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(71) Applicant: **Stig Engström**
833- 31 Strömsund (SE)

(72) Inventor: **Stig Engström**
833- 31 Strömsund (SE)

(74) Representative: **Pierrou, Mattias**
Awapatent AB,
P.O. Box 45 086
104 30 Stockholm (SE)

(54) Tool quick coupling device

(57) The present invention relates to a device and a method for coupling an operating arm of an excavator, a backhoe loader or a like machine to an implement. It also relates to an arm quick coupling part and an implement quick coupling part for use in such a device.

The implement quick coupling part includes first and second spaced, parallel implement mechanical coupling rods (3,4) and implement power circuit coupling means (5).

The arm quick coupling part includes arm mechanical coupling means (10,11) for cooperation with the implement mechanical coupling rods (3,4) for holding and locking the implement, and arm power circuit coupling means (26) for cooperation with the implement power circuit coupling means (5) for connecting a power system to the implement.

The arm mechanical coupling means (10,11) are arranged for being coupled to the implement mechanical coupling rods (3,4) by movement of the arm quick coupling part (1) relative the implement quick coupling part (2), wherein at least a final part of the movement is in a linear direction substantially perpendicular to the longitudinal axes of implement mechanical coupling rods (3,4).

The arm power circuit coupling means (26) and the implement power circuit coupling means (5) are arranged for being aligned in a first part of the movement and for being coupled during said final part of the movement.

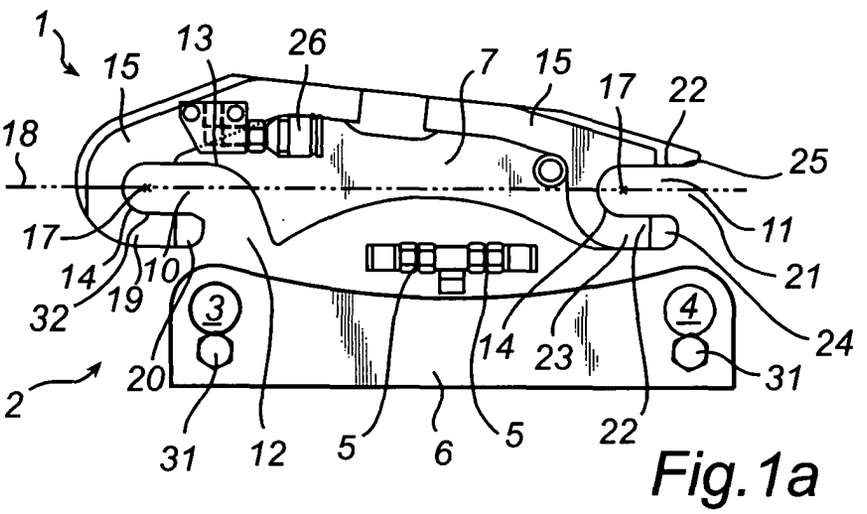

Fig.1a

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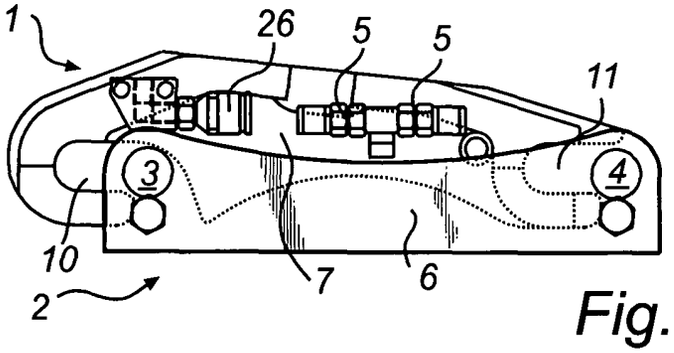

Fig.1b

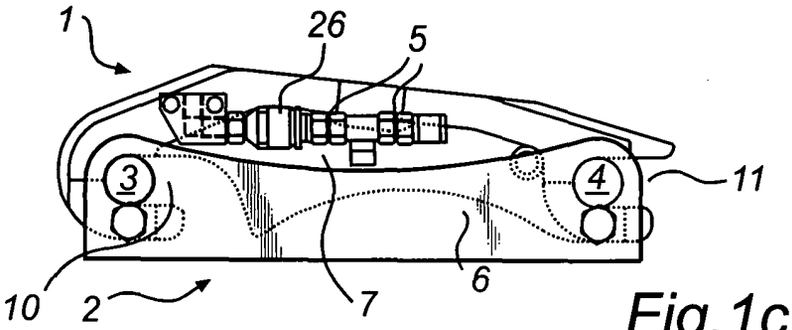

Fig.1c

Description

Technical Field of the Invention

[0001] The present invention relates to a device and a method for coupling an operating arm of an excavator, a backhoe loader or a like machine to an implement. It also relates to an arm quick coupling part and an implement quick coupling part for use in such a device.

Background Art

[0002] Modern excavators, backhoe loaders and like machines are often used together with different implements, such as shovels, snow ploughs, truck forks or grabbers. Many of these implements include hydraulically and/or electrically operable parts, for example a movable bottom part of a shovel, adjustable snow ploughs or grabber arms. Such implements have to be mechanically and hydraulically and/or electrically connected to and disconnected from the hydraulic and/or electric power system of the relevant machine. It is not unusual that the operator has to change implement several times during a working day. Therefore, many different types of quick coupling arrangements have been developed for coupling an operating arm of such a machine to an implement.

[0003] One type of quick coupling arrangements include two, spaced, parallel coupling rods mounted on the implement. The quick coupling part mounted on the operating arm is then in different ways adapted for cooperation with these rods for holding and locking the implement.

[0004] One kind of such quick couplings are entirely operable from the driving position, i.e. the operator need not leave his position and step outside for shifting implement. These quick couplings manage both the mechanical, the hydraulic and/or electric coupling. They also often include hydraulically operated mechanical locking devices for locking the quick coupling in a coupled position. In designing such quick couplings, it is generally a problem to provide for and to couple the rather sensitive hydraulic coupling parts.

[0005] A quick coupling arrangement for connecting an implement to an excavator while at the same time connecting a power system to the implement is known through WO 93/05241. This known arrangement includes a quick coupling device mounted on an excavator arm for cooperation with two spaced, parallel bolts mounted on the implement. The quick coupling device includes a first, fixed semicircular recess. It further includes a hydraulically movable locking device. A second semicircular recess and a hydraulic coupling part are provided on the locking device, which are movable together with the locking device in a linear direction. On the implement, there is also mounted a hydraulic coupling part for cooperation with the part on the movable locking device.

[0006] When this known quick coupling is to be coupled, firstly the first semicircular recess is brought into abutment with one of the bolts. Then, the second semicircular recess is aligned with the other bolt. Thereafter, the hydraulics of the locking device is activated and the locking device is moved until the second semicircular recess abuts against the other bolt. During this movement also the hydraulic coupling parts are coupled.

[0007] An disadvantage with this known device is the complex construction with movable coupling parts provided on a locking device, which render the device costly to manufacture. Since the working conditions for the quick coupling normally are rough, the movable parts are easily damaged. In addition, the necessary hydraulic piston cylinder for moving the locking device is space-requiring. This constitutes a problem since it is desirable to keep the quick coupling compact in order not to influence the cooperation between the excavator arm and the implement. Finally, in spite of if its complex construction, the alignment of the hydraulic coupling parts is not accurate and the parts may easily be damaged.

Summary of the Invention

[0008] It is therefore an object of the present invention to provide a reliable quick coupling having accurate coupling of the hydraulic parts and being cost-effective to manufacture.

[0009] This object is achieved with the device and method according to claim 1 and 29 respectively. It is also achieved with an arm quick coupling part and an implement quick coupling part for use in such a device according to claim 14 and 23 respectively.

[0010] Consequently, in accordance to a first aspect thereof, the invention is directed to a quick coupling.

[0011] In accordance with a second and a third aspect thereof, the invention is directed to an arm quick coupling part and an implement coupling part for use in a quick coupling.

[0012] In accordance with a fourth aspect thereof, the invention is directed to a method for coupling together a quick coupling.

[0013] The quick coupling is intended for being used in connection with heavy duty machines such as excavators or backhoe loaders. These machines operate with different types of implements.

