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(54) Removable pin stub

(57) A removable pin stub (20) for a jaw set (12) is disclosed. The removable pin stub (20) may be removably attached to the jaw set (12). The removable pin stub (20) comprises: a flange portion (26) having a first side (30) and a second side (32), the flange portion (26) having at least one through opening (34) extending from the first side (30) to the second side (32); and a stub portion (28) extending from the first side (30) of the flange portion (26).

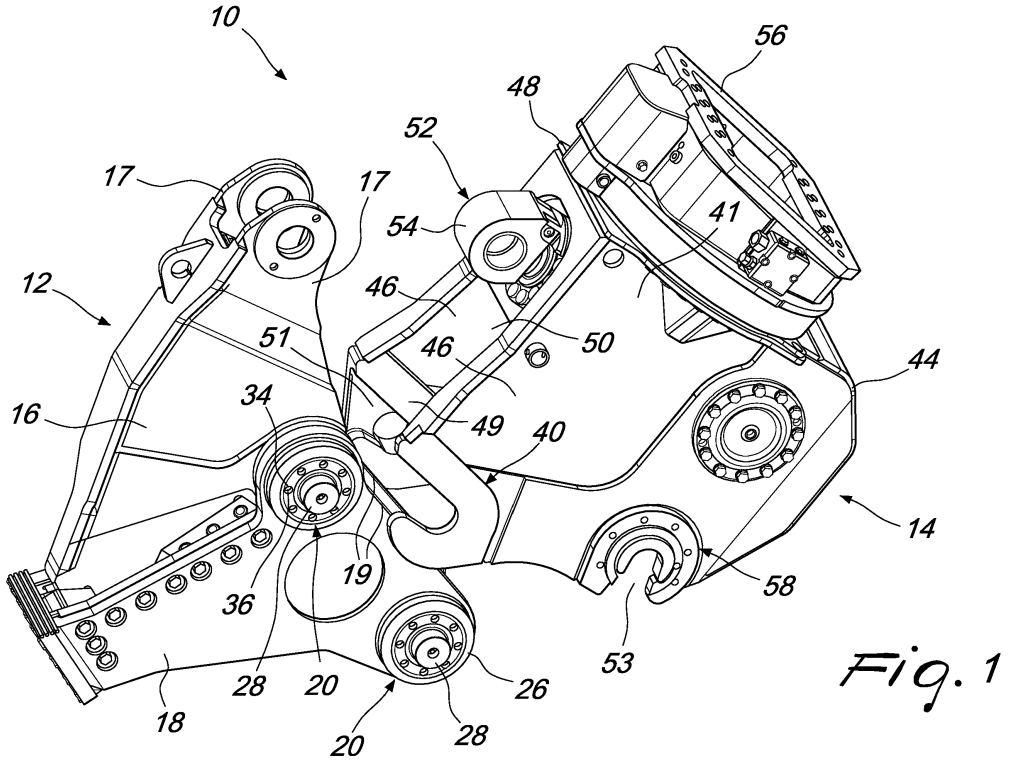

Fig. 1

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Description

Technical Field

[0001] This disclosure relates to the field of tools for crushing and/or cutting material and more particularly to the field of tools having interchangeable jaw sets and frames adapted to receive the jaw sets.

Background

[0002] A device for crushing and/ or cutting material is generally known. The device may have a jaw set for example suitable for crushing concrete. A different jaw set may be used for crushing or cutting other materials, for example for cutting scrap iron and/or iron sections. Thus, different devices may be used for crushing or cutting different materials. The jaw sets may be interchangeable in order to be used for varying work requirements.

[0003] EP2578752 discloses a demolition apparatus and an adapter frame of the demolition apparatus. The demolition apparatus may have a jaw set having a first jaw and a second jaw. The first jaw may be pivotably coupled to the second jaw. The second jaw may be pivotable about the pivot pin. The ends of the pivot pin may protrude from both sides of the jaw set. The adapter frame may be formed with coupling seats that engage the ends of the pivot pin on the jaw set to assemble the demolition apparatus.

[0004] The present disclosure is directed, at least in part, to improving or overcoming one or more aspects of the prior art system.

Brief Summary of the Invention

[0005] In a first aspect, the present disclosure describes a removable pin stub for a jaw set. The removable pin stub may comprise: a flange portion having a first side and a second side, the flange portion having at least one through opening extending from the first side to the second side; and a stub portion extending from the first side of the flange portion.

