(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 572 588 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
27.11.2019 Bulletin 2019/48

(51) Int Cl.:
E02F 3/36 *(2006.01)*

(21) Application number: **19173525.7**

(22) Date of filing: **09.05.2019**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **10.05.2018 GB 201807593**

(71) Applicant: **Verachtert Nederland B.V.**
5221 EC 's Hertogenbosch (NL)

(72) Inventor: **van Uden, Adrianus Wilhelmus**
5481 VD Schijndel (NL)

(74) Representative: **Harris, Oliver John Richard et al**
Novagraaf UK
3rd Floor
77 Gracechurch Street
London EC3V 0AS (GB)

(54) **WORKTOOL COUPLER**

(57) The disclosure relates to a coupler for coupling a worktool to a work machine. The work machine may for example be wheeled loader that has to be coupled to some kind of worktool. Coupling standards have not been harmonised in the industry hence there are a variety of couplers in use. The couple of this disclosure is configured such that it can be used in two different coupling systems where a machine would connect with the coupler from one end or another end depending on the system required at that time. The hydraulic connections are configured such that whatever the coupling system used, the behaviour of the operator controls remain the same.

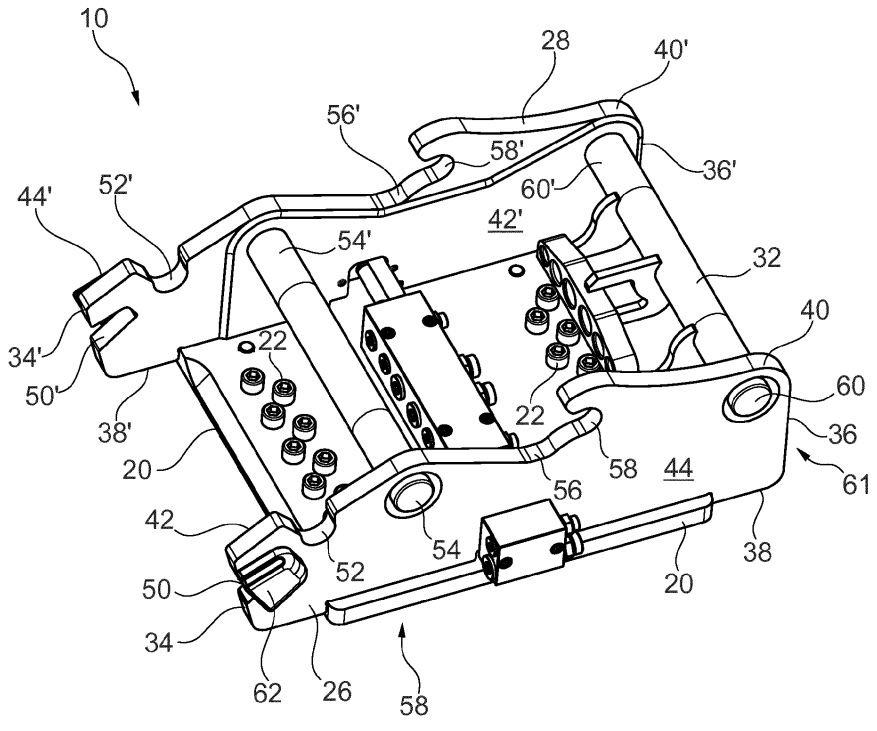

Fig. 1

EP 3 572 588 A1

Description

Field of the Invention

[0001] The invention relates to couplers to connect worktools to host machines.

Background and Prior Art

[0002] Host machines such as excavators can be equipped with a variety of worktools such as grabs, buckets, hammers, drills, etc. Host machines that switch between worktools with some frequency may benefit from so-called quick couplers, i.e. adapters that can relatively quickly connect to, and disconnect from, worktools. There are multiple systems of host machines, worktools and couplers on the market which may be of a disadvantage owners/operators as they could be locked into one particular provider to ensure compatibility of multiple host machines and/or and work tools. The current disclosure aims to overcome some of the existing disadvantages by providing an extended range of compatibility.

Summary of the Invention

[0003] Accordingly, the invention provides a coupler for coupling a worktool to a work machine, the coupler having a first coupling configuration and a second coupling configuration, the coupler comprising: a side wall having an end surface, an upper surface and a side surface, the side wall having in sequential order:

- a first recess associated with the first configuration in the first end surface
- a second recess associated with the first configuration in the upper surface
- a first pin associated with the second configuration projecting from the side surface
- a concave region associated with the second configuration in the upper surface
- a third recess associated with the first configuration in the upper surface
- a second pin associated with the second configuration projecting from the side surface.

[0004] Other features and advantages of this invention will become apparent from the following description and the accompanying drawings.