[0014] The term "implement" is to be understood as any work attachment or tool, for example shovels, grabbers or lifting forks. The implement is connected to the operating arm of the relevant machine during operation of the machine. Adapters may be mounted between the arm and the implement, for example a tilt-rotator. A tilt-rotator is a device that allows the connected parts to rotate and tilt relative each other. The quick coupling according to the invention is suitable both for coupling an implement directly to an arm, and for coupling adapters to an arm and to an implement. Consequently, several quick couplings may be used at the same time in a ma-

chine. The quick coupling includes two parts capable of being coupled or uncoupled. In this application the parts are referred to as "arm quick coupling part" and "implement coupling part", although they may, as indicated, be placed on an adapter or on other parts of a relevant machine itself or on other parts for use on a relevant machine.

[0015] The invention relates to a kind of quick coupling arrangements which include two spaced parallel implement mechanical coupling rods included in the implement quick coupling part. There exist different standards for these rods, i.e. variations regarding centre-to-centre-distances, rod length and cross sections. One advantage of the present invention is that it easily is adaptable to such variations as will be described later.

[0016] The inventions concerns implements including a power circuit. The implement may have movable parts or other features relying on power supply. The power circuit may be of an arbitrary kind, for example an electric, a hydraulic, or a pneumatic circuit. Several circuits of the same kind or different kinds may be included in a single implement/arm. The power system of the excavator is connected to the implement by the quick coupling according to the invention. One power coupling part is situated on the arm quick coupling part and one power coupling part is situated on the implement quick coupling part.

[0017] The power coupling parts often constitute male and female parts, respectively, for mutual insertion. Consequently, the parts will not connect at all unless they are positioned such that the male part is able to slide into the opening of the female part. The power coupling parts are sensitive to strain and wear and may easily be damaged if pushed together by non-linear forces. Therefore, it is desirable to couple the power coupling parts in the linear direction of their longitudinal axes.

[0018] According to the invention the object is achieved by, on the one hand, arranging the arm quick coupling part and the implement quick coupling part for being accurately positioned relative each other, and on the other hand, arranging the arm quick coupling part for being, at least in a final part of the coupling movement, coupled to the implement quick coupling part in the desired linear direction. When coupling together the quick coupling, the whole coupling parts are moved relative each other. Hereby, no movable parts are necessary and it is possible to achieve a construction that is reliable, compact and cost-efficient to manufacture.

[0019] Under these conditions according to the invention, carefully positioned and aligned power coupling parts on the implement quick coupling part and the arm quick coupling part respectively, will be accurately positioned and aligned prior to being inserted, and when inserted, they will be pushed together in the desired linear direction.

[0020] With the construction according to the invention it is advantageously also possible to keep the rather sensitive hydraulic coupling parts as protected as possible within or close to the quick coupling parts.

[0021] The arm quick coupling part includes arm mechanical coupling means for cooperation with the implement mechanical coupling rods. The arm mechanical coupling means are arranged for functioning as means for holding and locking the implement as well as means for guiding the arm quick coupling part in its movement.

[0022] By "movement" or "part of a movement" is to be understood a relative displacement of the arm coupling part and the implement coupling part. Consequently, it is possible to perform the coupling movement in a single direction, by describing a continuous curve or by performing successive linear or curved movements.

[0023] As stated above, the action of coupling the quick coupling according to the invention includes the action of accurately position the power coupling parts and the action of coupling together the power coupling parts. Consequently, it is possible to arrange the arm quick coupling for movement in a single, linear direction, or for, during a first part of the movement, position the power coupling parts and, during a final part of the movement, couple together the power coupling parts.

[0024] The arm mechanical coupling means also include locking means for locking the quick coupling in a coupled position. It is possible to arrange the locking means for being operable by a power system.

[0025] According to the invention it is possible for the arm mechanical coupling means to include separate means for guiding the arm quick coupling part during the coupling movement, which separate means cooperate with the implement mechanical coupling rods or some other part on the implement quick coupling part.

[0026] According to one embodiment of the invention, the arm mechanical coupling means include first and second engagement means for engagement with the first and second implement mechanical coupling rods, respectively. The engagement means are arranged for, in cooperation with the implement mechanical coupling rods, holding the implement as well as for guiding the arm quick coupling part during the coupling movement. Hereby, a simpler, more cost-efficient construction is achieved. By having two engagement means it is advantageously possible to fix the relative angular position of the quick coupling parts.

[0027] According to one embodiment, said engagement means include slots for receiving the first and second rods respectively, which slots include guide surfaces for the rods. The arm coupling part is to be moved so that the rods abut their corresponding guide surface during the coupling movement. Thereby the arm quick coupling part is guided in its movements in a plane normal to the longitudinal direction of the coupling rods.

[0028] An advantage with slots as mechanical holding and guiding means is that the arm coupling part easily is adaptable to different standards of implement coupling rods by choosing appropriate distances between the slots and dimensions for the slots. Such adaptations are substantially more complicate with coupling parts

having internal moving coupling details.

[0029] According to one embodiment of the invention, said engagement means constitute hook-like portions defining said slots.

[0030] According to one embodiment of the invention, the power coupling parts are accurately positioned and aligned when the rods are inserted in entrance openings of the slots. The guide surfaces then function to guide the arm quick coupling part in the linear movement of coupling the power coupling parts only.

[0031] According to one embodiment of the invention, the guide surfaces of the slots includes a first part, which the rod abuts during said first part of the movement for positioning and aligning the power coupling parts, and a second part, which the rod abuts during said final part of the movement for coupling together the power coupling parts in a straight, linear direction.

[0032] According to one embodiment of the invention, the final linear movement is in a direction being perpendicular to the longitudinal axes of the rods and parallel to the plane defined by the longitudinal axes of the rods.

[0033] Of course, the guide surfaces according to the above embodiments also function to guide the rods to the correct position for the mechanical holding and locking of the implement.

[0034] According to one embodiment of the present invention, the quick coupling parts include guide means for guiding the arm quick coupling part in the longitudinal direction of the rods during the coupling movement. The arm quick coupling part includes one part of the guide means and the implement quick coupling part includes a complementary part. Hereby, it is possible to align the power coupling parts accurately in said direction before they contact each other and during the final, linear part of the coupling movement.

[0035] Consequently, it is according to the invention possible to guide the position of the arm quick coupling part relative the quick coupling part in all three dimensions as well as in their relative angular position. Hereby, it is possible to couple the sensitive power coupling parts in a controlled, safe way, minimising the risk for damage.

[0036] According to one embodiment of the invention, the mechanical coupling means include accurately machined stops defining the coupled position. This ensures that the quick coupling parts are closely fitted together when being coupled and that the power coupling parts are not subjected to coupling forces after they have been fully inserted.

[0037] According to one embodiment of the invention, the stops are constituted by the final portions of said slots.

[0038] According to one embodiment of the invention, the first engagement means are able to engage either one of the first and second implement mechanical coupling rods and the.second engagement means are able to engage the respective other one of the first and second implement mechanical coupling rods. The implement coupling part include first implement power circuit coupling means arranged for being coupled to the arm power circuit coupling means when the first engagement means is engaged with the first implement mechanical coupling rod. The implement coupling part includes second implement power circuit coupling means arranged for being coupled to the arm power circuit coupling means when the first engagement means is engaged with the second implement mechanical coupling rod. The quick coupling according to this embodiment is advantageously capable of being coupled in two directions. This is suitable for implements having different functions in their opposite directions or for optimising the position of the implement in relation the operating arm of the machine.

[0039] According to one embodiment of the invention, all power coupling parts are rigidly mounted due to the possibility of accurately position, align and couple together the power coupling parts enabled by the invention.

[0040] According to one embodiment of the invention, the arm power circuit coupling means are resiliently or flexibly mounted. Hereby, it is possible to allow for greater tolerances in the design of the quick coupling. The person skilled in the art realises many different ways of resiliently mounting the power coupling parts, for example by an intermediate spring or by an elastic bushing.