[0006] In a second aspect, the present disclosure describes a jaw set comprising: a first jaw pivotally coupled to a second jaw at a pivot axis; and at least one removable pin stub fastened to the first jaw or the second jaw such that the stub portion protrudes from an outer surface of the jaw set.

[0007] In a third aspect, the present disclosure describes a demolition apparatus comprising: a jaw set having at least one removable pin stub; and a frame connectable to an arm of a machine, the frame having at least one coupling seat to engage the removable pin stub.

Brief Description of the Drawings

[0008] The foregoing and other features and advantages of the present disclosure will be more fully understood from the following description of various embodiments, when read together with the accompanying drawings, in which:

Fig. 1 is a side view of a jaw set assembly and a frame according to the present disclosure;
Fig. 2 is a section through the jaw set and a removable pin stub assembled with the frame; and
Fig. 3 is an alternate section through the jaw set and a pair of removable pin stubs assembled with the frame.

Detailed Description

[0009] This disclosure generally relates to a removal pin stub for a work tool. Fig. 1 illustrates a demolition apparatus **10**. The demolition apparatus **10** may comprise a jaw set **12** and a frame **14.** The jaw set **12** and the frame **14** may be mutually connectable. The jaw set **12** and the frame **14** may be configured for mutual connection.

[0010] With reference to Fig. 1, jaw set **12** may comprise a removable pin stub **20**. The removable pin stub **20** may comprise a flange portion **26** and a stub portion **28**. The flange portion **26** and the stub portion **28** may be monolithically formed. In an embodiment, flange portion **26** and stub portion **28** may be separately formed and subsequently connected to form the removable pin stub **20.**

[0011] With reference to Fig. 2, flange portion **26** may be configured to engage a side of the jaw set **12** so as to be fixed thereto. The flange portion **26** may have a first side **30** and a second side **32**. First side **30** may be substantially parallel to the second side **32**. Edge **27** may be formed between the first side **30** and the second side **32.** The first side **30** may have an inclined surface **29** formed at the periphery. Inclined surface **29** may surround first side **30**. Inclined surface **29** may be interposed between the first side **30** and the edge **27**.

[0012] The flange portion **26** may have at least one through opening **34** extending from the first side **30** to the second side **32**. Flange portion **26** may be shaped as a disc. In an embodiment, flange portion **26** may have a plurality of through openings **34** arranged radially on the first side **30**. The flange portion **26** may have a recess **31** positioned at the centre thereof. Recess **31** may create a clearance for the transition (radius) between the stub portion **28** and the flange first side **30**. The transition may reduce any interference with the edges of seat **40** so as to prevent fatigue failure.

[0013] Flange portion **26** may have an aperture (not shown) positioned on the second side **32**. The aperture may be centrally located on the second side **32**. The position of the aperture on the second side **32** may correspond to the position of the stub portion **28** on the first side **30**.

[0014] The stub portion **28** may be configured to engage a part of the frame **14**. The stub portion **28** may

extend from the first side **30** of the flange portion **26**. Stub portion **28** may be centrally positioned on the flange portion **26**. Stub portion **28** may be centrally positioned on the first side **30**. Stub portion **28** may extend perpendicularly relative to the first side **30**. The diameter of the stub portion **28** may be smaller than the dimensions of the flange portion **26**. The diameter of the stub portion **28** may be smaller than the diameter of the flange portion **26**.

[0015] Stub portion **28** may be positioned in the recess **31**. Stub portion **28** may be formed as a rod. The plurality of through openings **34** may be radially arranged about the recess **31**. The plurality of through openings **34** may be radially arranged about the stub portion **28**.

[0016] With reference to Fig. 1, the jaw set **12** may comprise a first jaw **16** and a second jaw **18**. The first jaw **16** and the second jaw **18** may be suitably provided for crushing concrete and/ or cutting iron sections.

[0017] In an embodiment, the first jaw **16** may comprise two spaced-apart and parallel plates **17**. The plates **17** may be provided at an end of the first jaw **16**. The first jaw **16** may be provided with crushing or cutting tools for crushing or cutting activity. The crushing or cutting tools may be connected to plates **17** of the first jaw **16**. The crushing or cutting tools may be suitably configured for engaging with the second jaw **18** for crushing or cutting activity. In an embodiment, the crushing or cutting tools may be blades, teeth or any other form of material engaging component.

[0018] In an embodiment, the second jaw **18** may comprise two spaced-apart and parallel plates **19** at one end. The plates **19** may be provided at an end of the second jaw **18**. The second jaw **18** may be provided with crushing or cutting tools for crushing or cutting activity. The crushing or cutting tools may be connected to plates **19** of the second jaw **18**. The crushing or cutting tools may be suitably configured for engaging with the first jaw **16** for crushing or cutting activity. In an embodiment, the crushing or cutting tools may be blades, teeth or any other form of material engaging component.