Brief Description of the Figures

[0005] The invention will be described with reference to the accompanying drawings, in which:

Fig. 1 is a coupler providing two configurations according to current disclosure;
Figs. 2-4 show a connection sequence of the coupler of Fig. 1 using the first of the two configurations;
Figs. 5-7 show a connection sequence of the coupler of Fig. 1 using the second of the two configurations;
Fig. 8 shows the coupler of Fig.1 with an emphasis on components of a fluid system;
Fig. 9 shows an hydraulic schematic of the fluid system of Fig. 8.

Description of Preferred Embodiments

[0006] Figs. 1 to 9 show a coupler 10 for coupling a worktool 12 such as for example a clamshell grab to a host machine 14 such as an excavator (partially shown).

[0007] The coupler 24 is provided with two coupling configurations as set out in more detail below such that host machines with one of two types of linkages can be coupled to the worktool 12. Traditional couplers have single configurations meaning they are restricted to pick up by host machines with one specific type of linkage only.

[0008] The coupler 10 includes a base plate 20. The base plate 20 may be connected to the worktool 12 using threaded fasteners 22 or other suitable means such as welding. The coupler 10 further includes a first side wall 26 and a second side wall 28 that are connected to the base plate 30 via any suitable means such as welding.

[0009] First and second side walls 26, 28 may be provided with different features, but are provided with common features that will be discussed below. For ease of understanding only side wall 26 will be described, but it is understood that the description substantially applies to both side walls 26, 28 and like numerals will be applied to like features as to a large extend, the first and second sidewalls 26, 28 may mirror each other.

[0010] The side wall 26 is provided with a first end surface 34, a second end surface 36, a lower surface 38, an upper surface 40, an inner side surface 42 and an outside surface 44. Starting from the first end surface 34, the first side wall 26 is provided with the following features (in sequential order):

- a first recess 50 in the first end surface 34.
- a second recess 52 in the upper surface 40;
- a first pin 54 projecting from the inner side surface 42;
- a concave region 56 in the upper surface;
- a third recess 58 in the upper surface; and
- a second pin 60 projecting from the inner side surface 42.

[0011] The first recess 50 may be a generally conical recess. At least one of the second and third recesses 52 and 54 may be generally U-shaped recess. In an embodiment both of the second and third recesses 52 and 54 may be generally U-shaped recesses.

[0012] The first recess 50, the second recess 52 and the third recess 58 form, or are associated with, the first coupling configuration 59, whereas the first pin 54, the concave region 56 and the second pin 60 form, or are associated with, the second coupling configuration 61.

[0013] The first recess 50 may be partially covered with

a protective hood 62. The concave region 56' may be omitted from the second sidewall 28. The first and second pins 54, 60 may extend between and connect with both the first and second sidewalls 26, 28.

[0014] As shown in Figs. 2-4, a host machine 14 with a linkage 64 of the type compatible with the first configuration engages the coupler 10 in the following manner. The linkage 64 is manipulated such that a generally pin shaped first linkage section 70 engages the third recess 58, followed by a generally pin shaped second linkage section 72 engaging the second recess 52 and followed by a generally wedge shaped third linkage section 74 moving into the first recess 50 thereby locking the linkage 64 in place with the coupler 10.

[0015] As shown in Figs. 5-7, a host machine 14 with a linkage 78 of the type compatible with the second configuration engages the coupler 10 in the following manner. The linkage 78 is manipulated such that a generally U-shaped first linkage section 80 engages the first pin 54, followed by a generally pin shaped second linkage section 82 engaging the concave region 56 closely followed by a generally semi-U-shaped third linkage section 84 engaging the second pin 60. The coupler 10 and linkage 78 are locked into position by a locking device 86 on the linkage 78 sliding under the second pin 60 thereby completing the semi-U shaped of the third linkage section 78 to a full general U-shape.

[0016] It is clear from Figs 2-4 and 5-7 that the engagement between the coupler 10 and a linkage 64 (compatible with the first configuration) or a linkage 78 (compatible with the second configuration) occurs from different sides of the coupler 10. The first coupling configuration 59 is adapted to receive a host machine 14 with a linkage compatible with the first coupling configuration 59 from a first end proximal to second pin 60. The second coupling configuration 61 is adapted to receive a host machine 14 with a linkage compatible with the second coupling configuration 61 from a second end proximal to first recess 50.

[0017] Figs. 2-7 show the mechanical coupling arrangement between a host machine 14 and a worktool 12. Many types of worktool 12 require a fluid connection with the host machine 14 to hydraulically power elements of the worktool 12 such as for example hydraulic cylinders and hydraulic motors (not shown). Once a fluid connection have been established, an operator can control the worktool 12 via a control device such as a joystick (not shown) mounted in a cabin on host machine 14.

[0018] Fig. 8 shows an embodiment of worktool 12 provided with a fluid system 100. The fluid system 100 has a first connector block 102, a second connector block 104 and a third connector block 106. The fluid system further comprises a junction block 108. First and second connector blocks 102 and 104 are associated with the first coupling configuration 59, whereas the third connector block 106 is associated with the second coupling configuration 61. Junction block 108 is associated with both the first and second coupling configurations 59 and 61. At least one of the first and second connector blocks 102, 104 is positioned on one of the outside surfaces 44, 44'. In an embodiment first connector block 102 is positioned on an outside surface 44 of said first sidewall 26, and said second connector block 104 is positioned on an outside surface 44' of said second sidewall 28. Either one or both of the third connector block 106 and junction block 108 is positioned generally in between the first and second side walls 26, 28.