Brief Description of the Drawings

[0041] The invention may be performed in many various ways and, by way of example only, embodiments thereof will now be described in detail with reference being made to accompanying drawings, in which:

Fig. 1 is a side view of a quick coupling in accordance with a first embodiment of the present invention, showing an arm quick coupling part and an implement coupling part in a uncoupled position, in a partly coupled position and in a coupled position;

Fig. 2 is a plan view of the arm quick coupling part in accordance with the first embodiment of the present invention;

Fig. 3 is a plan view of the implement quick coupling part in accordance with the first embodiment of the present invention;

Fig. 4 is a side view of a quick coupling in accordance with a second embodiment of the present invention, showing an arm quick coupling part and an implement coupling part in a uncoupled position, in a partly coupled position and in a coupled position;

Fig. 5 is a plan view of the arm quick coupling part in accordance with the second embodiment of the present invention;

Fig. 6 is a plan view of the implement quick coupling part in accordance with the second embodiment of the present invention;

Fig. 7 is a side view of a quick coupling in accordance with a third embodiment of the present inven-

tion, showing an arm quick coupling part and an implement coupling part in a uncoupled position, in a partly coupled position and in a coupled position;

Fig. 8 is a plan view of the arm quick coupling part in accordance with the third embodiment of the present invention;

Fig. 9 is a plan view of the implement quick coupling part in accordance with the third embodiment of the present invention;

Fig. 10 is a plan view of a quick coupling in accordance with the first embodiment of the present invention, showing the arm quick coupling part and the implement coupling part in.a partly coupled position

Fig. 11 is a side view of a quick coupling in accordance with the first embodiment of the present invention, showing the arm quick coupling part and the implement coupling part in a coupled unlocked position and in a coupled locked position;

Fig. 12 is a side view of a quick coupling in accordance with the second embodiment of the present invention, showing the arm quick coupling part and the implement coupling part in a coupled unlocked position and in a coupled locked position;

Fig. 13 is a side view of a quick coupling in accordance with the third embodiment of the present invention, showing the arm quick coupling part and the implement coupling part in a coupled unlocked position and in a coupled locked position.

Detailed Description of Preferred Embodiments of the Invention

[0042] Referring to Figs. 1 - 3, a quick coupling in accordance with a first embodiment of the present invention includes an arm quick coupling part 1 and an implement quick coupling part 2. The arm quick coupling part 1 can be directly mounted to an hydraulic arm of an excavator, a backhoe loader or like machine, or to an intermediate device such as an adapter, for example a tilt-rotator (not shown). The implement coupling part can be directly mounted to an implement such as a shovel, grabber or to an intermediate device such as an adapter, for example a tilt-rotator (not shown).

[0043] The implement quick coupling part 2 includes two spaced, parallel implement plates 6. First and second spaced parallel implement mechanical coupling rods 3, 4 extend between the plates 6 in a direction essentially normal to the plane of both plates 6. The rods 3, 4 are at their ends fixed to the plates 6.

[0044] Four adjusting screws 31 are lead through the implement plates 6, one adjusting screw 31 being mounted near each fixing point of rods 3, 4.

[0045] Implement power circuit coupling means constituted by male parts 5 of hydraulic couplings are provided on the implement coupling part 2. There are provided four male parts 5, two at each plate 6. The male parts 5 on the same implement plate 6 face in opposite directions towards the respective one of the rods 3, 4. The male parts 5 are rigidly mounted and they are aligned for being coupled in a direction that is perpendicular to the rods and parallel to the plane defined by the rods 3, 4.

[0046] As can be seen from Fig. 2, the arm coupling part 1 includes two spaced, parallel arm plates 7. The plates 7 are connected by first and second connecting plates 8, 9. The arm coupling part 1 includes arm mechanical coupling means constituted by first and second slots 10, 11 being provided in the arm plates 7. The portions around the slots 10, 11 are enforced with enforcement blocks 15. The first slots 10 are adapted for cooperation with the first rod 3 and the second slots 11 are adapted for cooperation with the second rod 4. The slots 10, 11 all have a semi-circular end portion 14. The centre axes 17 of the end portions 14 define a reference plane 18.

[0047] Each first slot 10 includes an entrance opening 12 lying in a plane being essentially parallel to the reference plane 18. A guide surface 13, which defines one of the sides of each slot 10, connects the opening 12 with the end portion 14. The guide surface 13 has a curved part adjacent to the opening 12, which curved part transforms into a linear part adjacent to the end portion 14. The curved part curves approximately 45° from the entrance opening 12 to the linear part. The linear part is essentially parallel to the reference plane 18. Opposite to the guide surface 13, a linear surface 32 being essentially parallel to the linear part of the guide surface 13 connects to the end portion 14. This linear surface 32 constitutes the inner surface of a hook-like portion 19 and defines the other of the sides of the slot 10. The hook-like portion 19 terminates in a bevelled edge 20 at the entrance opening 12.

[0048] Each second slot 11 includes an entrance opening 21 lying in a plane being essentially perpendicular to the reference plane 18. Each second slot 11 extends in a direction being essentially parallel to the reference plane 18. Each second slot 11 is, on both its sides, defined by linear second guide surfaces 22 respectively being essentially parallel to the reference plane 18. The second guide surfaces 22 transform into the end portion 14 from their respective side. One of the second guide surfaces 22 of each slot 11 constitutes the inner surface of a hook-like portion 23 being essentially identical to the hook-like portion 19 described in connection with the first slot 10. Also the hook-like portion 23 terminates in a bevelled edge 24 at the entrance opening 21.

[0049] Opposite to the bevelled edge 24, each one of the arm plates 7 has a protruding edge 25. The linear guide surfaces 22 that are opposite the hook-lie portion are located in the same plane as the linear part of guide surfaces 13.

[0050] The bevelled edges 20, 24 include arm guide surfaces for cooperation with the adjusting screws 31 on the implement coupling part 2.

[0051] Arm power circuit coupling means constituted

by female parts 26 of hydraulic couplings are provided on the arm coupling part 1. There are provided two female parts 26, one at each enforcement block 15 of the first slot 10. Both female parts are facing towards the second slot 11. The female parts 26 are resiliently mounted and they are aligned for being coupled in a direction that is perpendicular to the centre axes 17 and parallel to the reference plane 18.

[0052] Both quick coupling parts 1, 2 are symmetrical over a longitudinal axis 16.

[0053] In Fig 11, a locking device 27 being part of the mechanical coupling means is shown. The locking device 27 includes a locking element 28 and a hydraulic operating means 30. The locking element 28 is pivotable mounted around a pivot axis 29 being parallel with the centre axis 17 and fixed to the arm plates 7 near both the first slots 10. One end of a hydraulic cylinder of the hydraulic operating means 30 is fixed to both of the arm plates 6 close to the second slots 11. The distal end of the piston cooperating with said hydraulic cylinder is fixed to the locking element 28 at a distance from the pivot axis 29. The locking element 28 includes a locking arm 31.

[0054] With reference to Figs. 1 - 3, 10 and 11, in the following, one way of coupling together the arm quick coupling part 1 and the implement coupling part 2 of the first embodiment of the present invention will be described:

[0055] The arm quick coupling part 1 is moved towards the implement quick coupling part 2 such that the slots 10, 11 are moved towards the first and second rods 3, 4. When so doing, the second slots 11 are kept at an equal or greater distance from the second coupling rod 4 than the first slots 10 from the first coupling rod 3. Then the first rod 3 is brought into engagement with the first guide surfaces 13 at the entrance openings 12, possibly guided by the bevelled edges 20. Thereafter, the arm quick coupling part 1 is further lowered and also moved slightly towards the second rod 4 guided by the first guide surface 13. If necessary, the arm quick coupling part 1 is simultaneously pivoted bringing the second slots 11 closer to the second rod 4. This movement is continued until the second rod 4 abuts against the protruding edges 22, possibly being guided by the bevelled edges 24.

[0056] At the end of said lowering and possibly pivoting movement, the arm guide surfaces at the bevelled edges 20, 24 come into contact with the adjusting screws 31 on the implement coupling part 2. Thereby the arm coupling part 1 is guided in the longitudinal direction of the rods 3, 4.

[0057] When the first rod 3 reaches the linear parts of the guide surfaces 13 and the linear surface 32, the second rod 4 is received between the guide surfaces 22 of each second slot 11. Thereby, the arm quick coupling part 1 is fixed in its angular position in relation to the implement quick coupling part 2. Further, in this position, a pair of female parts 26 of the hydraulic coupling provided on the arm coupling part 1 are aligned with a pair of male parts 5 of the hydraulic coupling which pair is provided on the implement quick coupling part 2 facing the first rod 3. If necessary, the position of the arm quick coupling part 1 can be adjusted by adjusting the adjustment screws 31.

