



(51) International Patent Classification:

E02F 3/36 (2006.01) *F16L 37/35* (2006.01)
E02F 9/22 (2006.01) *F16L 37/56* (2006.01)
F16L 37/34 (2006.01)

(21) International Application Number:

PCT/EP2019/085137

(22) International Filing Date:

13 December 2019 (13.12.2019)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

1950075-0 23 January 2019 (23.01.2019) SE

(71) Applicant: **ROTOTILT GROUP AB** [SE/SE]; Box 56,
922 21 Vindeln (SE).

(72) Inventors: **JONSSON, Anders**; Håradsvägen 183, 922 31 Vindeln (SE). **SJÖDIN, Daniel**; Östra Norrlandsgatan 86, 903 31 Umeå (SE). **BJUR, Niklas**; Renfors 41, 922 91 Vindeln (SE).

(74) Agent: **EHRNER & DELMAR PATENTBYRÅ AB**; Drottninggatan 33, 111 51 Stockholm (SE).

(81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(54) Title: A TOOL BRACKET AND A TOOL IMPLEMENT COMPRISING SUCH A TOOL BRACKET

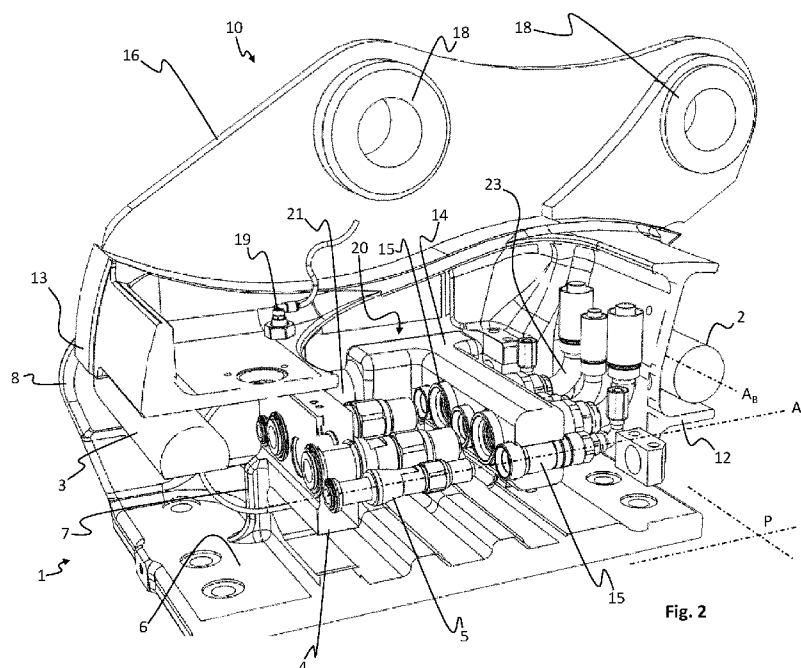


Fig. 2

(57) Abstract: The invention relates to a tool bracket (1) for connecting a hydraulic tool to a crane arm, the tool bracket (1) comprising two bracket pins (2, 3) arranged in parallel at a distance from each other, the bracket pins (2, 3) being arranged to be connected to a tool coupler (10) that comprises fasteners that are arranged to mate with the bracket pins (2, 3), wherein the tool bracket (1) further comprises a quick coupling unit (4) comprising at least two hydraulic couplings (5). Further, the tool bracket (1) comprises a bracket plate (6) which extends between the bracket pins (2, 3) and is fixedly attached to the bracket pins (2, 3) and is arranged to be part of a hydraulic tool or to be rigidly attached to a hydraulic tool, wherein the quick coupling unit (4) is arranged on the bracket plate.



(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

A TOOL BRACKET AND A TOOL IMPLEMENT COMPRISING SUCH A TOOL BRACKET

TECHNICAL FIELD

The invention relates to tool bracket for attaching a hydraulic tool to a crane arm. The invention also relates to a tool implement including such a tool bracket. The invention

5 also specifically relates to a tiltrotator including such a tool bracket.

BACKGROUND

In construction work, forest keeping and the like it is common practice to utilise a work vehicle, such as an excavator, with a crane arm having an outer end for connecting a hydraulic tool such as a tiltrotator, compactor, hydraulic hammer, grapple or the like. The

10 work vehicle typically comprises a hydraulic pump and a tank for providing hydraulic fluid to the tool. Hydraulic hoses are arranged along the crane arm and hydraulic couplings are arranged at the outer end of the crane arm.

Often, it is desired to use different tool implements for performing different but related working operations. There is therefore a need for an operator to change tool implement in

15 a quick manner, preferably without outside assistance. As a consequence, it has become conventional to arrange a quick coupling on a coupler on the outer end of the crane arm and a mating quick coupling on a tool or tool bracket such that the operator may switch tools and have them provided with hydraulics without leaving the cab of the work vehicle.

US 5 465 513 A discloses an arrangement for quickly coupling a working implement to a

20 heavy-duty machine and simultaneously connecting hydraulic power to the implement.

In US 2012/0128404 A1 a similar arrangement is disclosed, in which the male parts of the hydraulic coupling are firmly arranged on the tool implement. The mechanical quick coupling includes a bracket part with two parallel pins, which are to be gripped by engagement portions on an opposed coupler part. The hydraulic coupling arrangement

25 on the bracket part is arranged to extend from one of the parallel bars.

This is advantageous as the pins define the position of the interaction of coupling such that the arranging of the hydraulic coupling arrangement in a fixed position relative to the pins guarantees correct positioning of the hydraulic coupling arrangement so as to guarantee correct coupling.

30 However, in some cases, heavy use of a tool implement has been known to lead to displacement of the hydraulic coupling arrangement, which in turn leads to that the

hydraulic couplings will not be correctly connected or not connected at all. Further, the construction in itself is not designed to cope with high mechanical effort, and in addition it is difficult to achieve a satisfactory precision with the construction.

It would be advantageous to achieve an arrangement that overcomes, or at least alleviates at least one of the drawbacks of the prior art.

SUMMARY OF THE INVENTION

It is an object of the invention to provide a tool bracket for attaching a hydraulic tool to a crane arm, which has a precise position of a coupling device, and which at the same time has a robust construction that guarantees a problem free utilisation over long period of time.

According to a first aspect the invention relates to a tool bracket for connecting a hydraulic tool to a crane arm, the tool bracket comprising a first bracket pin and a second bracket pin, which bracket pins are arranged parallel to each other at a distance from each other and are arranged to be connected to a tool coupler that comprises fasteners that are arranged to mate with the bracket pins, wherein the tool bracket further comprises a quick coupling unit comprising at least two hydraulic couplings which extend in parallel to each other along an axial connection direction. The tool bracket comprises a bracket plate which extends at a distance from the bracket pin and is fixedly connected to the bracket pins, the bracket plate being provided as a part of a hydraulic tool or to be rigidly attached to a hydraulic tool, wherein the quick coupling unit is arranged on the bracket plate between the first and second bracket pin such that the hydraulic couplings will face the second bracket pin, and wherein the axial connection direction is substantially parallel to a plane of the bracket plate.

An advantage of the inventive arrangement is that bracket plate provides the possibility of attaching the quick coupling unit in a precise and mechanically advantageous manner. This provides for a construction that will stand over time.

In specific embodiments of the invention the bracket pins are attached to the bracket plate via at least one mantle portion on each side of the bracket plate.

In specific embodiments of the invention the at least one mantle portion on each side of the bracket plate extend substantially parallel with each other and substantially orthogonal with respect to the plane of the bracket plate.

In specific embodiments of the invention the bracket pins extend in an axial direction, wherein the axial connection direction of the at least two hydraulic couplings of the quick coupling unit is substantially orthogonal to the axial direction of the bracket pins.