[0019] In an embodiment the first and second connector blocks 102 and 104 are configured to be connected manually to a fluid system (not shown) on the linkage 64. The third connector block is configured to be connected automatically to a fluid system (not shown) on the linkage 78.

[0020] Junction block 108 has four sets of ports, 110, 112, 114 and 116. Ports 110 and 112 are configured to receive fluid lines 122, 124 from first and second connector blocks 102 and 104 respectively. Ports 114 are configured to receive fluid lines 126 (not shown) from third connector block 106 and ports 116 are configured to receive fluid lines 120 (not shown) from worktool 12. The four sets of ports 110, 112, 114 and 116 may each include one or more ports and the ports within each set may be conveniently grouped together. Fluid lines 120, 122, 124 and 126 may be pressure ("P") or tank ("T") lines as set out below.

[0021] As discussed above, the engagement between the coupler 10 and a linkage 64 (compatible with the first configuration) or a linkage 78 (compatible with the second configuration) occurs from different sides of the coupler 10. When a worktool 12 is connected to a host machine 14, it is highly desirable to create the same type of response of a worktool based on a specific operator input regardless whether a linkage 64 or a linkage 78 is being used to couple the worktool 12 to the host machine 14. However, due to the fact that the first coupling configuration 59 is adapted to receive a host machine 14 with a linkage compatible with the first coupling configuration 59 from a first end proximal to second pin 60 and the second coupling configuration 61 is adapted to receive a host machine 14 with a linkage compatible with the second coupling configuration 61 from a second end proximal to first recess 50, the response of the worktool 12 based on a specific operator input would be different as the fluid connections would be made in the opposite "hand", i.e. LHS (Left Hand Side) and RHS (Right Hand Side) connections would be switched. To overcome this problem, the fluid system 100 has been provided with a unique configuration as shown in Fig. 9. For ease of reference an axis X is shown in Fig. 9 dividing the fluid system 100 in two zones which may be interpreted as a LHS zone and a RHS zone of the worktool 12 (see Fig. 8).

[0022] A "P" denotes a pressure line, a "T" denotes a tank line, an "L" a leak line, an "S" is a spare connection. The numerals "1" and "2" immediately following the "P" and "T" tank line denominators refer to a first and second worktool function such as for example clamping and ro-

tation. A "W" indicates the fluid connection extending to the worktool 12. The exact functions associated with "1" and "2" may be worktool dependent and are of no particular relevance. The configuration and location of the "L" and "S" lines is not of particular further interest. If an engagement between the coupler 10 and a linkage 64 would happen from the same side as an engagement between the coupler 10 and a linkage 78, the pressure lines of both the first coupling configuration 59 and the second coupling configuration 61 would be expected to be found in the same zone, i.e. in one of the LHS or RHS zones. The tank lines of both the first coupling configuration 59 and the second coupling configuration 61 would then be expected to be located in the other of the LHS and RHS zones. It can be seen from Fig. 9 that the fluid connections have been switched to account for the relative opposite approaches of linkages 64 and 78. The pressure lines PI of the first coupling configuration 59 are now found in the same zone as the tank lines T2 of the second coupling configuration 61 and vice versa.

[0023] In an embodiment the pressure lines PI of the first coupling configuration 59 are on one of the LHS and RHS and the pressure lines P2 of the second coupling configuration 61 are on the other one of the LHS and RHS. Where the pressure lines PI of the first coupling configuration 59 are on one of the LHS and RHS, the tank lines T1 of the first coupling configuration 59 are on the other one of the LHS and RHS. Where the pressure lines P2 of the second coupling configuration 61 are on one of the LHS and RHS, the tank lines T2 of the second coupling configuration 61 are on the other one of the LHS and RHS. Junction block 108 connects the pressure lines PI of the first coupling configuration 59 with the pressure lines P2 of the second coupling configuration 61.

[0024] In an embodiment the first connector block 102 contains pressure lines PI, the second connector block 104 contains tank lines T1, the third connector block 106 contains pressure and tank lines P2, T2, with the junction block 108 receiving pressure and tank lines PI, P2, T1, T2 from the first, second and third connector blocks 102, 104, 106.

[0025] It is to be understood that the exact geometric arrangement of the coupler 10 may be modified without materially affecting its function as will be apparent to the person skilled in the art. Other modifications may be made within the scope of the appended claims.