[0058] Then, in a final movement, the arm quick coupling part 1 is moved bringing the female 26 and male parts 5 together in a linear direction that is perpendicular to the rods 3, 4 and parallel to the plane of the rods 3, 4. During this movement the arm quick coupling part 1 is guided by the first rod 3 abutting against the linear part of each guide surface 13 and against each linear surface 32, and by the second rod 4 abutting against the linear guide surfaces 22 of each second slot 11. Further, the arm quick coupling part 1 is kept in the correct position in the longitudinal direction of the rods 3, 4 by the adjustment screws 31 abutting against the enforcement blocks 15. Consequently, it is hereby ensured that the previously aligned hydraulic coupling parts 5, 26 are coupled in a linear direction minimizing the risk for damaging the coupling parts 5, 26.

[0059] Finally, the hydraulic operating means 30 of the locking device 27 is activated for pivoting the locking element 28 into engagement with the first rod 3. The quick coupling is thereby locked in a coupled position.

[0060] The quick coupling described above is capable of being uncoupled in the reversed way.

[0061] Since there is provided a second pair of male parts 5 of hydraulic couplings facing toward the second rod, the arm coupling part 1 advantageously is capable of being coupled the other way, i.e. the first slots 10 receive the second rod 4 and the second slots receive the first rod 3. Hereby the female parts 26 of the hydraulic couplings mounted on the arm coupling part connect with said second pair. This is suitable for implements having different functions in different directions or for optimising the position in relation to the relevant machine.

[0062] Of course, embodiments of the present invention which have only two male coupling parts provided on the implement coupling part and which are restricted to be coupled in one direction only are also possible, though not shown in the drawings. Other power circuit coupling means such as electrical coupling means are encompassed in the scope of protection of the present invention.

[0063] With reference to Figs. 4-6 and 7-9, in the following alternative embodiments of the present invention will be described, but only to the extent that they differ from what has already been described above. In the figures those parts that correspond to parts shown in Figs. 1-3 are provided with the same reference numerals.

[0064] The alternative embodiments, i.e. a second embodiment according to Figs. 4-6 and a third embodiment according to Figs. 7 - 9, differ from the first embodiment in the design of the first and second slots 10, 11 and in that the male parts 5 of the hydraulic couplings and the female parts 26 of the hydraulic couplings are

aligned in another direction adapted to the design of the first and second slots 10, 11.

[0065] As shown in Fig. 4, according to the second embodiment all slots 10, 11 have equal form and shape. Like the first embodiment, the slots 10, 11 have a semi-circular end portion 14. The centre axes 17 of the end portions 14 define a reference plane 18. The slots 10, 11 each includes an entrance opening 12, 21 lying in a plane being essentially parallel to the reference plane 18.

[0066] Each slot 10, 11 extend in a direction being angled +45° in relation to the reference plane 18. Each first and second slot 10, 11 is, on both its sides, defined by linear first and second guide surfaces 32, 22 respectively, wherein said guide surfaces 32, 22 are angled +45° in relation to the reference plane 18. The guide surfaces 32, 22 transform into the end portion 14 from their respective side.

[0067] The female parts 26 of hydraulic couplings provided on the arm coupling part 1 are resiliently mounted and they are aligned for being coupled in a direction that is perpendicular to the centre axes 17 and angled +45° to the reference plane 18. Both female parts 26 are aligned parallel with the angled slots 10, 11 and their guide surfaces 32, 22 and face in the direction of the entrance openings 12, 21.

[0068] The male parts 5 of hydraulic couplings are provided on the implement coupling part 2 are rigidly mounted and they are aligned for being coupled in a direction that is perpendicular to the rods and angled about +45° to the plane defined by the rods 3, 4. The male parts 5 on the same implement plate 6 face in different directions. One male part 5 faces in a direction angled towards the first rod 3, and one male part 5 faces in a direction angled towards the second rod 4.

[0069] As can be seen from figure 12, the second embodiment of the present invention has a locking device for locking the quick coupling in a coupled position. The locking device according to Fig. 12 differs form the locking device described with reference to Fig. 11 above only in that the locking element 28 presses the first rod 3 in a different direction in order to urge it against the end portions 14 of the first slot 10.

[0070] It is easily understood by the person skilled in the art that the arm quick coupling part 1 and the implement coupling part 2 of to the second embodiment of the present invention may be coupled together in a similar way as the arm quick coupling part 1 and the implement coupling part 2 of the first embodiment of the present invention, which has been described above. One difference is though that, in the beginning of the coupling action, the arm quick coupling part 1 has to be carefully moved and pivoted back and forth while it is being brought closer to the implement coupling part 2 until the first and second rods 3, 4 are received in the entrance openings 12, 21 respectively. In this position, the arm quick coupling part 1 is fixed in its angular position in relation to the implement quick coupling part 2. Further, the pair of female parts 26 of the hydraulic coupling provided on the arm coupling part 1 are aligned with one pair of male parts 5 of the hydraulic coupling which pair is provided on the implement quick coupling part 2 facing towards the first rod 3. If necessary, the position of the arm quick coupling part 1 can be adjusted by adjusting the adjustment screws 31.

[0071] Then, in a final movement, the arm quick coupling part 1 is moved bringing the female 26 and male parts 5 together in a linear direction that is perpendicular to the rods 3, 4 and angled +45° to the plane of the rods 3, 4. During this movement the arm coupling part 1 is guided by the first rod 3 abutting against the linear guide surfaces 32 of each first slot 10, and by the second rod 4 abutting against the linear guide surfaces 22 of each second slot 11. Further, the arm quick coupling part 1 is kept in the correct position in the longitudinal direction of the rods 3, 4 by the adjustment screws 31 abutting against the arm plates 7. Consequently, it is hereby ensured that the previously aligned hydraulic coupling parts 5, 26 are coupled in a linear direction minimizing the risk for damaging the coupling parts 5, 26.

[0072] Consequently, the quick coupling according to the second embodiment can advantageously be coupled together in a single, linear movement. The slots 10, 11 have to be machined within strict tolerances for avoiding jamming of the rods 3, 4. With the first embodiment, the strict demand on tolerances is limited to the end portions 14.

[0073] Finally, the quick coupling is locked in a coupled position by activating the locking device.

[0074] Since there is provided a second pair of correspondingly aligned male parts 5 of hydraulic couplings, the arm coupling part 1 according to the second embodiment, is also capable of being coupled both ways.

[0075] In Figs. 7 - 9, a third embodiment of the present invention is shown. As in the earlier described embodiments, the first slots 10 are adapted for cooperation with the first rod 3 and the second slots 11 are adapted for cooperation with the second rod 4. The slots 10, 11 all have a semi-circular end portion 14. The centre axes 17 of the end portions 14 define a reference plane 18.

[0076] Each first slot 10 includes an entrance opening 12 lying in a plane being essentially parallel to the reference plane 18. A guide surface 13, which defines one of the sides of each slot 10, connects the opening 12 with the end portion 14. The guide surface 13 has a curved part adjacent to the opening 12, which curved part transforms into a linear part adjacent to the end portion 14. The curved part curves approximately 180° from the entrance opening 12 to the linear part. The linear part is angled -45° in relation to the reference plane 18. Opposite to the guide surface 13, a linear surface 32 being essentially parallel to the linear part of the guide surface 13 connects to the end portion 14 and extends to the entrance opening 12.

[0077] Each second slot 11 includes an entrance opening 21 lying in a plane being essentially perpendic-

ular to the reference plane 18, though directed in opposite direction to the entrance openings 12 of the first slots 10. Each second slot 11 extend in a direction being angled -45° in relation to the reference plane 18. Each second slot 11 is, on both its sides, defined by linear second guide surfaces 22 being angled -45° in relation to the reference plane 18. The second guide surfaces 22 transform into the end portion 14 from their respective side. Hence, the linear surface 32, the linear part of guide surface 13 of the first slots 10, the guide surfaces 22 of the second slots 11 all are parallel and angled -45° in relation to the reference plane 18.

[0078] The female parts 26 of hydraulic couplings provided on the arm coupling part 1 are resiliently mounted and they are aligned for being coupled in a direction that is perpendicular to the centre axes 17 and angled -45° to the reference plane 18. Both female parts 26 are aligned parallel with said parallel surfaces of the slots 10, 11 and face in the direction of the entrance openings 21 of the second slots 11.