[0019] With reference to Fig. 2, the first jaw **16** and the second jaw **18** may be pivotally connected. In an embodiment, the first jaw **16** and the second jaw **18** may be pivotally coupled together by a pivot pin **22**. The pivot pin **22** may extend through the first jaw **16** and the second jaw **18** at the position of the pivotal connection. The pivotal connection may lie on a pivot axis **24**. In an embodiment, the pivot axis **24** may be coincident with the longitudinal axis of the pivot pin **22**.

[0020] In an embodiment, the first jaw **16** and the second jaw **18** may be retained on the pivot pin **22** without play along the length of the pivot pin **22**. The first jaw **16** and the second jaw **18** may be retained on the pivot pin **22** so that lateral movement may be restricted and rotational movement may not be restricted.

[0021] The first jaw **16** and the second jaw **18** may each be provided with a passage to accommodate the pivot pin **22**. In an embodiment, the plates **17, 19** may be provided with passages to accommodate the pivot pin **22**.

[0022] The removable pin stub **20** may be fastened to the first jaw **16** or the second jaw **18.** The stub portion **28** may protrude from an outer surface of the jaw set **12**. Stub portion **28** may protrude from a side of the jaw set **12**. Stub portion **28** may protrude perpendicularly with respect to the first jaw **16** and the second jaw **18**.

[0023] The removable pin stub **20** may be positioned at the pivot axis **24**. The removable pin stub **20** may be positioned on the jaw set **12** adjacent the pivot pin **22**. The removable pin stub **20** may be positioned such that the pivot axis **24** extends through the centre of the stub portion **28**. In an embodiment, an end of the pivot pin **22** may abut the second side **32** of the flange portion **26**. Stub portion **28** may have the same diameter as the body of the pivot pin **22**.

[0024] Removable pin stub **20** may be fastened to the jaw set **12**. The removable pin stub **20** may be fastened to a surface of either the first jaw **16** or the second jaw **18**. The flange portion **26** may be fastened to an outer surface of the jaw set **12**. The outer surface of the jaw set **12** may be defined as the surface that is immediately adjacent the frame **14** when the jaw set **12** is coupled to the frame **14**. With the removable pin stub **20** on the outer surface the stub portion **28** may be available for engagement with the frame **14**.

[0025] The flange portion **26** may be fastened to an outer surface of either the first jaw **16** or the second jaw **18**. Flange portion **26** may be bolted to the outer surface of either the first jaw **16** or the second jaw **18**. With reference to Fig. 1, bolts **36** may be inserted through the through openings **34** to fasten the removable pin stub **20** to the first jaw **16** or the second jaw **18**. The removable pin stub **20** may be removed by extracting the bolts **36**.

[0026] The outer surface of the jaw set **12** may comprise a pocket **38** to receive the removable pin stub **20**. The pocket **38** may be formed by extensions from the outer surface of the jaw set **12**. The pocket **38** may engage the edge **27** of the flange portion **26**.

[0027] With reference to Fig. 3, in an embodiment, a pair of removal pin stubs **20** may be positioned on opposite external surfaces of the jaw set **12**. The respective stub portions **28** may extend in opposite directions. The respective stub portions **28** may be mutually aligned.

[0028] The pair of removal pin stubs **20** may be aligned on the pivot axis **24**. The pair of removable pin stubs **20** may be positioned such that the pivot axis **24** extends through the centre of the respective stub portions **28**. In an embodiment, opposite ends of the pivot pin **20** may abut the second sides **32** of the respective flange portions **26**. The respective stub portions **28** may have the same diameter as the body of the pivot pin **22**. In a further embodiment, the pivot pin **22** may be interposed by the pair of removable pin stubs **20**.

[0029] The jaw set **12** may further comprise a coupling pin **42.** The coupling pin **42** may be spaced from the pivotal connection of the first jaw **16** and the second jaw **18**. The coupling pin **42** may be spaced from the pivot pin **22**.

[0030] In an embodiment, the coupling pin **42** may extend through the second jaw **18**. The second jaw **18** may be provided with a passage to accommodate the coupling pin **42**. In an embodiment, the coupling pin **42** may extend through the plates **19** of the second jaw **18**. The plates **19** may be provided with passages to accommodate the coupling pin **42**.