5 In specific embodiments of the invention the quick coupling unit is detachable from the bracket plate, the tool bracket comprising an attachment device for attaching the quick coupling unit to the bracket plate. An advantage of this specific embodiment is that the user of a tool implements may at anytime upgrade a tool bracket comprising such an attachment device by arranging a therefore adapted quick coupling unit to the attaching device of the tool bracket.

10 The attachment device may be comprised of screw holes mating with corresponding recesses of the quick coupling unit for attaching and correctly positioning the quick coupling unit on the tool bracket, preferably by means of screws or bolts.

15 In specific embodiments of the invention the tool bracket comprises a leg or legs for holding the quick coupling unit, and wherein the leg or legs are arranged as an integrated part of the bracket plate. This is an embodiment with particularly good mechanical properties in combination with a precise positioning of the quick coupling unit.

The at least one leg may either be directly connected to the quick coupling or it may comprise attachment means such as screw holes for attachment of the quick coupling unit.

20 In specific embodiments of the invention the quick coupling unit comprises passages for receiving and attaching the at least two hydraulic couplings. This allows for the individual hydraulic couplings to be attached and connected to hydraulic conduits of the tool of the tool bracket at location.

25 At a front side of the quick coupling unit, which front side in operation faces a the quick coupling unit of a tool coupler, the passages may be provided with abutment surfaces adapted to interact with shoulders on the least two hydraulic couplings, so as provide a stop for movement in an axial direction of the hydraulic couplings, away from the quick coupling unit of the tool coupler.

30 According to a second aspect the invention relates to a tool implement that comprises a tool bracket as defined above.

According to a third aspect the invention relates to a tiltrotator, which in addition to comprising a tool bracket at an upper side also comprises a tool coupler for attachment of a tool implement at a lower side.

Other embodiments and advantages will be apparent from the detailed description and the appended drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Below, specific embodiments of the invention will be described with reference to the appended drawings, of which;

Fig. 1 is a perspective view of a work vehicle with a crane arm and a hydraulic tool arranged to the crane arm via a tool bracket;

Fig. 2 is a partly cut perspective view a first embodiment of a tool bracket partly connected to a tool coupler;

Fig. 3 is a perspective view of a tool coupler, a cylinder lock unit and a tool bracket;

Fig. 4 is a cut perspective view of a tool bracket and a disconnected coupling unit of a tool coupler;

Fig. 5 is a cut perspective view of a tool bracket and an interconnected coupling unit of a tool coupler;

Fig. 6 is a perspective view of a tiltrotator comprising a tool bracket and a tool coupler, to which a tool implement is connected;

Fig. 7 is a perspective view of a tiltrotator comprising a tool bracket and a tool coupler;

Fig. 8 is a perspective view of a tool bracket with a hydraulic coupling unit in accordance with the invention;

Fig. 9 is a cut perspective view of a cylinder lock unit of a tool coupler, with an integrated hydraulic coupling unit;

Fig. 10 is a cut perspective view of a tool bracket with a hydraulic coupling unit according to the prior art;

Fig. 11 is a perspective view of a tool bracket according to a second embodiment arranged on a tiltrotator; and

Fig. 12 is a perspective view of the tool bracket and tiltrotator of fig. 11 with detached hydraulic coupling unit.

DETAILED DESCRIPTION OF THE SHOWN EMBODIMENTS

Fig. 1 shows a work vehicle 100 with a crane arm 101, to which a tool 102 is connected. In the shown embodiment the tool 102 is a compactor, but it may be any hydraulic tool adapted to be coupled to a crane arm, such as a tiltrotator, compactor, hydraulic hammer, grapple or the like.

The crane arm 101 is provided with a tool coupler 10 at its outer end for connecting the hydraulic tool 102. The hydraulic tool 102 comprises a bracket 1 for attachment to the tool coupler 10. In the shown embodiment a tiltrotator 30 however is arranged between the crane arm 101 and the hydraulic tool 102. The tiltrotator 30 also includes a bracket such that it may be arranged to the coupler 10 on the crane arm 101.

Further, the tiltrotator 30 is provided with a tool coupler, for connection to the hydraulic tool 102 at its lower end. Thus, the bracket may be arranged either directly on the outer end of the crane arm 101 and/or at the lower end of a tiltrotator 30. This will be further described below with reference to Figs. 6-7.

In Fig. 10 a prior art tool bracket 51 is shown in a cut perspective view. The prior art tool bracket 51 comprises a first and a second bracket pin 52 and 53 arranged in parallel at a distance from each other. The bracket pins 52 and 53 are connected to each other by a frame comprising two mantle portions 56 extending orthogonally with respect to the bracket pins 52 and 53. One of the mantle portions 56 has been cut away for visibility reasons. The frame is arranged to be attached to a tool. A quick coupling unit 54 comprising hydraulic couplings 55 is attached to the second bracket pin 53 via legs 57. The legs 57 are welded to the second bracket pin 53 and to the quick coupling unit 54. The attachment of the quick coupling unit 54 to the second bracket pin 53 assures that the quick coupling unit 54 is located at a well-defined position with respect of the connection and has, to a certain extent, become a standard in the art. The well-defined position makes sure that the connection of the quick coupling unit 54 to a tool coupler with a mating quick coupling unit will be made possible for provision of hydraulic fluid to a tool comprising the tool bracket. However, the construction has its flaws in that it is not very rigid and in that is difficult to correctly position the quick coupling unit 54 by a welding operation, which is normally made by hand.

The invention involves an improved attachment of a quick coupling unit.

In Fig. 3 a tool coupler 10, a cylinder lock unit 20 and a tool bracket 1 are shown as separate parts. The cylinder lock unit 20 comprises two lock pins 21 which in operation are arranged to be received in through holes 17 in a base 11 that constitutes the lower portion of the tool coupler 10.

5 In a conventional manner the tool bracket 1 comprises a first and a second bracket pin 2 and 3, respectively, arranged in parallel at a distance from each other. The tool bracket 1 is arranged to be connected to a tool coupler 10, which is typically arranged on the free end of a crane arm, or below a tiltrotator. The tool coupler 10 comprises an upper tool coupler end 16 with attachment portions 18 for connection to a crane arm or the like. In
10 the shown embodiment the attachment portions 18 are comprised of through holes adapted to receive holding pins of the crane arm.

At the lower end of the tool coupler 10, i.e. at the base 11, the tool coupler 10 comprises a first engagement portion 12 and a second engagement portion 13 that are arranged to engage with the first and second bracket pins 2 and 3 of a tool bracket 1, respectively, so
15 as to securely lock the tool bracket 1 to the tool coupler 10.

The cylinder lock unit 20, which is also separately shown in a cut perspective view in Fig. 9, comprises the quick coupling unit 14 of the coupler 10, which comprises through holes 22 for receiving hydraulic couplings 15.

20 The tool bracket 1 has a quick coupling unit 4 that comprises at least two hydraulic couplings 5. In the shown embodiment the quick coupling unit 4 comprises five hydraulic couplings. The tool bracket 1 comprises a bracket plate 6 which extends between the bracket pins 2 and 3 and is fixedly connected to the bracket pins 2 and 3 and is arranged to be part of a hydraulic tool implement or to be rigidly attached to a hydraulic tool
25 implement. In the shown embodiment the tool bracket 1 is a separate part intended to be attached to an upper portion of a tool implement, such as a tiltrotator, a digger, bucket, pallet loader or the like.

The shown tool bracket 1 further comprises a lubrication connector 9 for connection to a connectable lubrication dispenser 19 (Shown in Fig. 2) arranged on the tool coupler 10. This connection assures that lubrication fluid is provided to the tool attached to the tool
30 bracket. In the shown embodiment the lubrication connector 9 is arranged on upper portion of the quick coupling unit 4. Preferably, the lubrication connector 9 faces upwards orthogonally with respect to the extension of the plane P of the bracket plate 6.