[0079] The male parts 5 of hydraulic couplings are provided on the implement coupling part 2 are rigidly mounted and they are aligned for being coupled in a direction that is perpendicular to the rods and angled about -45° to the plane defined by the rods 3, 4. The male parts 5 on the same implement plate 6 face in different directions. One male part 5 faces in a direction angled towards the first rod 3, and one male part 5 faces in a direction angled towards the second rod 4.

[0080] As can be seen from figure 13, the second embodiment of the present invention has a locking device for locking the quick coupling in a coupled position. The locking device according to Fig. 13 differs form the locking device described with reference to Fig. 11 above only in that the locking element 28 presses the first rod 3 in a different direction in order to urge it against the end portions 14 of the first slot 10.

[0081] It is easily understood by the person skilled in the art that the arm quick coupling part 1 and the implement coupling part 2 of to the second embodiment of the present invention may be coupled together in a similar way as the arm quick coupling part 1 and the implement coupling part 2 of the first embodiment of the present invention, which has been described above. One difference is though that the second slots 11 have to be inserted between the rods 3, 4 either prior to the first rod 3 being inserted into the entrance opening 12 of the first slots 10 or, alternatively, when the first rod 3 abuts against the first part of the curved part of the first guide surface 13. In this way, the second rod 4 is received between the guide surfaces 22 of each second slot 11 at the entrance opening 21, when the first rod 3 reaches the linear parts of the guide surfaces 13 and the linear surface 32. Thereafter the coupling operation is continued as described above with reference to the first and second embodiments.

[0082] Since there is provided a second pair of correspondingly aligned male parts 5 of hydraulic couplings, the arm coupling part 1 according to the third embodiment, is also capable of being coupled both ways.

[0083] Consequently, the quick coupling according to the third embodiment advantageously has a built in mechanic support in its coupled position. This minimizes the load on the locking device.

Claims

1. A quick coupling for coupling an operating arm of an excavator, a backhoe loader or a like machine to an implement, including

an arm quick coupling part and a complementary implement quick coupling part for cooperation with the arm quick coupling part, wherein

the implement quick coupling part includes first and second spaced, parallel implement mechanical coupling rods and implement power circuit coupling means,

the arm quick coupling part includes arm mechanical coupling means for cooperation with the implement mechanical coupling rods for holding and locking the implement, and arm power circuit coupling means for cooperation with the implement power circuit coupling means for connecting a power system to the implement, wherein

the arm mechanical coupling means are arranged for being coupled to the implement mechanical coupling rods by movement of the arm quick coupling part relative the implement quick coupling part, wherein at least a final part of the movement is in a linear direction substantially perpendicular to the longitudinal axes of the implement mechanical coupling rods, and

the arm power circuit coupling means and the implement power circuit coupling means are arranged for being aligned in a first part of the movement and for being coupled during said final part of the movement.

2. A quick coupling according to claim 1, wherein the arm mechanical coupling means include first and second engagement means for engagement with said first and second implement mechanical coupling rods, respectively, for guiding the arm quick coupling part during said movement in directions lying substantially in a plane normal to the longitudinal axes of the implement mechanical coupling rods.

3. A quick coupling according to claim 2, wherein the first and second engagement means include first and second slots respectively, which receive and cooperate with the first and second implement mechanical coupling rods respectively for guiding the arm quick coupling part in said plane during said movement.

4. A quick coupling according to claim 3, wherein the first slots include first guide surfaces and wherein the second slots include second guide surfaces, which first and second guide surfaces abuts the first implement mechanical coupling rod and the second implement mechanical coupling rod, respectively, at least during said final part of the movement.

5. A quick coupling according to any of claims 1 - 4, wherein said final part of the movement is in a direction substantially parallel to the plane of the rods.

6. A quick coupling according to any of claims 3 - 5, wherein the first slots each include a semi-circular end portion for receiving the first implement mechanical coupling rod with a close fit, wherein the second slots each include a semi-circular end portion for receiving the second implement mechanical coupling rod with a close fit, and wherein the arm mechanical coupling means include at least one locking device for urging at least one of the implement mechanical coupling rods against the respective end portion, thereby locking the quick coupling in a coupled position.

7. A quick coupling according to any of claims 1 - 6, wherein the implement quick coupling part includes implement guide means and the arm quick coupling part include arm guide means for cooperation with the implement guide means for guiding the arm quick coupling, during said movement, in the direction of the longitudinal axes of the implement mechanical coupling rods.

8. A quick coupling according to claim 7, wherein the implement guide means and/or the arm guide means are adjustable in the direction of the longitudinal axes of the implement mechanical coupling rods.

9. A quick coupling according to claim 8, wherein the implement guide means include adjustment screws and the arm guide means include bevelled edges.

10. A quick coupling according to claim 2 and any of claims 3 - 19, wherein the first engagement means are able to engage either one of the first and second implement mechanical coupling rods, and the second engagement means are able to engage the respective other one of the first and second implement mechanical coupling rods, and wherein the implement power circuit coupling means include first implement power circuit coupling means arranged for being coupled to the arm power circuit coupling means when the first engagement means is engaged with the first implement mechanical coupling rod and wherein the implement power circuit coupling means include second implement power circuit coupling means arranged for being coupled to the arm power circuit coupling means when the first engagement means is engaged with the second implement mechanical coupling rod.

11. A quick coupling according to any of claims 1 - 10, wherein the implement power circuit coupling means and/or the arm power circuit coupling means are rigidly mounted.

12. A quick coupling according to any of claims 1 - 10, wherein the implement power circuit coupling means and/or the arm power circuit coupling means are flexibly mounted.

13. A quick coupling according to any of claims 1 - 12, wherein the implement power circuit coupling means and the arm power circuit coupling means include hydraulic and/or electric coupling means.

14. An arm quick coupling part for use in a quick coupling for coupling an operating arm of an excavator, a backhoe loader or a like machine to an implement having a complementary implement quick coupling part including first and second spaced, parallel implement mechanical coupling rods and implement power circuit coupling means, said arm quick coupling part comprising:

arm mechanical coupling means couplable with the implement mechanical coupling rods for holding and locking the implement, and
arm power circuit coupling means couplable to the implement power circuit coupling means for connecting a power system to the implement, wherein
the arm mechanical coupling means are arranged for being coupled to the implement mechanical coupling rods by movement of the arm quick coupling part relative the implement quick coupling part, wherein at least a final part of the movement is in a linear direction substantially perpendicular to the implement mechanical coupling rods, and wherein
the arm power circuit coupling means are arranged for being aligned with the implement power circuit coupling means in a first part of the movement and for being coupled to the implement power circuit coupling means during said final part of the movement.

15. An arm quick coupling part according to claim 14, wherein the arm mechanical coupling means include two spaced, interconnected, parallel arm plates, and a first and a second slot provided in each arm plate, which first and second slots are arranged for receiving the first and second implement mechanical coupling rods, respectively, for guiding the

arm quick coupling part during said movement and for holding the implement coupling part.

16. An arm quick coupling part according to claim 15, wherein the first slots and the second slots each include an entrance opening, a semi-circular end portion, and a guide surface which interconnects the entrance opening and the end portion.

17. An arm quick coupling part according to claim 16, wherein the arm plates, adjacent to each entrance opening, include a bevelled edge.

18. An arm quick coupling part according to claim 16 or 17, wherein the guide surface of each slot includes a final portion that transforms into the end portion, wherein at least the final portion is linear.

19. An arm quick coupling part according to claim 18, wherein the arm power circuit coupling means are aligned for being coupled in the direction of said final portion.

20. An arm quick coupling part according to any of claims 14 - 19, wherein the arm power circuit coupling means are rigidly mounted.

21. An arm quick coupling par according to any of claims 14 - 19, wherein the arm power circuit coupling means are flexibly mounted.

22. An arm quick coupling part according to any of claims 14 - 21, wherein the arm power circuit coupling means include hydraulic and/or electric coupling means.

23. An implement quick coupling part for use in a quick coupling for coupling an implement to an operating arm of an excavator, a backhoe loader or a like machine having a complementary arm quick coupling part including arm mechanical coupling means and arm power circuit coupling means, including

first and second spaced, parallel implement mechanical coupling rods for cooperation with the arm mechanical coupling means for holding and locking the implement, and implement power circuit coupling means for cooperation with the arm power circuit coupling means for connecting a power system to the implement, wherein

the implement power circuit coupling means are arranged for being coupled in a linear direction.