[0031] In an alternate embodiment, the coupling pin **42** may be interposed by a pair of removal pin stubs **20**. The opposite ends of the coupling pin **42** may abut the second sides **32** of the respective flange portions **26**. The respective stub portions **28** may have the same diameter as the body of the coupling pin **42**.

[0032] The demolition apparatus **10** may comprise the jaw set **12** and the frame **14** that is connectable to an arm of a machine (not shown). The frame **14** may have at least one coupling seat **40** to engage the removable pin stub **20.** In an embodiment, the frame **14** may have a pair of coupling seats **40** to couple the pair of removable pin stubs **20**.

[0033] The jaw set **12** may be coupled to the frame **14**. The first jaw **16** may be movable connected to the second jaw **18** and the frame **14**. The second jaw **18** may be fixedly connected to the frame **14**. In an embodiment, the removable pin stub **20** may be positioned on the second jaw **18**.

[0034] With reference to Fig. 1, the frame **14** may comprise a housing **44**. The housing **44** may comprise spaced-apart frame plates **46**. The frame plates **46** may be mutually parallel.

[0035] The frame plates **46** may be connected to an end plate **48**. The end plate **48** may be connected to ends of the frame plates **46** at an end of the housing **44** to form a limit for void **50**. The frame plates **46** may extend perpendicularly from the end plate **48**. The end plate **48** may bound at least two sides of the frame plates **46.** In an embodiment, the end plate **48** may be substantially L-shaped in cross section. The sides of the frame plates **46** not bound by the end plate **48** may expose the void **50** to the exterior of the housing **44**.

[0036] A cylinder **52** may be positioned in the housing **44**. The cylinder **52** may be positioned in the void **50** between the frame plates **46** and adjacent to the end plate **48**. A piston rod head **54** may be positioned beyond the sides of frame plates **46** not bound by the end plate **48**. The piston rod head **54** may extend in a direction away from the frame plates **46** and the housing **44**. The direction of extension of piston rod head **54** may be parallel to the frame plates **46**.

[0037] A mounting member **56** may be provided on the housing **44**. The mounting member **56** may enable the frame **14** to connect to the arm of a machine, for example a jib of an excavator. The mounting member **56** may be suitably configured for the connection of the frame **14** to the machine arm. The mounting member **56** may be provided on the end plate **48**. The mounting member **56** may be positioned adjacent the cylinder **52**.

[0038] The coupling seat **40** may be positioned on the housing **44**. The frame **14** may have a pair of coupling seats **40** to couple the pair of aligned removable pin stubs **20**. The frame **14** may further comprise an engagement seat **58**. The frame **14** may have a pair of engagement seats **58** to couple a further pair of aligned removable pin stubs **20**.

[0039] The coupling seats **40** may form the first points of engagement of the jaw set **12** and the frame **14**. The coupling seats **40** may engage a first pair of removable pin stubs **20** on the jaw set **12**. The first pair of removable pin stubs **20** may be adjacent the pivot pin **22**. The coupling seats **40** may have openings **51** to receive the first pair of removable pin stubs **20.** The coupling seats **40** may be configured to receive the stub portions **28**.

[0040] The engagement seats **58** may form the second points of engagement of the jaw set **12** and the frame **14**. The engagement seats **58** may engage a second pair of removable pin stubs **20** on the jaw set **12**. The second pair of removable pin stubs **20** may be adjacent the coupling pin **42**. The engagement seats **58** may have openings **53** to receive the second pair of removable pin stubs **20**. The engagement seats **58** may be configured to receive the stub portions **28**.

[0041] The skilled person would appreciate that foregoing embodiments may be modified or combined to obtain the removable pin stub **20,** the jaw set **12** and the demolition apparatus **10** of the present disclosure.

Industrial Applicability

[0042] This disclosure describes a removable pin stub **20**. The removable pin stub **20** may be subject to forces generated in the jaw set **12**. The forces may be transferred to the frame **14** through the removable pin stub **20** and may become worn. The worn removable pin stub **20** may be removed from the jaw set **12** and replaced with a new removable pin stub **20**. The replacement may be effected without decoupling the first jaw **16** from the second jaw **18**. The removable pin stubs **20** may be independently replaced. In the embodiment of the removal pin stub **20** being positioned at the pivot axis **24** the forces may not be transferred to the pivot pin **22**.

[0043] Accordingly, this disclosure includes all modifications and equivalents of the subject matter recited in the claims appended hereto as permitted by applicable law. Moreover, any combination of the above-described elements in all possible variations thereof is encompassed by the disclosure unless otherwise indicated herein.