The act of attaching the tool bracket 1 to the tool coupler 10 is performed by manoeuvring the tool coupler 10 so as to firstly engage the first engagement portion 12 of the tool coupler 10 with the first bracket pin 2 of the tool bracket 1. At this step the connectable lubrication dispenser 19 will be positioned above, but not in contact with, the lubrication connector 9. In a second step, the second engagement portion 13 is lowered so as to arrive at a position in contact with the second bracket pin 3. In this step, contact and connection is achieved between the connectable lubrication dispenser 19 and the lubrication connector 9 as the second engagement portion 13 is lowered.

In a subsequent step the cylinder lock unit 20 is manoeuvred such that the two lock pins 21 will protrude through the through holes 17 of the tool coupler 10 and pass under the second bracket pin 3 to securely lock the tool bracket 1 to the tool coupler 10. Preferably, the hydraulic connection between the quick coupling units 4 and 14 is accomplished simultaneously as the two lock pins 21 are secured beneath the second bracket pin 3.

In Fig. 2 the tool coupler 10 is shown with both the first and the second engagement portions 12 and 13, respectively, positioned in contact with the first and the second bracket pin 2 and 3, respectively. The two lock pins 21 of the cylinder lock unit 20 are positioned in an unlocked position and the quick coupling unit 14 of the tool coupler 10 is hence in a disconnected position with respect to the quick coupling unit 4 of the tool bracket 1. In Fig. 2 only one of the two lock pins 21 is shown, barely visible at the distant end of the cylinder lock unit 20. In the shown position, where the couplings 5 and 15 of the respective quick coupling units are not connected, the lock pins 21, which are also part of the cylinder lock unit 20, are not in a fully secured position below the second bracket pin.

The quick coupling unit 4 is arranged on the bracket plate 6 between the first and second bracket pins 2 and 3. The bracket plate 6 is shaped as sheet, specifically a relatively thick sheet, wherein the sheet extends in a plane P, which is parallel to an axial extension A_B of the bracket pins 2 and 3. The quick coupling unit 4 is positioned such that the hydraulic couplings 5 will face the second bracket pin 3, and wherein an axial connection direction A_C of the hydraulic couplings 5 of the quick coupling unit 4 is substantially parallel to the plane P of the bracket plate 6. The hydraulic couplings 5 of the quick coupling unit 4 are arranged in parallel with each other along the axial connection direction A_C . Further, in the shown embodiment, the axial connection direction A_C of the hydraulic couplings 5 of the quick coupling unit 4 is substantially orthogonal to the axial extension A_B of the bracket pins 2 and 3.

Preferably, the quick coupling unit 4 will be located in the same position as the quick coupling unit of the prior art bracket 51 shown in Fig. 10. Namely, this position will make sure that the quick coupling unit 4 will mate with a quick coupling unit of a conventional tool coupler so that a tool comprising such a bracket may be utilised on a conventional tool coupler.

A mantle portion 8 is arranged at each side of the bracket plate 6 and connects the sides of bracket plate 6 to the end portions of the bracket pins 2 and 3, respectively. In the shown embodiment the mantle portion 6 extends along the whole length of the bracket plate 6. In an alternative embodiment each mantle portion 8 comprises two portions, wherein each portion supports only one of the bracket pins 2 and 3. The mantle portions 8 on opposite sides of the bracket plate 6 are preferably substantially parallel to each other and substantially orthogonal to the plane P of the bracket plate 6.

Hydraulic conduits 23 are provided and attached to a back end of each hydraulic coupling 15 of the quick coupling unit 14 of the tool coupler 10. The hydraulic conduits 23 are typically connected to hydraulic pressures source on the work vehicle. Preferably, the hydraulic conduits 23 are hydraulic hoses arranged along the crane arm to the hydraulic pressures source. Likewise, corresponding hydraulic conduits (not shown) are connected to the back end of each hydraulic coupling 5 of the quick coupling unit 4 of the tool bracket 1 and connected to the tool comprising the tool bracket.

As illustrated in Figs. 4 and 5, the two lock pins 21 of the cylinder lock unit 20 of the shown embodiment will make sure that the quick coupling unit 14 of the tool coupler 10 will move transversely in and out of connection with the quick coupling unit 4 of the tool bracket 1 as the cylinder lock unit 20 is translated between a locking position and a release position. The quick coupling unit 14 of the tool coupler comprises at least two hydraulic couplings 15 for connection to corresponding hydraulic couplings 5 of the quick coupling unit 4 of the tool bracket 1. In the shown embodiment the quick coupling unit 14 of the tool coupler 10 is arranged in connection with the cylinder lock unit 20 such that the quick coupling unit 14 will be positioned into a connected position in a movement related to the locking achieved by the positioning of the two lock pins 21 below the second bracket pin 3.

The connection between the hydraulic couplings 15 of the tool coupler 10 to the hydraulic couplings 5 of the tool bracket 1 demands a high precision and a construction that is adapted to cope with relatively high forces. Specifically, the tool coupler and tool bracket may be used in relatively harsh conditions, in which they may be exposed to dynamic

forces of varying types. Further, the quick coupling units 4 and 14 need to be arranged to cope with the forces provided by the pressurized hydraulic fluid. Specifically, in a connected position, the pressurized hydraulic fluid will act to separate the hydraulic couplings 5 and 15 from each other. Therefore, the quick coupling units 4 and 14 and the corresponding hydraulic couplings 5 and 15 need to be arranged in a manner that copes with the forces acting during operation and during exposure to ambient operating conditions.

In the current invention the tool bracket 1 includes a bracket plate 6. Further, the quick coupling unit 4 of the tool bracket 1 is arranged on the bracket plate 6 of the tool bracket 1. This is advantageous as it provides a robust structure with a well-defined position of the quick coupling unit 4. The quick coupling unit 4 is attached to the bracket plate 6 via a leg or two or more legs 7, which are formed as an integrated part of the bracket plate 6. In the shown embodiment two legs 7 are provided.

A main reason for the increased robustness of the arrangement is that the positioning of the quick coupling unit 4 may be guaranteed with an improved robustness and mechanical strength. Namely, as mentioned above, in existing quick coupling arrangements the quick coupling unit 4 of the tool bracket 1 has been arranged on one of the bracket pins in order to guarantee its position with respect to the bracket pins 2 and 3. The quick coupling unit 4 is often welded to the second bracket pin 3. Such a construction is difficult to achieve with desired accuracy, both in terms of precision and in terms of mechanical strength.

In one embodiment the attachment device, e.g. the leg or legs 7 and the quick coupling unit 4, are machined in the same machining apparatus as the rest of the tool bracket 1, and specifically attachments for the bracket pins 2 and 3. The bracket pins are separately produced and attached to a frame of the tool bracket, preferably by welding, subsequent to machining process. The leg or legs 7 may be arranged as an integrated part of the bracket plate 6. Preferably, the leg or legs 7 are machined or casted as an integrated part of the bracket plate 6. Further, the bracket plate 6 may be machined or casted as an integrated part of the tool bracket 1 including the mantle portions 8. Even if separate machining apparatuses or processes are utilised for the production of the tool bracket, the position of the bracket pins, or their attachment points, may be used as a reference when the bracket plate 6 and specifically the attachment device or leg or legs 7 defining the position of the quick coupling unit 4 is machined.

The quick coupling unit 4 may be formed as a plate with recesses or passages 24 for holding the individual hydraulic couplings 5. See below with reference to Fig. 8. The quick coupling unit 4 may include abutment surfaces to interact with shoulders on the hydraulic couplings 5 to make sure they are held in place in a first axial direction. At an opposite side of the coupling unit 4 a circlip 31 may be arranged to secure each hydraulic coupling 5. The circlip 31 is preferably arranged at the side of the coupling unit 4 extending away from the quick coupling unit 14 of the tool coupler 10, wherein the shoulder-abutment interaction of the coupling unit 4 and hydraulic couplings 5 are provided on the side facing the quick coupling unit 14 of the tool coupler 10. This is advantageous as the forces are more important in this direction, both during the actual interconnection, but more importantly due to the force provided by the pressurised hydraulic fluid in the couplings.