24. An implement quick coupling according to claim 23, wherein the first and second implement mechanical coupling rods extend between two spaced parallel implement plates.

25. A quick coupling according to claim 24, wherein adjustment screws are fitted in the implement plates close to each first and second implement mechanical coupling rod.

26. An implement quick coupling part according to any of claims 23 - 25, wherein the implement power circuit coupling means are rigidly mounted.

27. An implement quick coupling par according to 23 - 25, wherein the arm power circuit coupling means are flexibly mounted.

28. An implement quick coupling part according to any of claims 23 - 27, wherein the implement power circuit coupling means include hydraulic and/or electric coupling means.

29. A method for coupling an operating arm of an excavator, a backhoe loader or a like machine to an implement, including the steps of

mechanically connecting an arm quick coupling part to an implement quick coupling part and bringing arm power circuit couplings means provided on the arm quick coupling part in alignment with implement power circuit coupling means provided on the implement mechanical coupling part,

moving the mechanically connected arm quick coupling part in a linear direction relative the implement quick coupling part and thereby couple together the arm power circuit coupling means and the implement power circuit coupling means as well as mechanically couple together the arm quick coupling part and the implement quick coupling part, and thereafter

mechanically locking the arm quick coupling part to the implement coupling part.

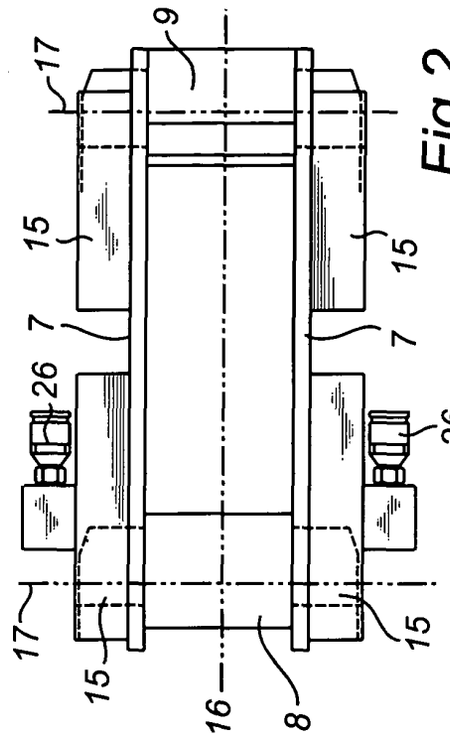

Fig.2

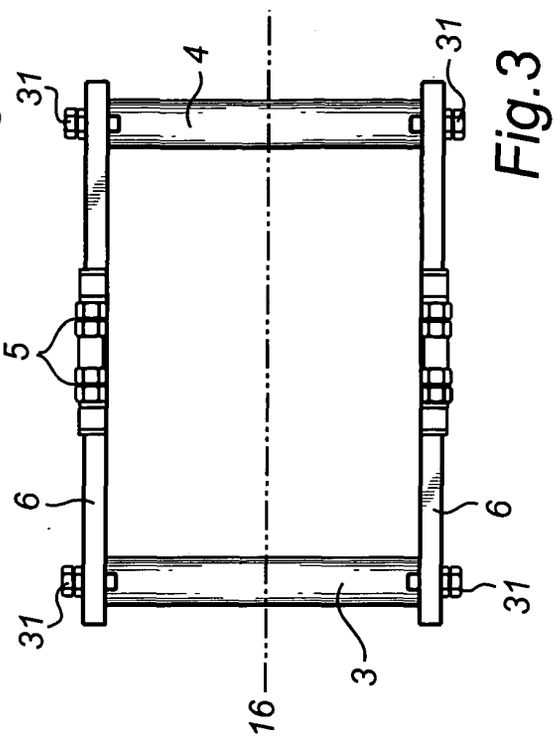

Fig.3

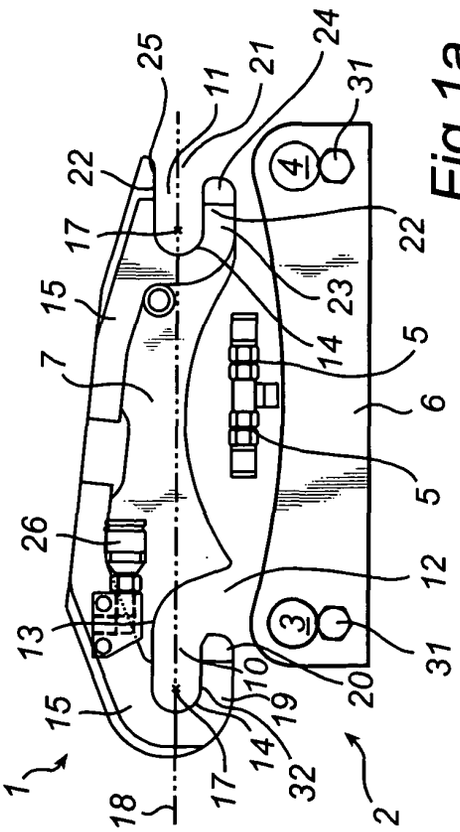

Fig.1a

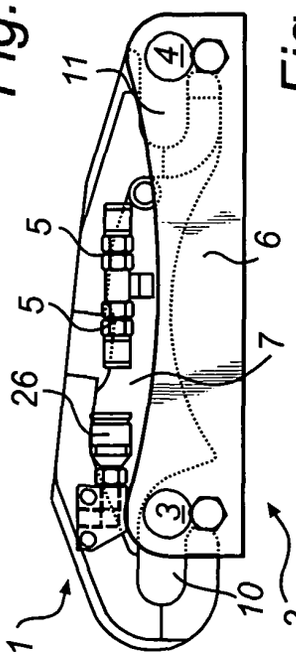

Fig.1b