[0044] Where technical features mentioned in any claim are followed by reference signs, the reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, neither the reference signs nor their absence have any limiting effect on the technical features as described above or on the scope of any claim elements.

[0045] One skilled in the art will realise the disclosure may be embodied in other specific forms without depart-

ing from the disclosure or essential characteristics thereof. The foregoing embodiments are therefore to be considered in all respects illustrative rather than limiting of the disclosure described herein. Scope of the invention is thus indicated by the appended claims, rather than the foregoing description, and all changes that come within the meaning and range of equivalence of the claims are therefore intended to be embraced therein.

Claims

1. A removable pin stub (20) for a jaw set (12), the removable pin stub (20) comprising:

a flange portion (26) having a first side (30) and a second side (32), the flange portion (26) having at least one through opening (34) extending from the first side (30) to the second side (32); and
a stub portion (28) extending from the first side (30) of the flange portion (26).

2. The removable pin stub (20) according to claim 1 wherein the stub portion (28) is centrally positioned on the flange portion (26).

3. The removable pin stub (20) according to claims 1 or 2 wherein the flange portion (26) has a plurality of through openings (34) radially arranged about the stub portion (28).

4. The removable pin stub (20) according to claims 1, 2 or 3 wherein the flange portion (26) has a form of a circular disc.

5. The removable pin stub (20) according to any of preceding claims wherein the flange portion (26) has a recess positioned on the second side (32).

6. A jaw set (12) comprising:

a first jaw (16) pivotally coupled to a second jaw (18) at a pivot axis (24); and
at least one removable pin stub (20) according to any one of preceding claims, the removable pin stub (20) being fastened to the first jaw (16) or the second jaw (18) such that the stub portion (28) protrudes from an outer surface of the jaw set (12).

7. The jaw set of claim 6 wherein the removable pin stub (20) is positioned at the pivot axis (24).

8. The jaw set of claim 6 or 7 wherein the removable pin stub (20) is fastened to an outer surface of the jaw set (12).

9. The jaw set of claims 6, 7 or 8 wherein the outer surface of the jaw set (12) comprises a pocket (38) to receive the removable pin stub (20).

10. The jaw set of claims 6, 7, 8 or 9 comprising a pair of removal pin stubs (20) positioned on opposite external surfaces of the jaw set (12).

11. The jaw set of claim 9 wherein the pair of removal pin stubs (20) aligned on the pivot axis (24).

12. The jaw set of claims 9 or 10 further comprising a pivot pin (22) pivotably coupling the first and second jaws (16, 18), the pivot pin (22) being interposed by the pair of removable pin stubs (20).

13. A demolition apparatus (10) comprising:

a jaw set (12) according to claims 6 to 12; and
a frame (14) connectable to an arm of a machine, the frame (14) having at least one coupling seat (40) to engage the removable pin stub (20).

14. The demolition apparatus of claim 13 wherein the removable pin stub (20) is positioned on the second jaw (18), the second jaw (18) being immovably connected to the frame (14).