Claims

1. A coupler for coupling a worktool to a work machine, the coupler having a first coupling configuration and a second coupling configuration, the coupler comprising:
   a side wall having an end surface, an upper surface and a side surface, the side wall having in sequential order:
   - a first recess associated with the first configuration in the first end surface
   - a second recess associated with the first configuration in the upper surface
   - a first pin associated with the second configuration projecting from the side surface
   - a concave region associated with the second configuration in the upper surface
   - a third recess associated with the first configuration in the upper surface
   - a second pin associated with the second configuration projecting from the side surface

2. A coupler according to claim 1, wherein said first recess is a generally conical recess.

3. A couple according to any of the preceding claims wherein at least one of said second and third recesses is a generally U-shaped recess.

4. A coupler according to any of the preceding claims, wherein said first coupling configuration is adapted to receive a host machine with a linkage compatible with said first coupling configuration from a first end of said coupler proximal to said second pin and said second coupling configuration is adapted to receive a host machine with a linkage compatible with said second coupling configuration from a second end of said coupler proximal to said first recess.

5. A coupler according to any of the preceding claims wherein said sidewall is the first of a pair of spaced parallel sidewalls, wherein said second sidewall has its own first, second and third recesses substantially mirroring those of the first sidewall and said first and second pins extend between, and connect with, said first and second sidewalls.

6. A coupler according to any of the preceding claims, wherein said coupler is provided with a fluid system comprising first and second connector blocks associated with said first configuration, at least one of said first and second connector blocks being positioned on an outside surface of said sidewall.

7. A coupler according to claim 6 wherein said first connector block is positioned on an outside surface of said first sidewall, and said second connector block is positioned on an outside surface of said second sidewall.

8. A coupler according to any of claims 6-7, wherein said fluid system further comprises a third connector block associated with said second configuration, said connector block being positioned generally between said first and second sidewalls.

9. A coupler according to any of claims 6-8, wherein

said fluid system further comprises a junction block associated with both said first and second configurations.

10. A coupler according to claim 8 wherein said junction block is positioned generally between said first and second sidewalls.

11. A coupler according to any of the preceding claims wherein said coupler has a left hand side (LHS) and a right hand side (RHS) wherein the first coupling configuration comprises pressure lines that are on one of the LHS and RHS and the second coupling configuration comprises pressure lines that are on the other one of the LHS and RHS.

12. A coupler according to any of the preceding claims wherein said coupler has a left hand side (LHS) and a right hand side (RHS) wherein the first coupling configuration comprises pressure lines that are on one of the LHS and RHS and the first coupling configuration comprises tank lines that are on the other one of the LHS and RHS.

13. A coupler according to any of claims 11-12 wherein the pressure lines of the second coupling configuration are on one of the LHS and RHS and the tank lines of the second coupling configuration are on the other one of the LHS and RHS.

14. A coupler according to any of claims 8-12, wherein said junction block connects the pressure lines of the first coupling configuration with the pressure lines of the second coupling configuration.

15. A coupler according to any of claims 9-14 wherein said first connector block (102) contains pressure lines, said second connector block (104) contains tank lines, said third connector block (106) contains pressure and tank lines, with said junction block (108) receiving pressure and tank lines from said first, second and third connector blocks.