In figs. 11-12 an alternative embodiment of the tool bracket 1 is shown, in which the quick coupling unit 4 is detachable from the bracket plate 6. In this embodiment, the tool bracket comprises arranged on a tiltrotator 30 and comprises an attachment device 32 for attaching the quick coupling unit 4 to the bracket plate 6. Specifically, the attachment device comprises screw holes 34 through the bracket plate 6 mating with corresponding recesses of an attachment portion 33 of the quick coupling unit 4 for attaching and correctly positioning the quick coupling unit 4 on the bracket plate 6 of the tool bracket 1. Screws 35 are arranged to be screwed through the recesses of the attachment portion 33. Further, in the shown embodiment, the attachment device 32 includes a recessed portion 36 adapted to receive the attachment portion 33 of the quick coupling unit 4.

An advantage of this arrangement is that the attachment device 32, specifically the screw holes 34, may be machined to the bracket plate 6 of the tool bracket with great precision. The attachment device 32, e.g. the screw holes, is advantageously machined in the same machining apparatus as the rest of the tool bracket 1, and specifically the bracket pins 2 and 3, or the attachments for the bracket pins, if they are separately produced and attached to a frame of the tool bracket.

This embodiment allows for a user to easily upgrade his tool bracket by arranging a quick coupling unit 4 to the therefore provided attachment device 32 on the bracket plate 6.

In Figs. 6-7, a tiltrotator 30 is illustrated. The tiltrotator 30 comprises a tool bracket 1 at its upper end, which tool bracket 1 is coupled to a tool coupler 10 via bracket pins 2' and 3' at its upper end, the coupler 10 in turn being arranged at a crane arm or the like, not shown. At its lower end the tiltrotator 30 comprises a tool coupler 10, which in fig. 6 is

connected to a tool implement 102, in the form of a compactor, the tool implement 102 comprising a tool bracket 1.

In Fig. 7, the tiltrotator 30 is illustrated without a coupled tool implement. Instead a tool bracket 1 without an accompanying tool is attached to the coupler 10 of the tiltrotator 30.

5 In Fig. 8, a tool bracket 1 is shown in a perspective view. From this view it is apparent that the quick coupling unit 4 of the tool bracket 1 comprises a front side 25 arranged to face the quick coupling unit 14 of the coupler 10 in operation, see e.g. Fig. 2. Further, the quick coupling unit 4 comprises passages 24 for receiving and attaching the at least two hydraulic couplings 5. In the shown embodiment the quick coupling unit 4 comprises five
10 passages 24, four passages for receiving and attaching hydraulic couplings 5, and one passage for receiving and attaching an additional connector.

The front side 25 is provided with abutment surfaces 26 adapted to interact with shoulders 28 on the hydraulic couplings 5 to provide stops for movement of the hydraulic couplings 5 in an axial direction thereof, away from the quick coupling unit 14 of the tool
15 coupler 10. In the shown embodiment, the abutment surfaces 26 are formed as circular ledges or recesses around the periphery of each passage 24.

The bracket plate 6 is advantageously provided with strengthening ribs 27 that extend along the bracket plate 6 between the mantle portions 8 in parallel with the bracket pins 2 and 3. The legs 7 of the tool bracket 1 are in the shown embodiment extending from one
20 such strengthening rib 27. In an alternative, not shown, embodiment the quick coupling unit 4 is attached to the bracket plate 6 via one leg only, either in connection with a strengthening rib 27 or directly on the bracket plate 6.

In the shown embodiment two legs 7 are provided to hold the quick coupling unit 4, which legs 7 are separated from each other by a void 29 between the quick coupling unit 4 and the bracket plate 6. The void provides a passage for hydraulic conduits, which in a
25 specific embodiment are arranged to pass through the void, to provide a protected conduit passage. As indicated above, the quick coupling unit 4 is attached to the bracket plate 6 via one, two or more legs 7, or the bracket plate 6 is provided with an attachment device such as a clamp or screw holes, for attaching the quick coupling unit 4.

30 Above, the invention has been described with reference to specific embodiments. The invention is however not limited to these embodiments. It is obvious to a person skilled in the art that other embodiments are possible within the scope of the following claims.

CLAIMS

1. A tool bracket (1) for connecting a hydraulic tool (30,102) to a crane arm (101), the tool bracket (1) comprising a first bracket pin (2) and a second bracket pin (3), which bracket pins (2,3) are arranged parallel to each other at a distance from each other
5 and are arranged to be connected to a tool coupler (10) that comprises fasteners that are arranged to mate with the bracket pins (2,3), wherein the tool bracket (1) further comprises a quick coupling unit (4) comprising at least two hydraulic couplings (5) which extend in parallel to each other along an axial connection direction (A_C),
characterised in that the tool bracket (1) comprises a bracket plate (6) which
10 extends at a distance from the bracket pins (2,3) and is fixedly connected to the bracket pins (2,3), the bracket plate (6) being provided as a part of a hydraulic tool or to be rigidly attached to a hydraulic tool, wherein the quick coupling unit (4) is arranged on the bracket plate (6) between the first and second bracket pin (2,3) such that the hydraulic couplings (5) will face the second bracket pin (3), and wherein the
15 axial connection direction (A_C) is substantially parallel to a plane (P) of the bracket plate (6).
2. The tool bracket (1) according to claim 1, wherein the bracket pins (2,3) extend in an axial direction (A_B), and wherein the axial connection direction (A_C) of the at least two hydraulic couplings (5) of the quick coupling unit (4) is substantially orthogonal to the
20 axial direction (A_B) of the bracket pins (2,3).
3. The tool bracket (1) according to claim 1 or 2, wherein the bracket pins (2,3) are attached to the bracket plate (6) via at least one mantle portion (8) on each side of the bracket plate (6).
4. The tool bracket (1) according to claim 3, wherein the at least one mantle portion (8)
25 on each side of the bracket plate (6) extend substantially parallel with each other and substantially orthogonal with respect to the plane (P) of the bracket plate (6).
5. The tool bracket (1) according to anyone of the preceding claims, wherein the quick coupling unit (4) is detachable from the bracket plate (6), the tool bracket comprising an attachment device (32) for attaching the quick coupling unit (4) to the bracket plate
30 (6).
6. The tool bracket (1) according to claim 5, wherein the attachment device (32) comprises screw holes (34) mating with corresponding recesses of the quick coupling unit (4) for attaching and correctly positioning the quick coupling unit (4) on the tool bracket (1) by means of bolts or screws (35).

7. The tool bracket (1) according to anyone of the preceding claims, wherein the tool bracket (1) comprises a leg or legs (7) for holding the quick coupling unit (4), and wherein the leg or legs (7) are arranged as an integrated part of the bracket plate (6).
- 5 8. The tool bracket (1) according to anyone of the preceding claims, wherein the quick coupling unit (4) comprises passages (24) for receiving and attaching the at least two hydraulic couplings (5).
- 10 9. The tool bracket (1) according to claim 8, wherein the passages (24), at a front side (25) of the quick coupling unit (4) which front side (25) in operation faces the quick coupling unit (14) of a tool coupler (10), are provided with abutment surfaces (26) adapted to interact with shoulders (28) on the least two hydraulic couplings (5), to provide stops for movement of the hydraulic couplings (5) in an axial direction thereof, away from the quick coupling unit (14) of the tool coupler (10).
10. A tool implement **characterised in** that it comprises a tool bracket (1) according to anyone of the preceding claims.
- 15 11. A tiltrotator (30), **characterised in** that it comprises a tool bracket (1) according to anyone of the claims 1-9 at an upper side and that it also comprises a tool coupler (10) for attachment of a tool implement at a lower side.