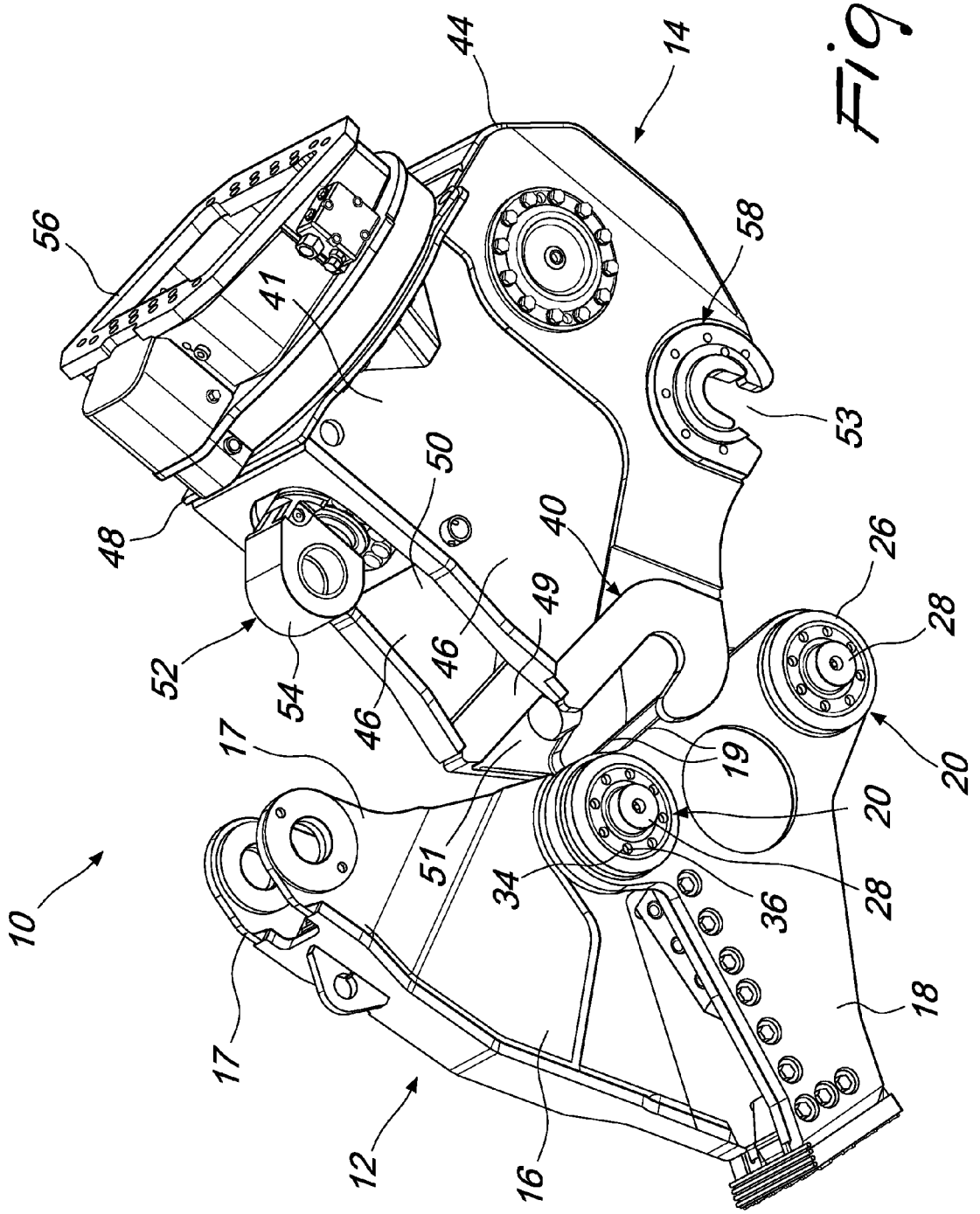
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Fig. 1