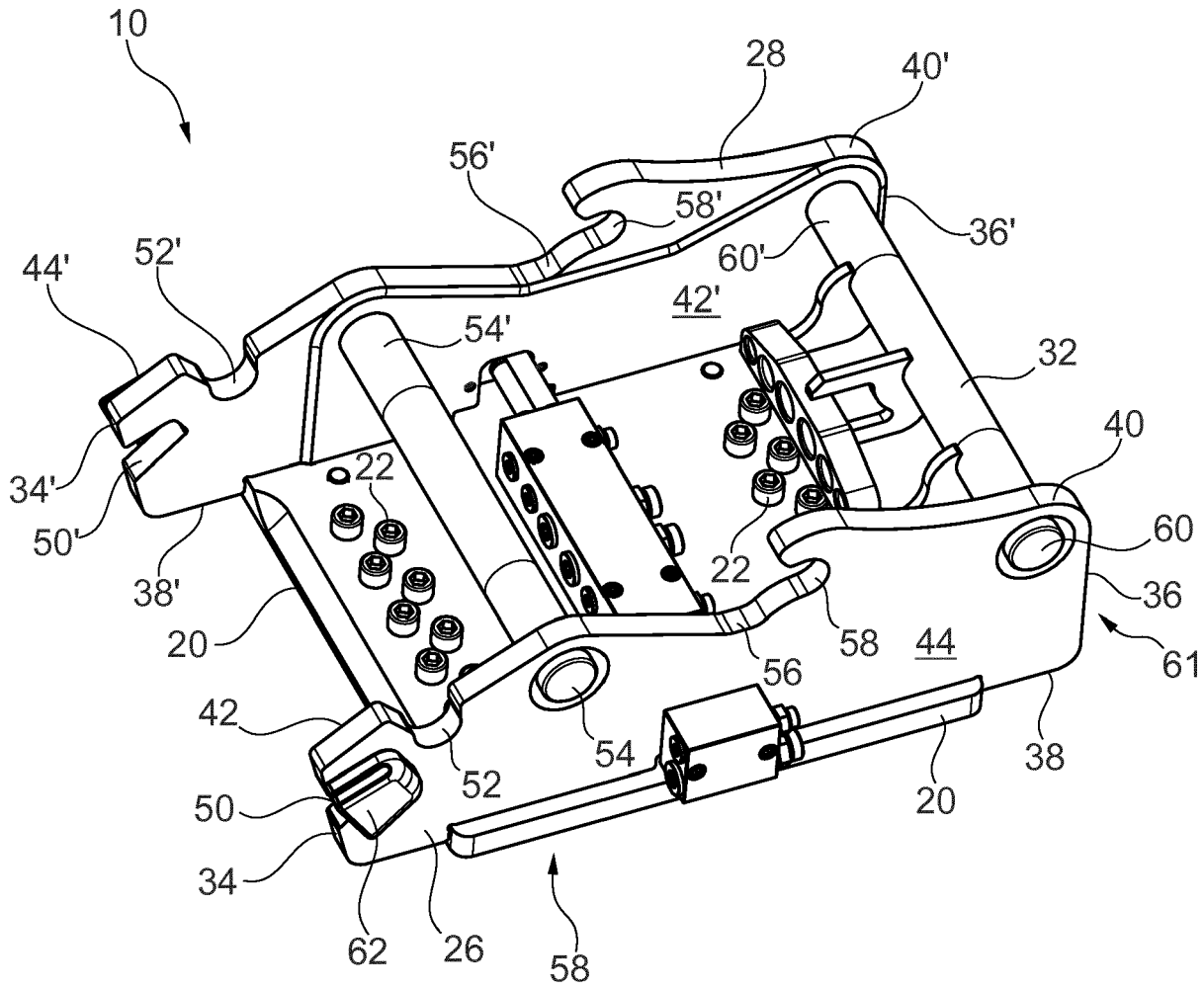
10
28
40'
56'
58'
36'
60'
44'
52'
42'
54'
32
40
34'
22
50'
38'
20
22
58
44
56
60
36
61
42
54
52
50
34
62
26
58
38
20