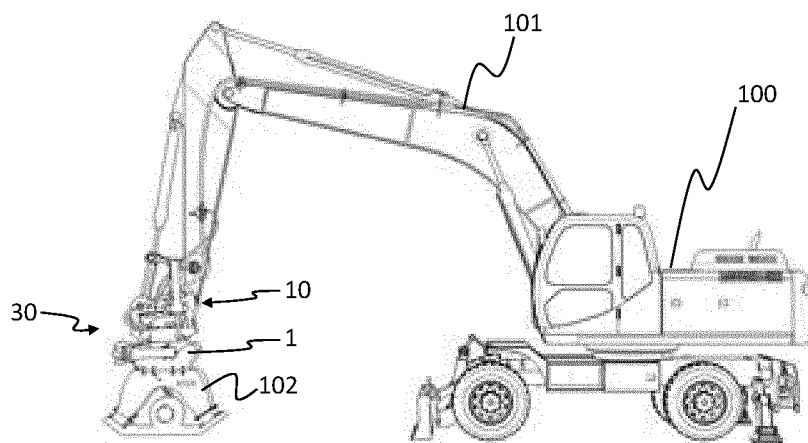


Fig. 1

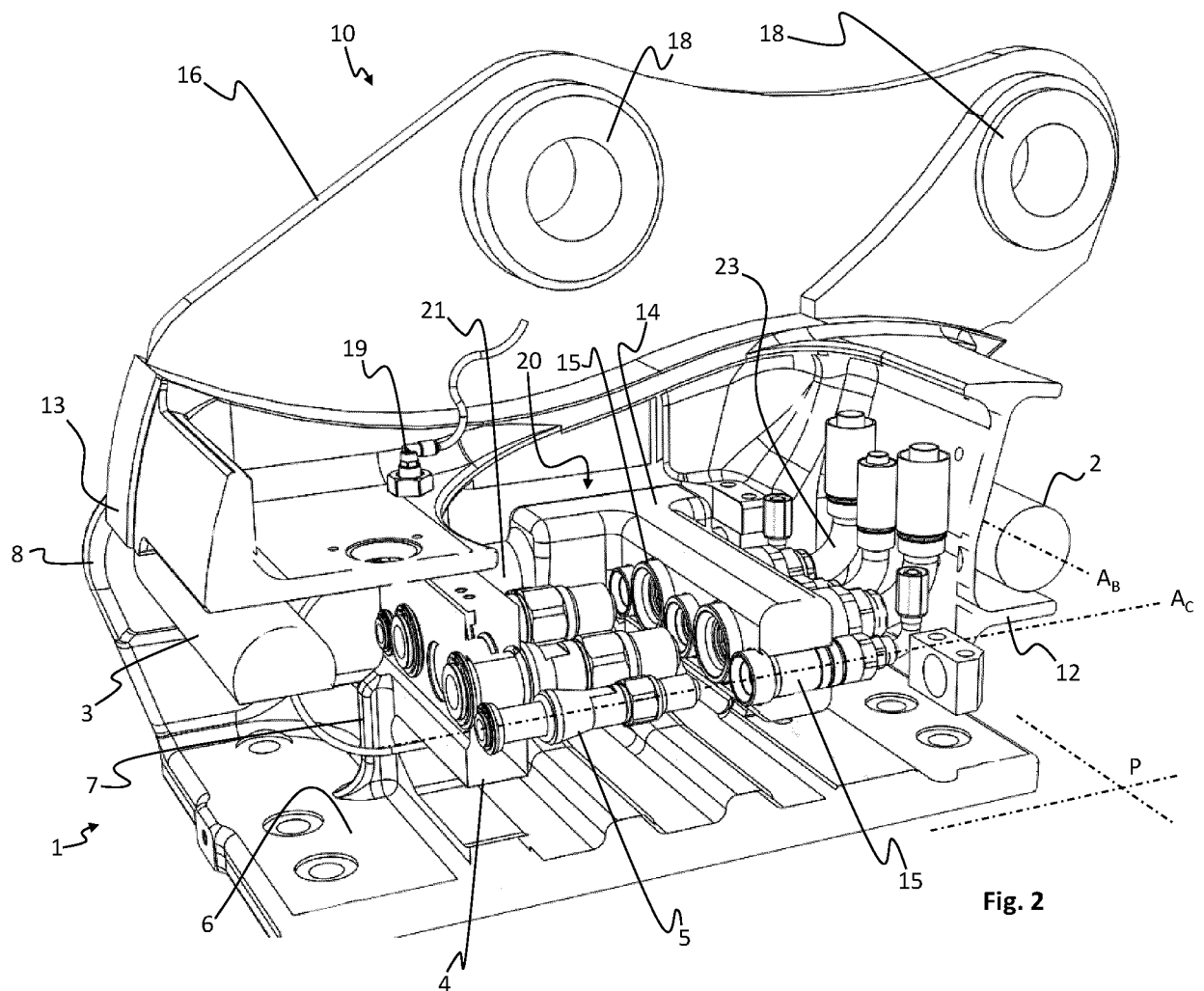


Fig. 2