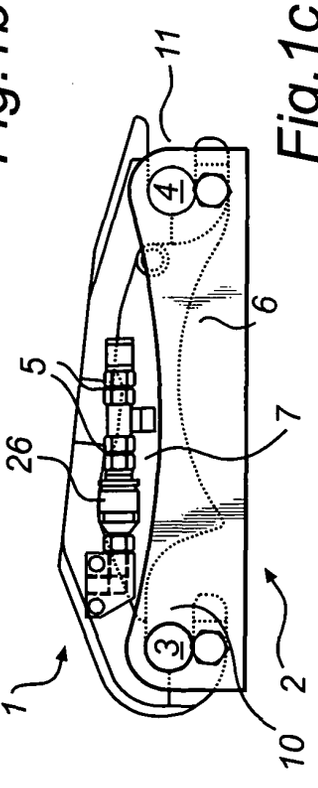

Fig.1c

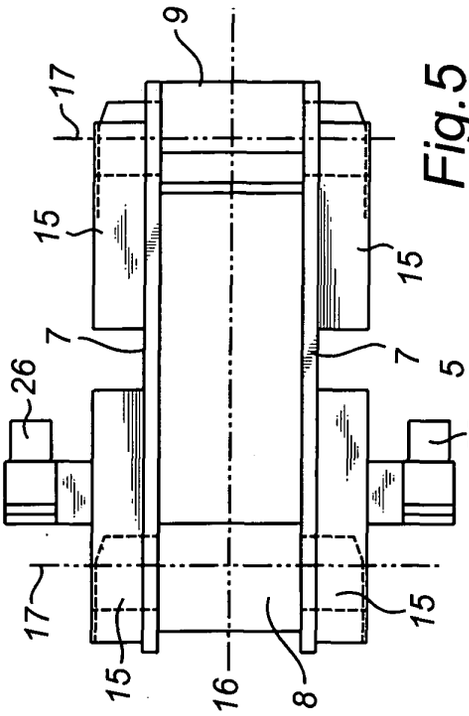

Fig.5

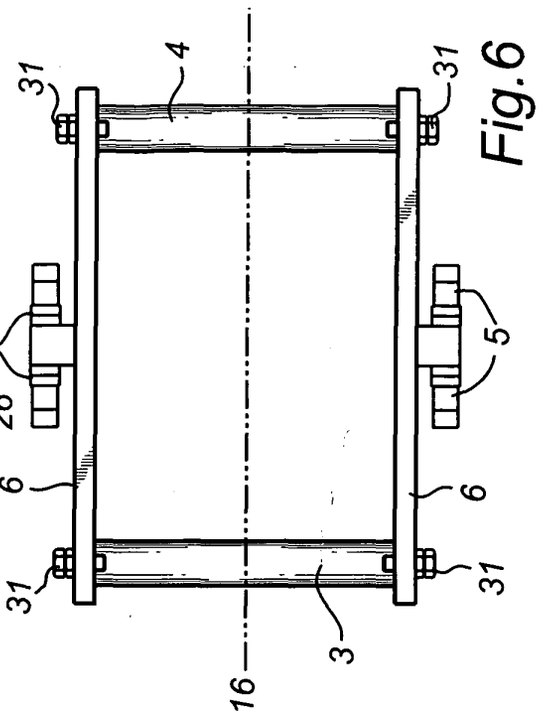

Fig.6

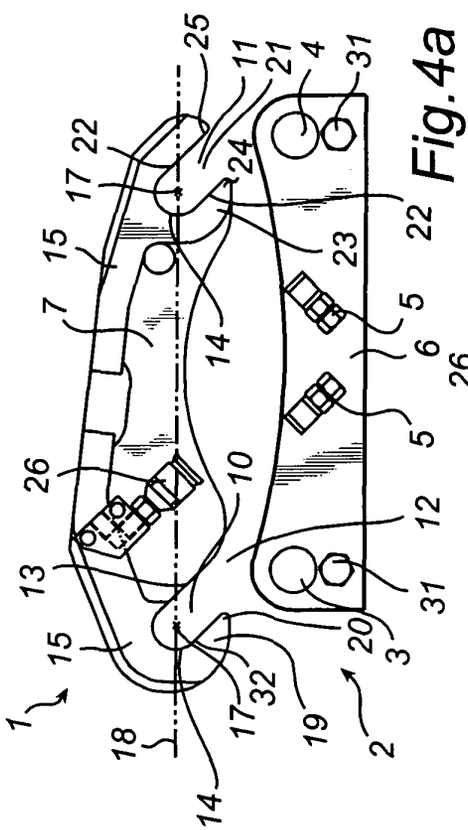

Fig.4a

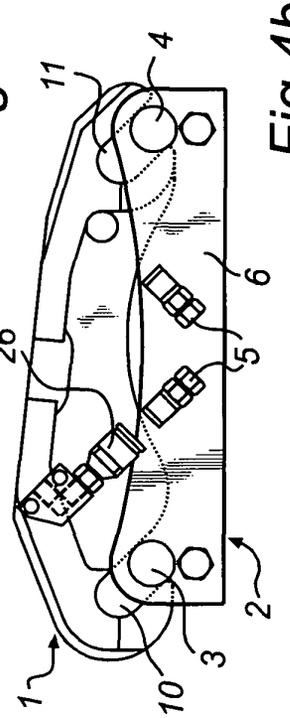

Fig.4b

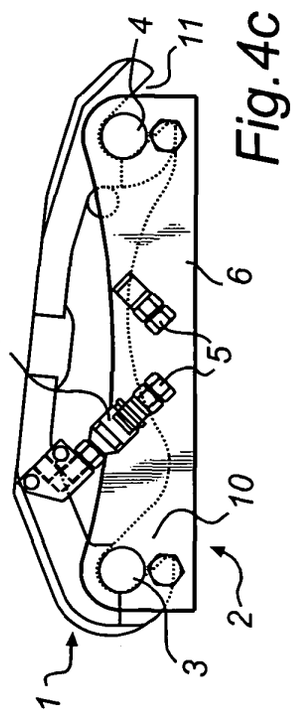

Fig.4c

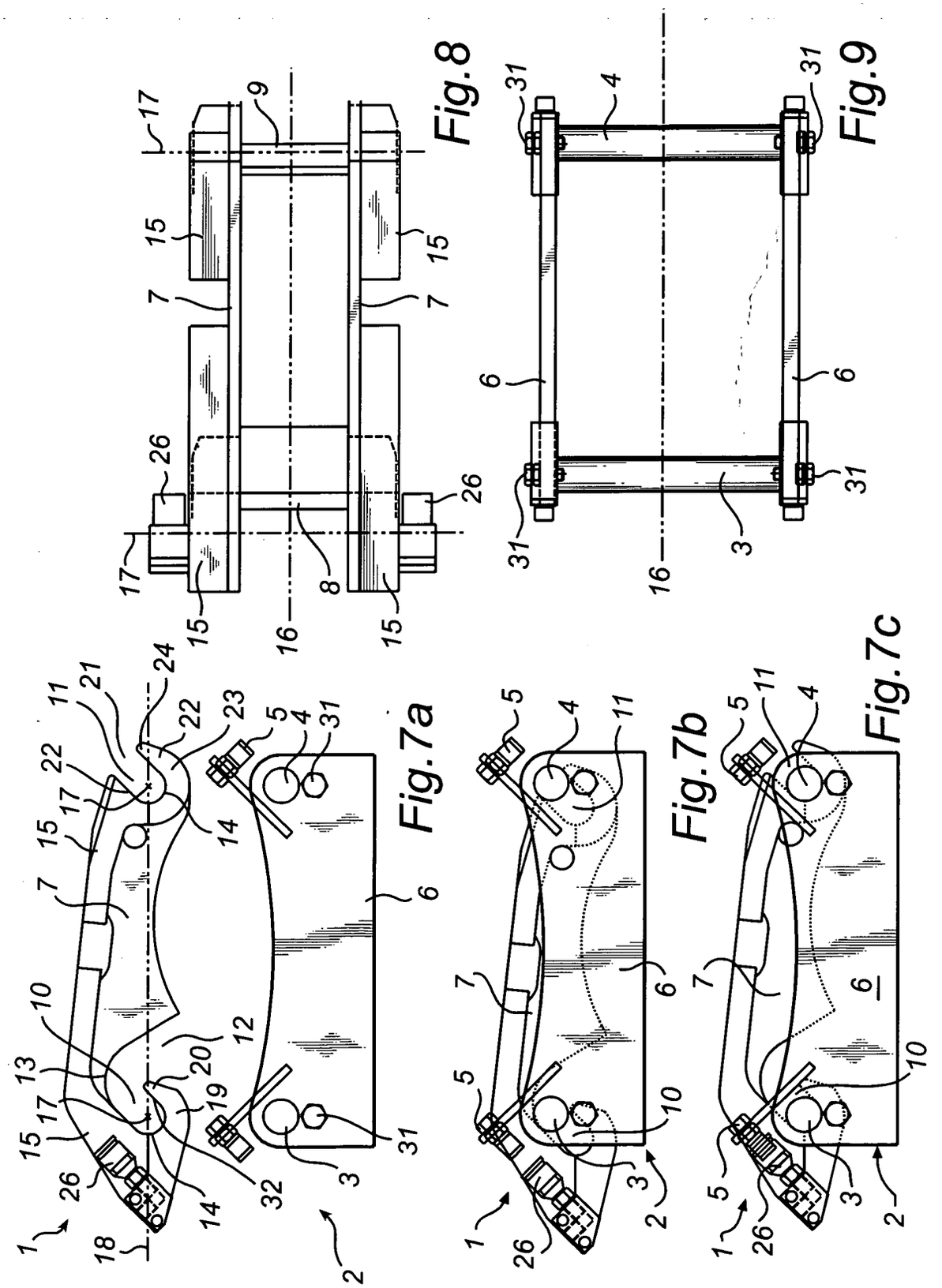
Fig.8
Fig.9
Fig.7a
Fig.7b
Fig.7c

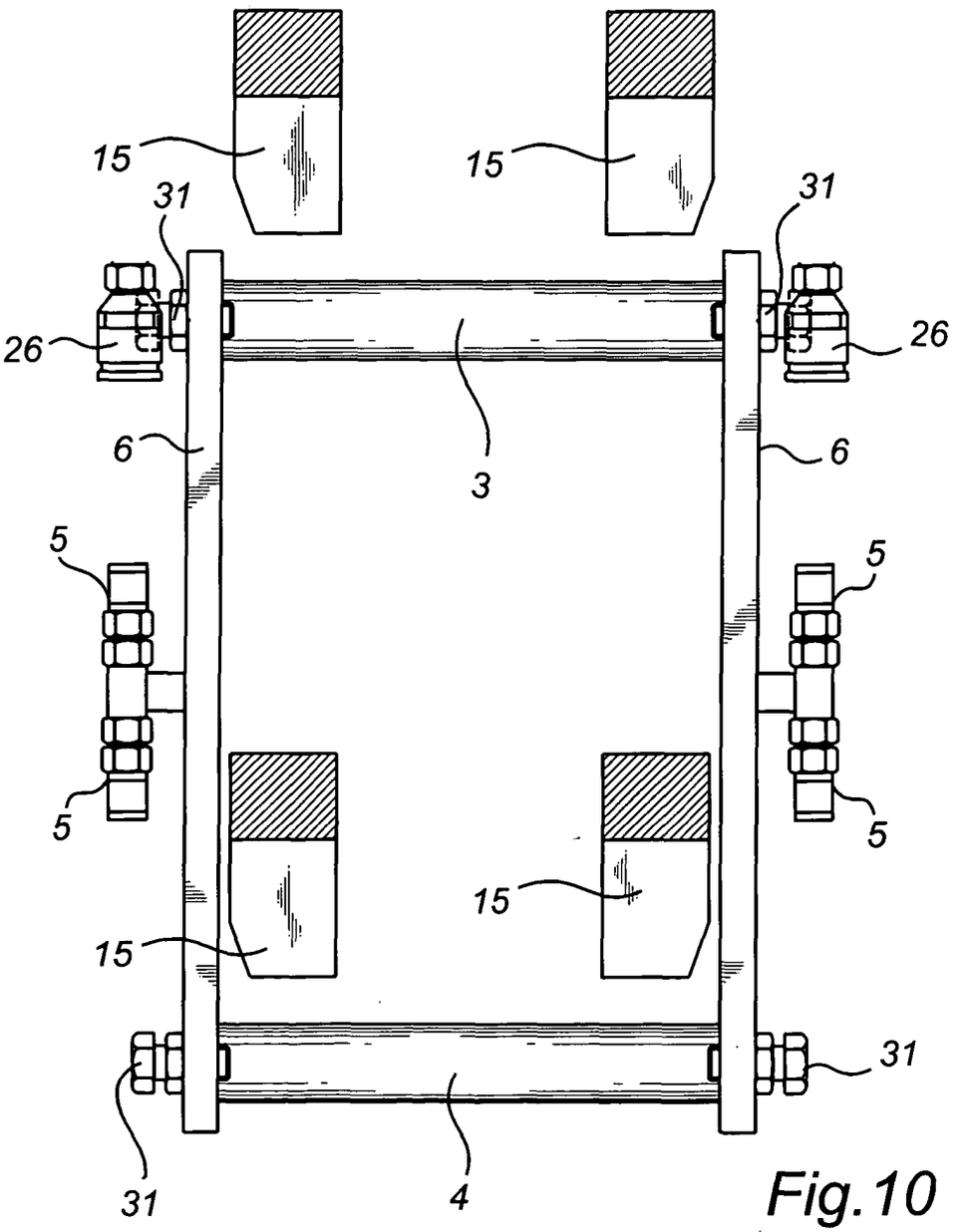

Fig.10

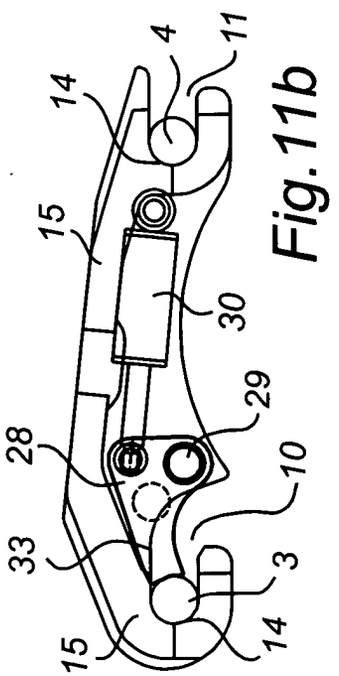

Fig.11b

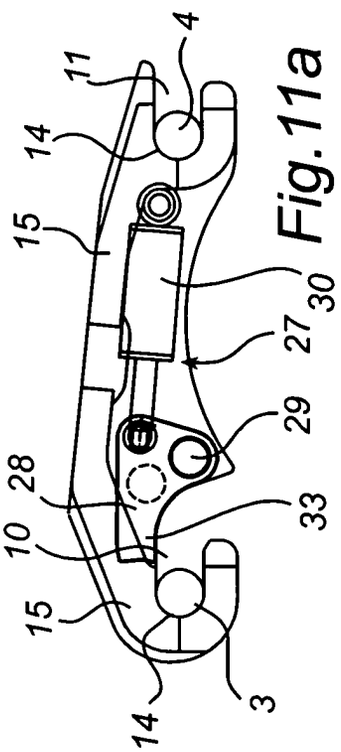

Fig.11a

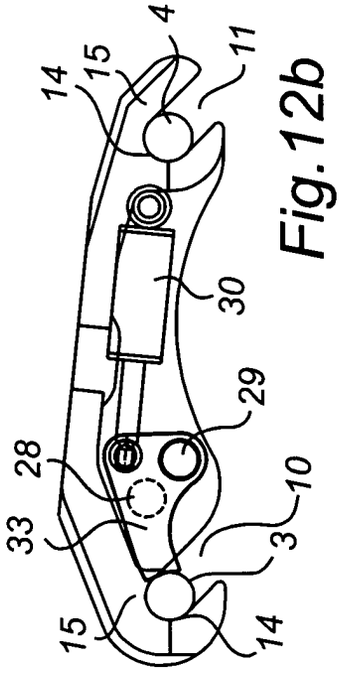

Fig.12b

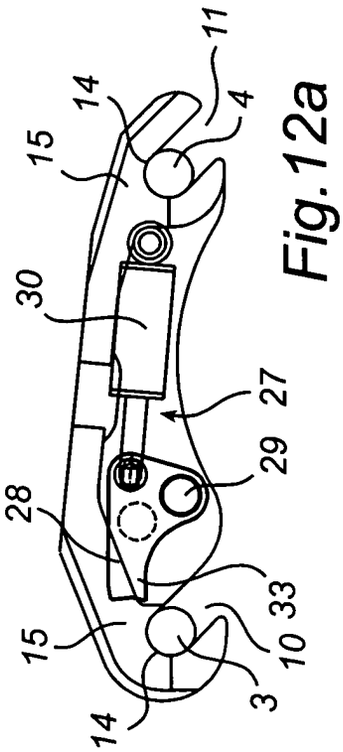

Fig.12a

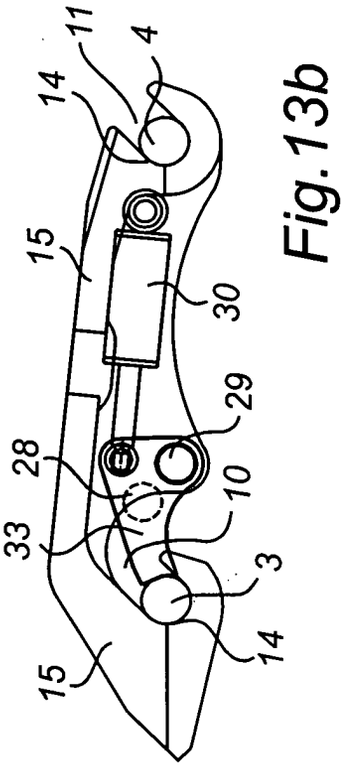

Fig.13b

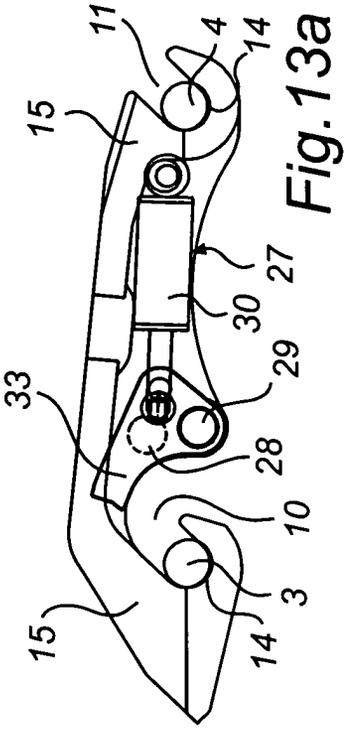

Fig.13a

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 00 7260

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	25 August 2004	Laurer, M

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