Fig. 1

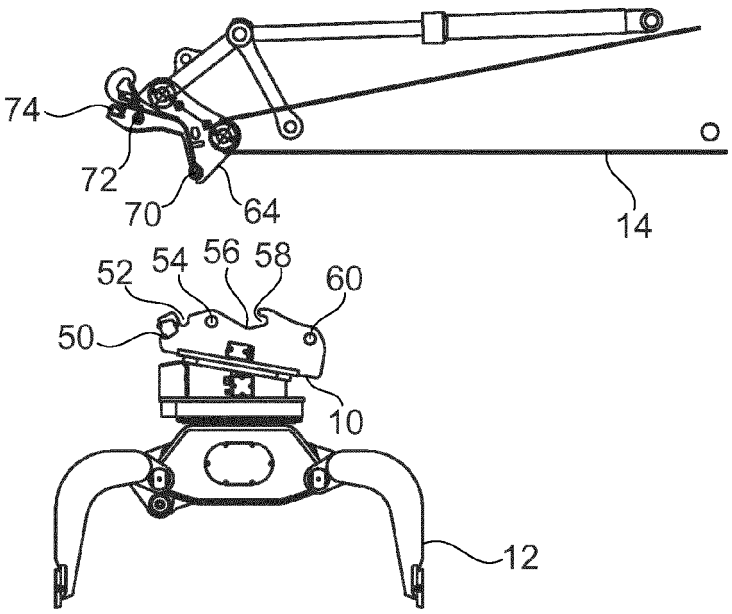

Fig. 2

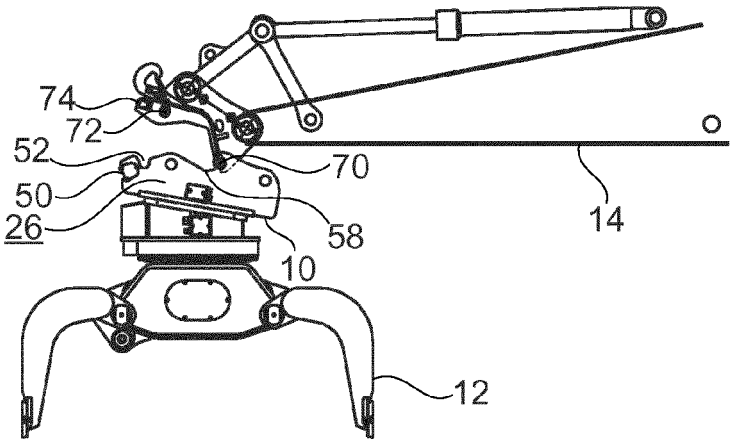

Fig. 3

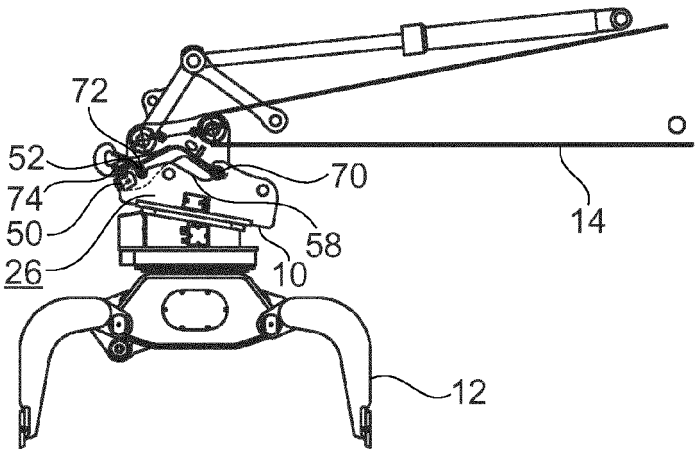

Fig. 4

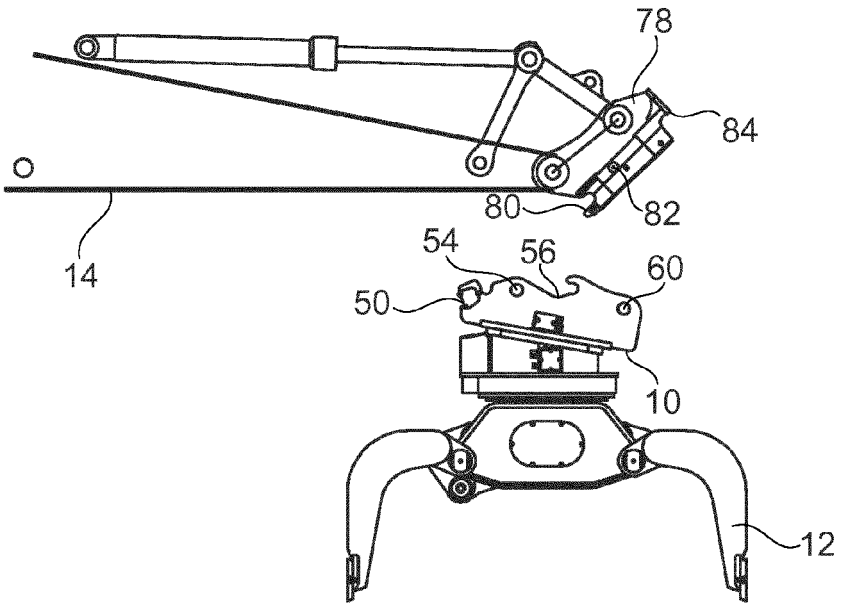

Fig. 5

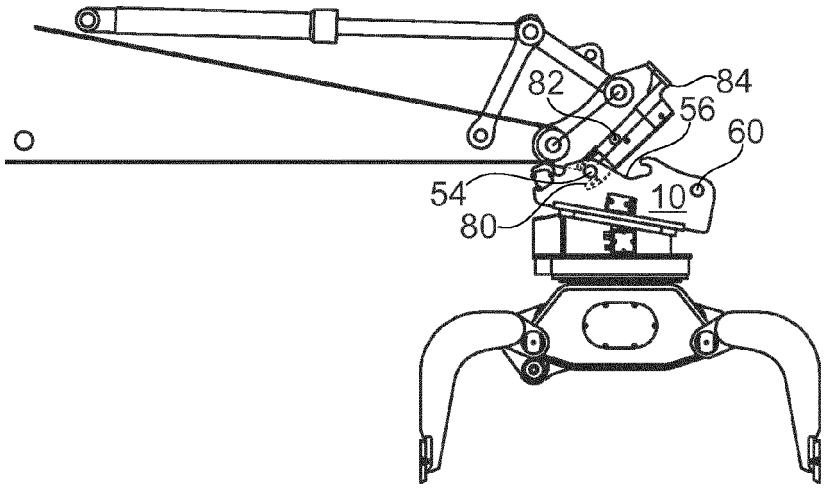

Fig. 6

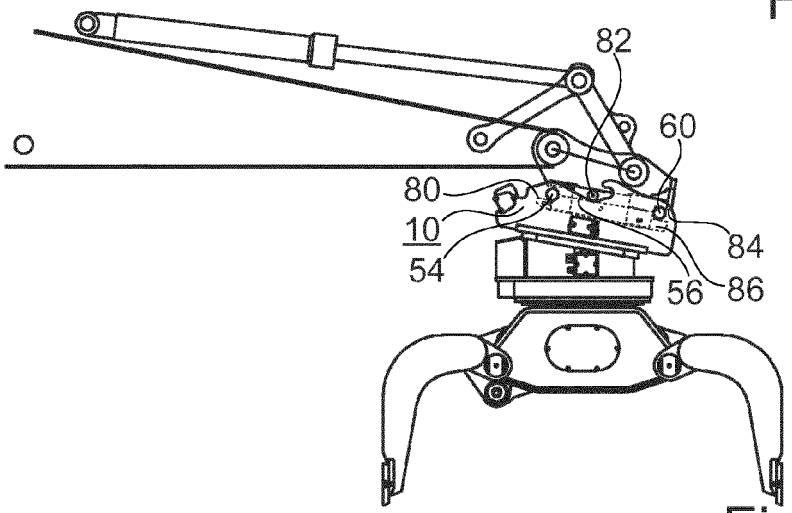

Fig. 7

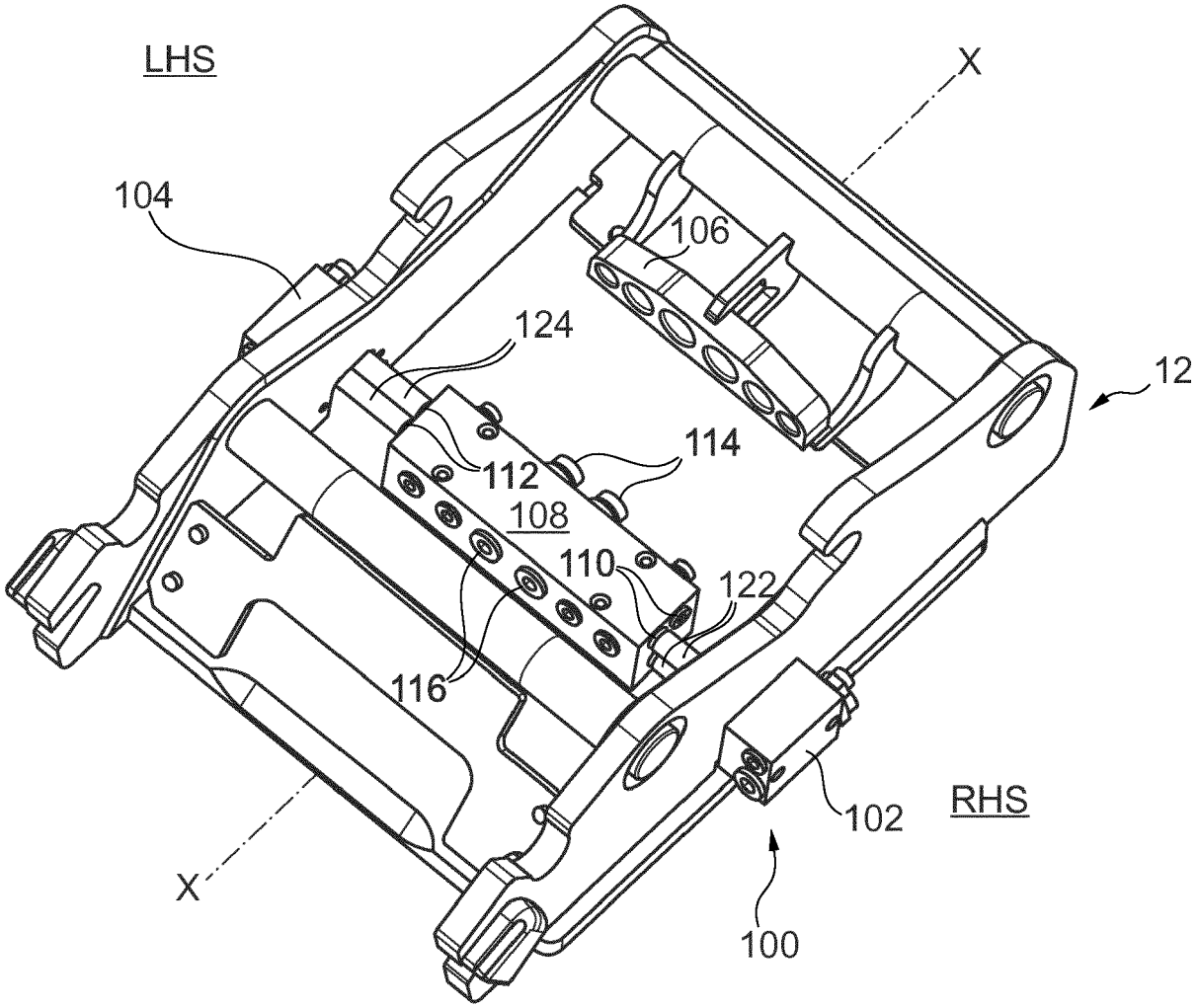

Fig. 8

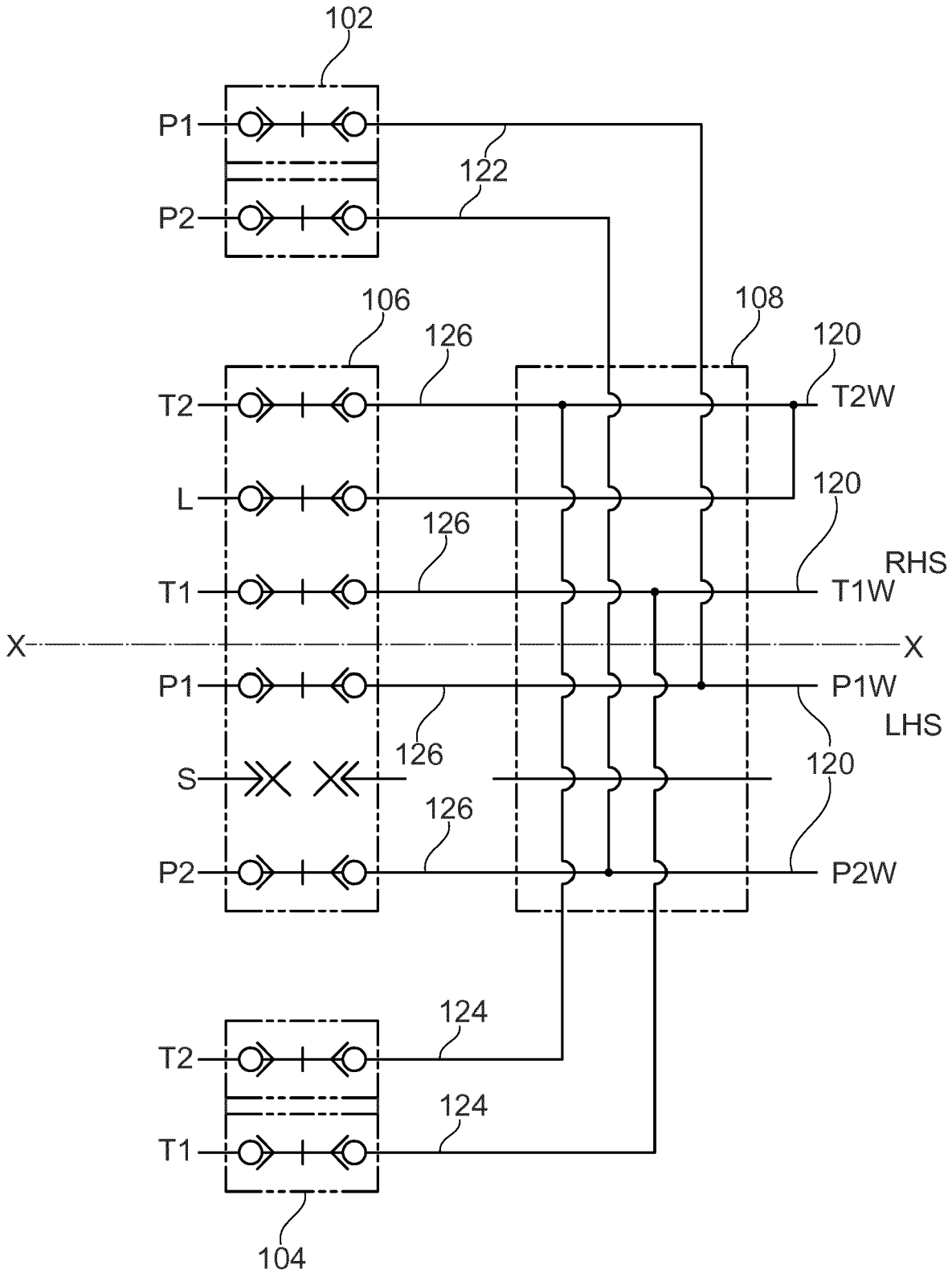
102
P1
122
P2
106
126
108
120
T2
T2W
L
120
126
RHS
T1
T1W
X
X
P1
P1W
LHS
126
120
S
126
P2
P2W
124
T2
124
T1
104

Fig. 9

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 19 17 3525

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	US 2012/237283 A1 (STOLLERY RANDAL D [CA]) 20 September 2012 (2012-09-20) * abstract; figures 1-5 *	1-5	INV. E02F3/36
A	DE 10 2007 023751 A1 (KURZ ANDREAS [DE]) 27 November 2008 (2008-11-27) * abstract; figures 1-6 *	1-5	
A	CA 2 727 324 A1 (GARIER INC [CA]) 10 July 2012 (2012-07-10) * abstract; figure 1 *	1-5	
A	DE 20 2017 107699 U1 (OILQUICK DEUTSCHLAND GMBH [DE]) 10 January 2018 (2018-01-10) * abstract; figures 1-10 *	1,4-15	

TECHNICAL FIELDS SEARCHED (IPC)
E02F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	15 October 2019	Ferrien, Yann

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 19 17 3525

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

15-10-2019

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2012237283 A1	20-09-2012	CA 2733965 A1	14-09-2012
		CA 2771372 A1	14-09-2012
		US 2012237283 A1	20-09-2012
DE 102007023751 A1	27-11-2008	NONE	
CA 2727324 A1	10-07-2012	NONE	
DE 202017107699 U1	10-01-2018	NONE	

EPO FORM P0459

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