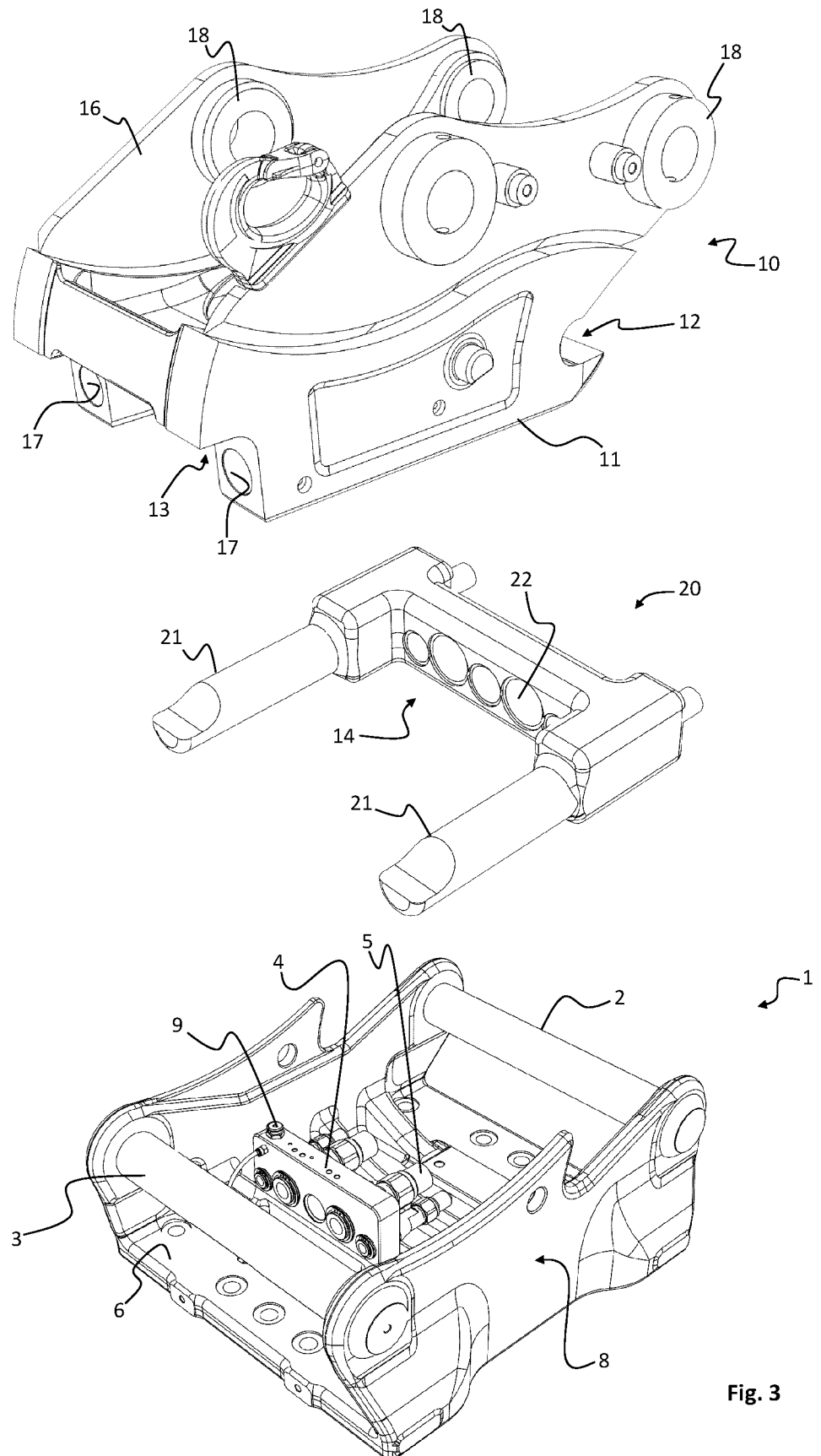
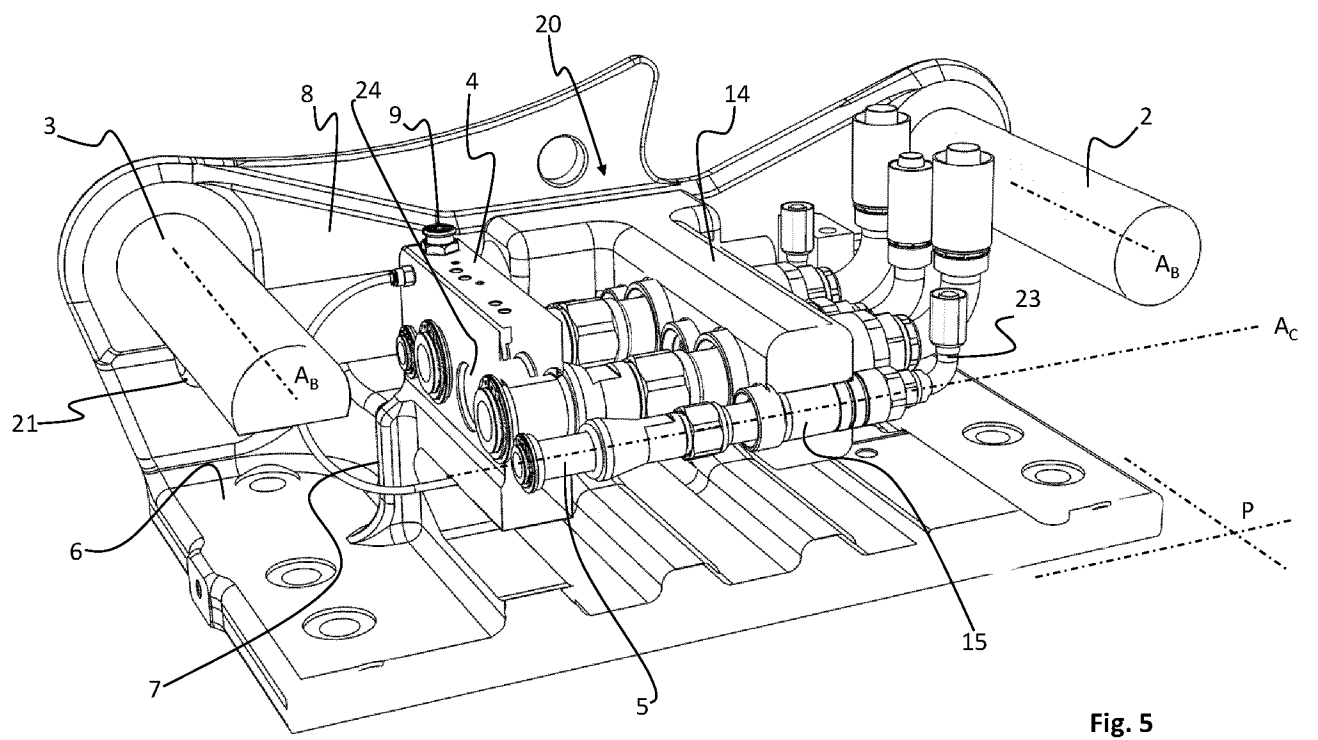
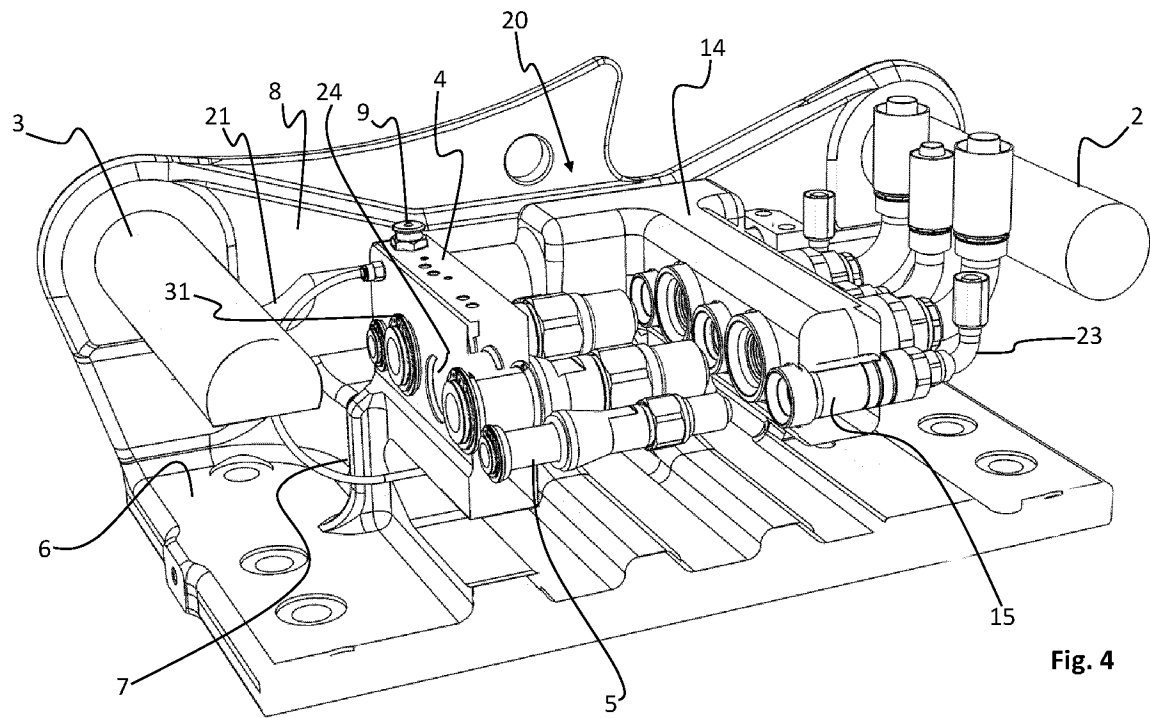