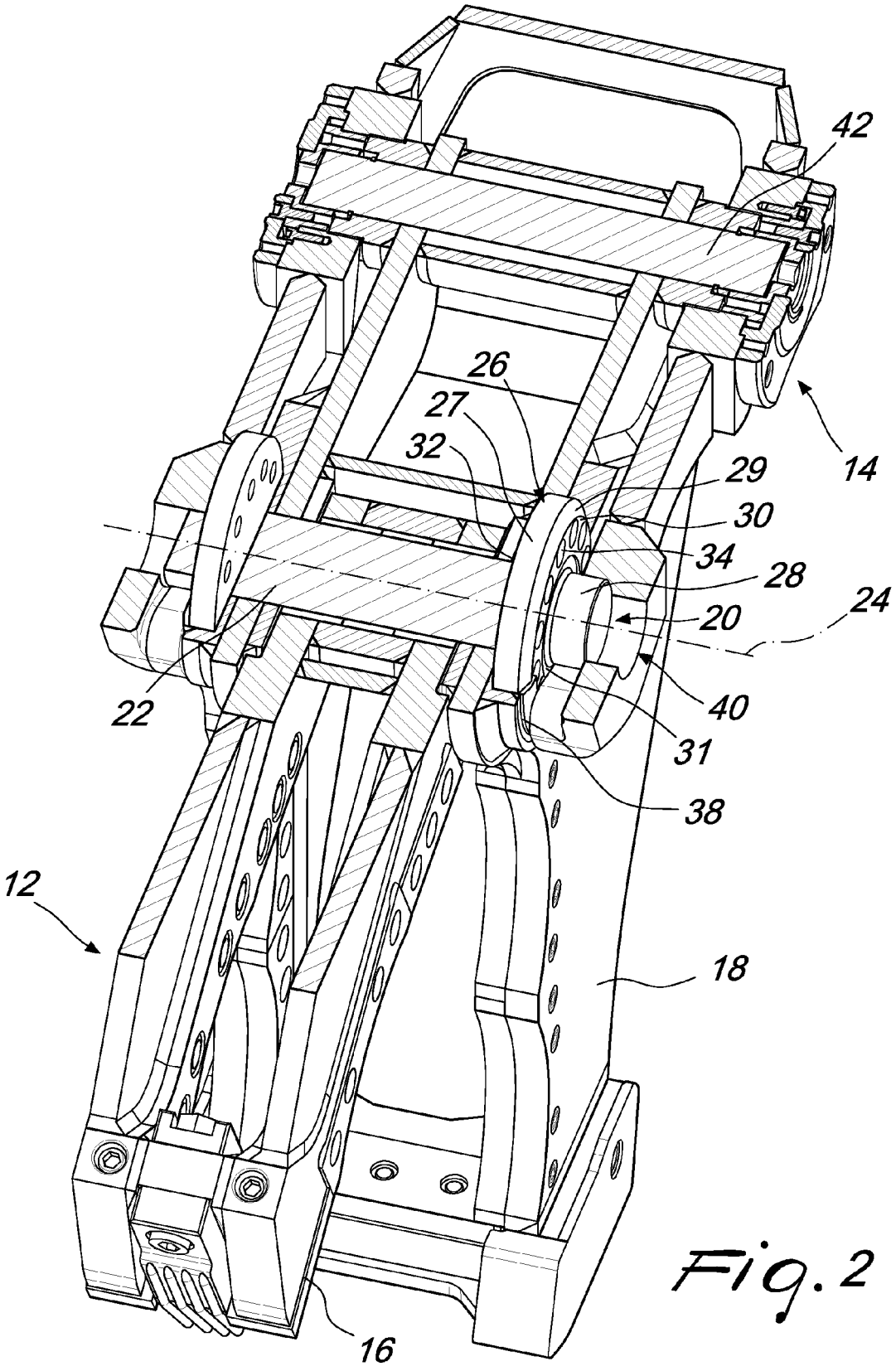

Fig. 2

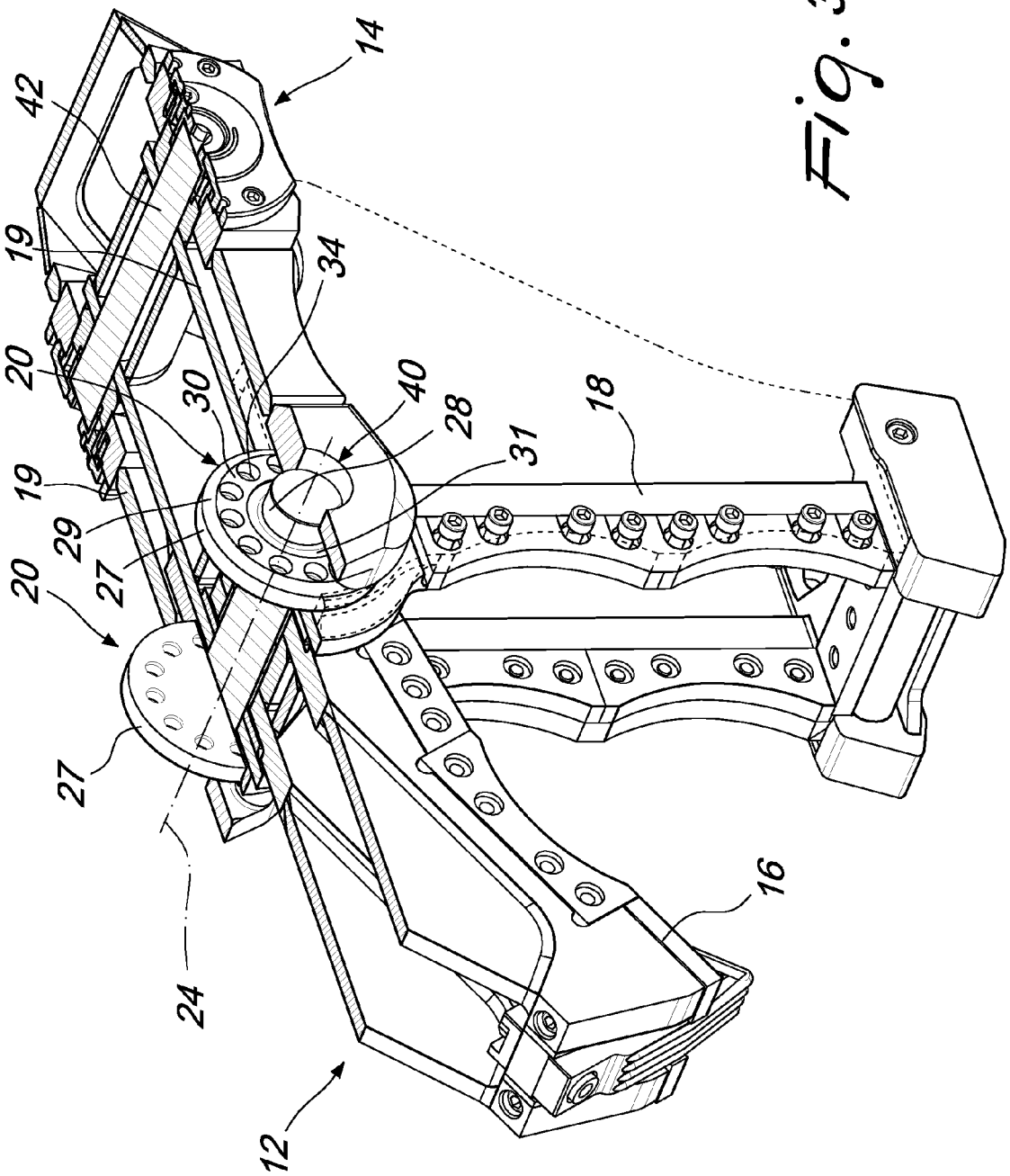

Fig. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 14 18 1290

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2005/116076 A1 (WENT GREGORY N [AU]) 2 June 2005 (2005-06-02)	1-4, 6-11,13, 14	INV. E02F3/96 E02F9/00
A	* paragraph [0036] - paragraph [0042]; figures 11-13 *	12	

X	US 5 065 514 A (GROSS SOL N [US]) 19 November 1991 (1991-11-19) * the whole document *	1-3	

X	JP H05 321487 A (SANGO JUKI KK) 7 December 1993 (1993-12-07) * figure 3 *	1-4	

X,D	EP 2 578 752 A1 (CATERPILLAR WORK TOOLS BV [NL]) 10 April 2013 (2013-04-10)	1-4,6-9, 13,14	
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X	US 3 554 588 A (REINSMA HAROLD L ET AL) 12 January 1971 (1971-01-12) * figures *	1-3	
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X	NL 2 008 684 C (RUSCH B V) 3 July 2013 (2013-07-03) * figures 2,4 *	1-4	E02F F16C E04G

X	US 4 243 341 A (KABAY STEVE ET AL) 6 January 1981 (1981-01-06) * figures 2,3 *	1-5	

X	US 2010/032973 A1 (RAMUN JOHN R [US]) 11 February 2010 (2010-02-11) * figures 9-11,57 *	1	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	4 May 2015	Laurer, Michael

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)

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Application Number
EP 14 18 1290

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 14 18 1290

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-4

directed to the known removable pin stub of claim 1 with different aspects:

1.1. claims: 1, 2

is directed to the known removable pin stub of claim 1, wherein as potential special technical features the stub portion is positioned centrally on the flange portion. The resulting technical effect is: The stub-flange alignment offers a better mounting in a special environment. The objective technical problem to solve may be formulated as: Improving mounting of a pin stub.

1.2. claims: 1, 3

