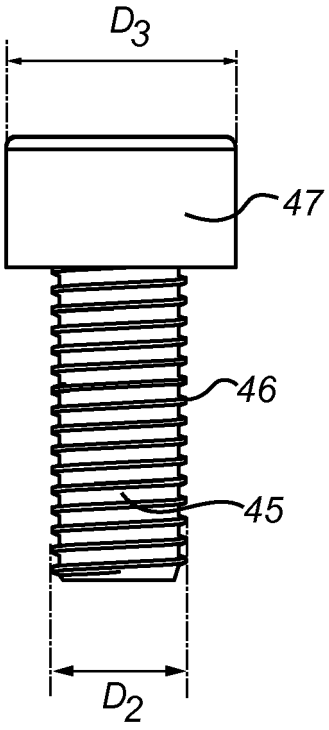

Fig. 5A

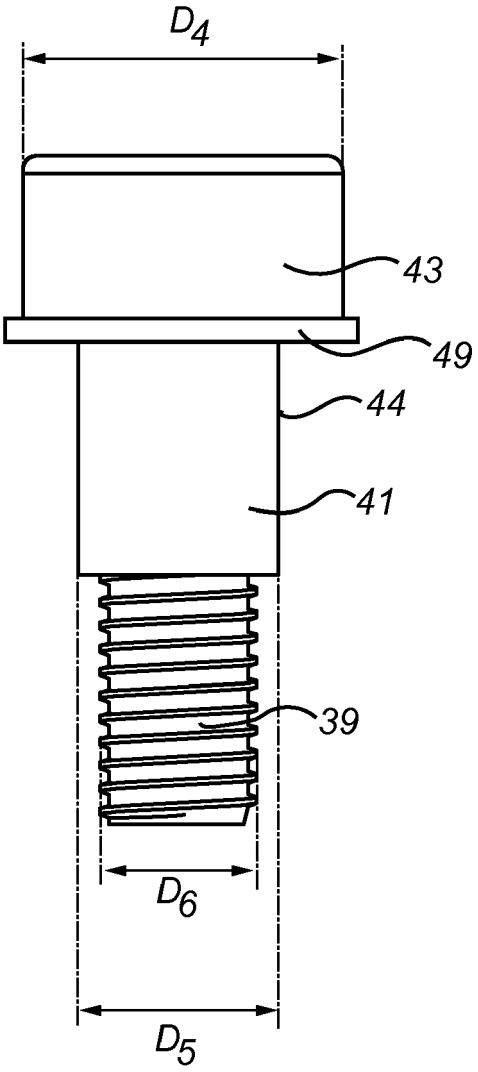

Fig. 5B

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EUROPEAN SEARCH REPORT

Application Number
EP 16 20 0070

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	DE 102 31 826 A1 (KLEINBONGARTZ & KAISER OHG [DE]) 5 February 2004 (2004-02-05) * abstract; figures 3,5 * -----	1	INV. B25B27/00 B25B27/06 B25B27/02
A	US 4 908 925 A (JOHNSON RUDOLPH E [US]) 20 March 1990 (1990-03-20) * column 4, line 28 - line 57; figure 7 * -----	1	
A	FR 664 000 A (HEPWORTH, ERNEST (GB)) 28 August 1929 (1929-08-28) * page 2, line 38 - line 66; figures 6,8,9 * -----	1	

TECHNICAL FIELDS SEARCHED (IPC)

B25B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	16 August 2017	Pothmann, Johannes

CATEGORY OF CITED DOCUMENTS

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EPO FORM 1503 03.82 (P04C01)

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16-08-2017

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 10231826 A1	05-02-2004	NONE	
US 4908925 A	20-03-1990	NONE	
FR 664000 A	28-08-1929	NONE	

EPO FORM P0459

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

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Patent documents cited in the description

- EP 1790437 A **[0004]**
- DE 102012006700 **[0004]**
- EP 15189415 A **[0011]**
- EP 2163347 A **[0039]**