Fig. 3



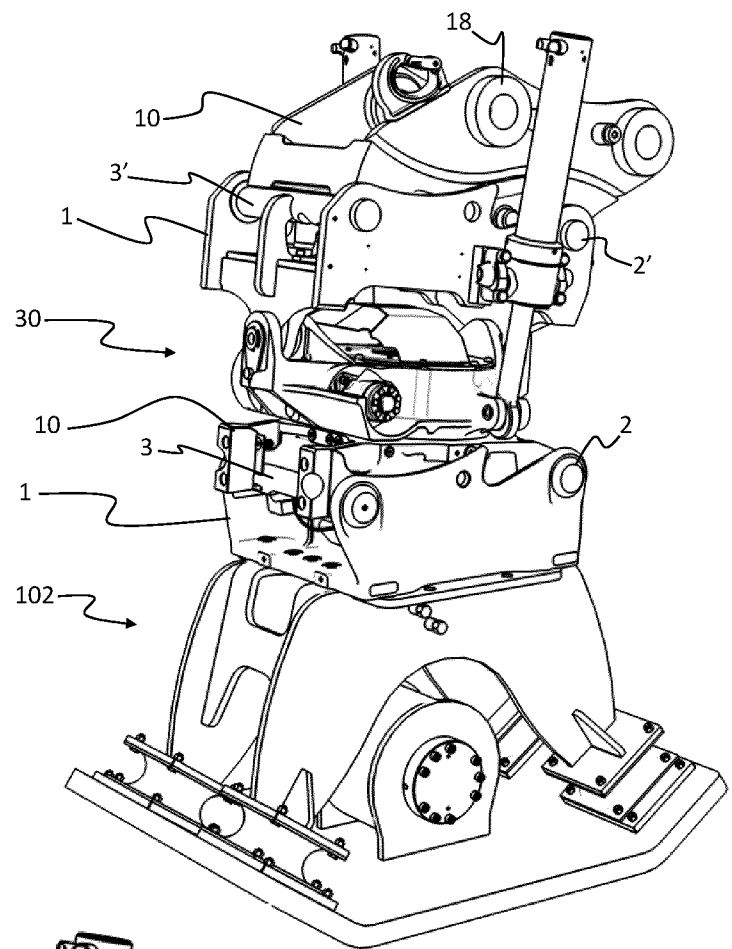


Fig. 6

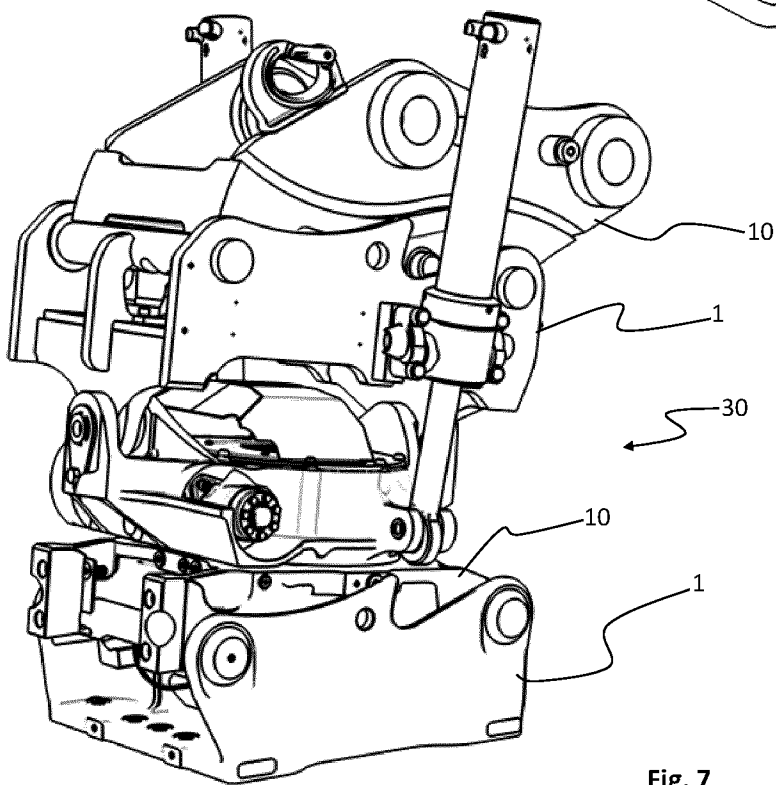


Fig. 7

5/6

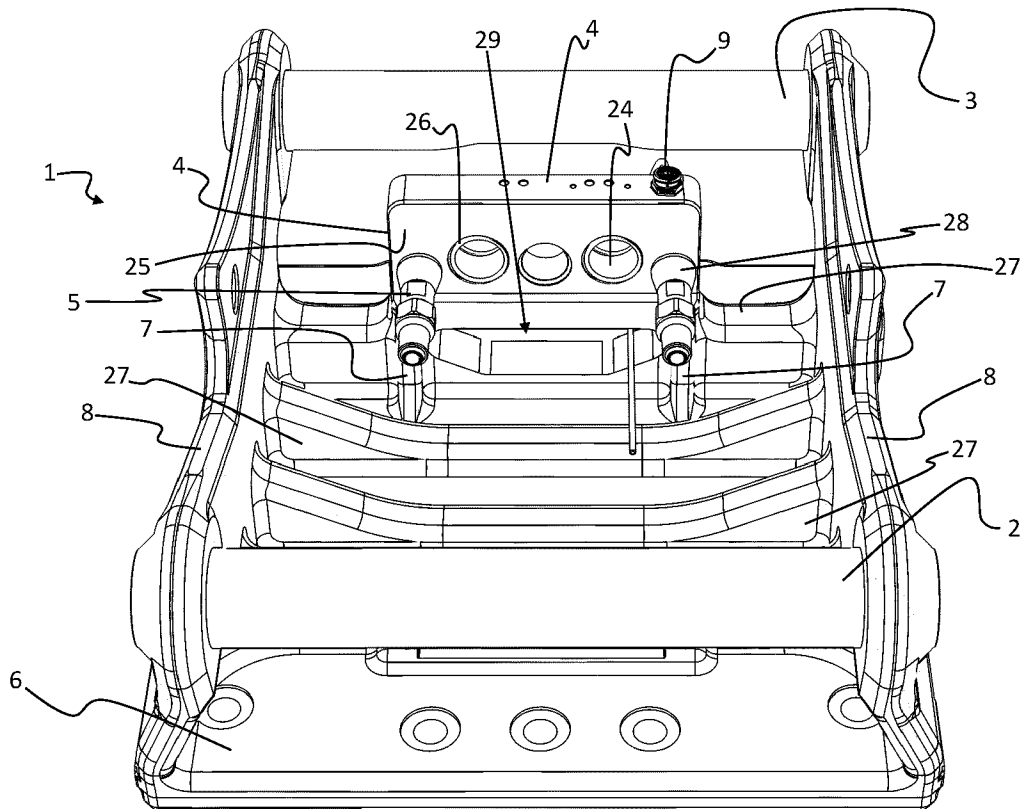


Fig. 8

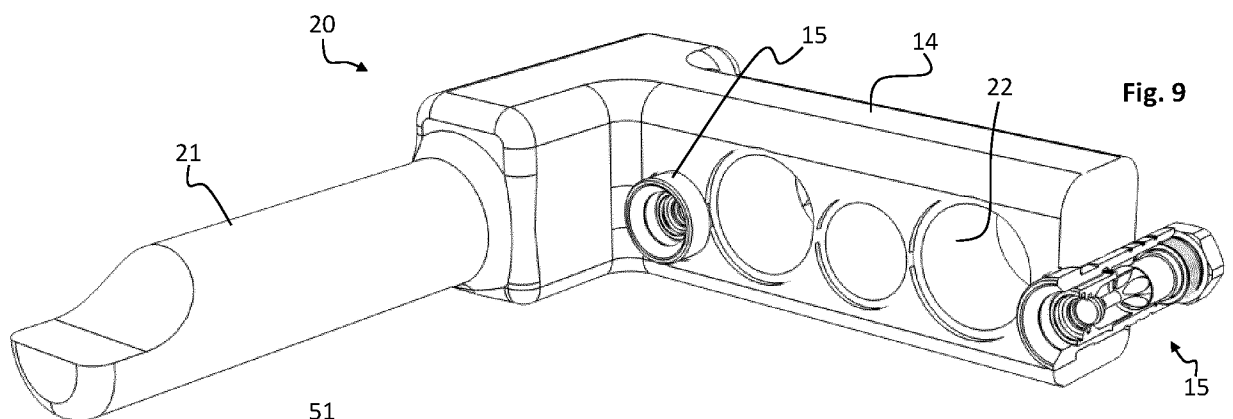


Fig. 9

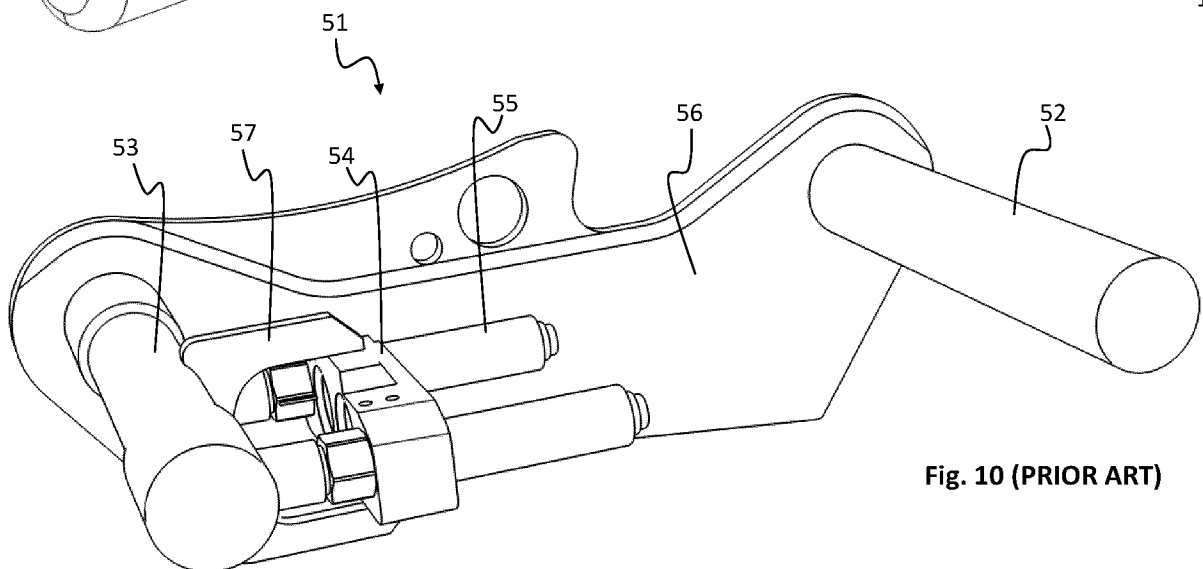


Fig. 10 (PRIOR ART)

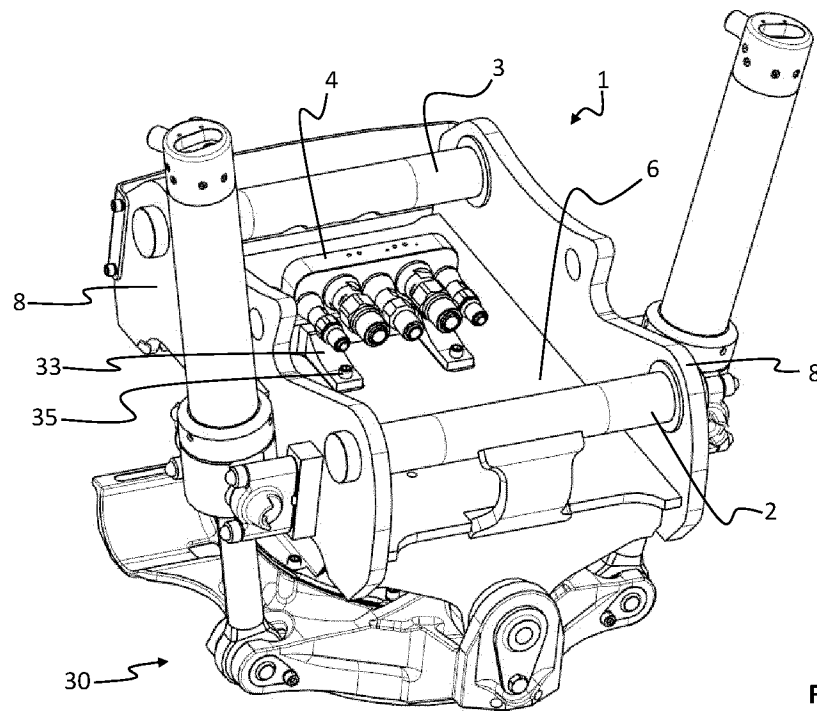


Fig. 11

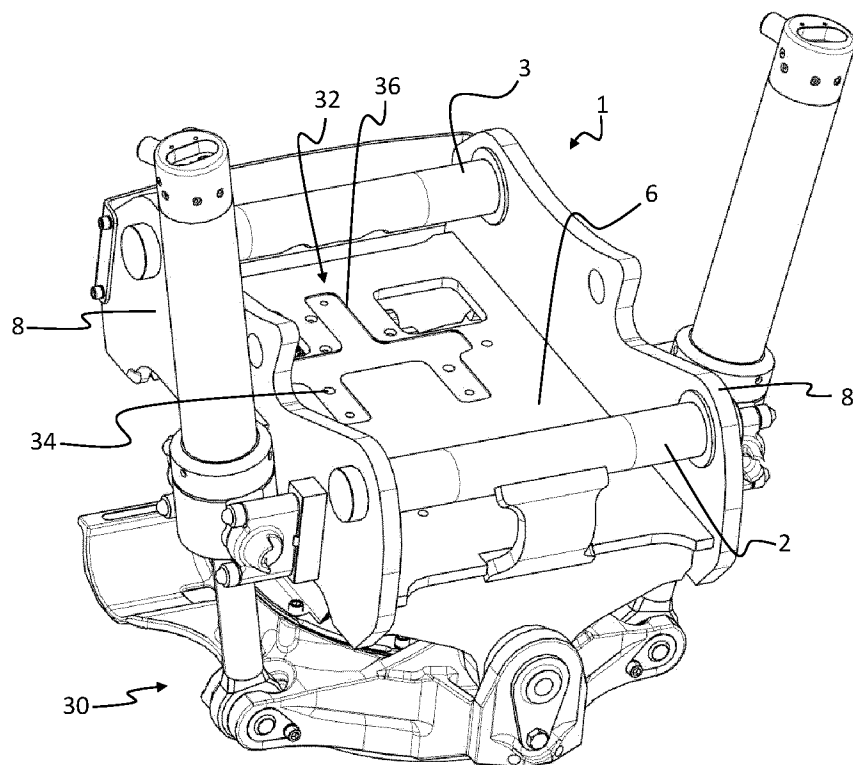


Fig. 12

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2019/085137

A. CLASSIFICATION OF SUBJECT MATTER INV. E02F3/36 E02F9/22 F16L37/34 F16L37/35 F16L37/56 ADD.		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) E02F F16L		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal, WPI Data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 3 354 801 A1 (BAUMASCHINENTECHNIK GES M B H [AT]) 1 August 2018 (2018-08-01)	1-8,10
Y	paragraphs [0026] - [0040]; figures -----	9,11
Y	DE 92 09 060 U1 (FASTER S.R.L.) 22 October 1992 (1992-10-22) figures -----	9
Y	SE 501 047 C2 (MANNBRO ROLF [SE]) 24 October 1994 (1994-10-24) figures -----	11
X	US 5 465 513 A (SONERUD JOHN T [SE]) 14 November 1995 (1995-11-14) cited in the application	1-8,10
Y	column 2, line 52 - column 3, line 4; figures -----	11
☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 6 April 2020		Date of mailing of the international search report 21/04/2020
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Kühn, Thomas

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2019/085137

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 3354801	A1	01-08-2018	NONE
DE 9209060	U1	22-10-1992	NONE
SE 501047	C2	24-10-1994	NONE
US 5465513	A	14-11-1995	AT 137550 T 15-05-1996
		CA 2117095 A1	18-03-1993
		DE 69210405 D1	05-06-1996
		DE 69210405 T2	05-12-1996
		DK 0602165 T3	16-09-1996
		EP 0602165 A1	22-06-1994
		ES 2088153 T3	01-08-1996
		FI 940873 A	24-02-1994
		JP 2736286 B2	02-04-1998
		JP H06510343 A	17-11-1994
		NO 179376 B	17-06-1996
		SE 467742 B	07-09-1992
		US 5465513 A	14-11-1995
		WO 9305241 A1	18-03-1993