is directed to the known removable pin stub of claim 1, wherein as potential special technical features the flange portion has a plurality of through opening arranged radially about the stub portion. The resulting technical effect is: The force transfer from the stub over the flange into a portion of the jaw set is equally radially divided about the bolt-holes. The objective technical problem to solve may be formulated as: Improving force transfer of such a pin stub.

1.3. claims: 1, 4

is directed to the known removable pin stub of claim 1, wherein as potential special technical features the flange portion has the form of a circular disc. The resulting technical effect is: The pin stub flange may be machined by turning. The objective technical problem to solve may be formulated as: Simplifying manufacturing of such pin stub.

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2. claims: 5-14

Claim 5 is directed to the known removable pin stub of claim 1, wherein as potential special technical features of claim 5 the flange portion has a recess positioned on the second side. The resulting technical effect is: The pin stub flange provides space for a serially aligned axle. The objective technical problem to solve may be formulated as: Improving mounting in series of such a stub pin-axle assembly.
Claims 6-14 are directed to a jaw set comprising the known removable pin stub of claim 1 or a demolition apparatus comprising said jaw set, wherein as potential special technical features the pin stub is aligned with the jaw pivot axis such that to protrude from an outer surface of the jaw set (see claim 6). The resulting technical effect

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 14 18 1290

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

is: A split pin stub axle assembly for a jaw set may be established for easing replacement of the jaw set. The objective technical problem to solve may be formulated as: Simplifying replacement of a jaw set.

Please note that all inventions mentioned under item 1, although not necessarily linked by a common inventive concept, could be searched without effort justifying an additional fee.

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 14 18 1290

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.

04-05-2015

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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