



(51) International Patent Classification:
E02F 3/36 (2006.01)

(21) International Application Number:
PCT/GB2011/001141

(22) International Filing Date:
29 July 2011 (29.07.2011)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
1013155.5 4 August 2010 (04.08.2010) GB

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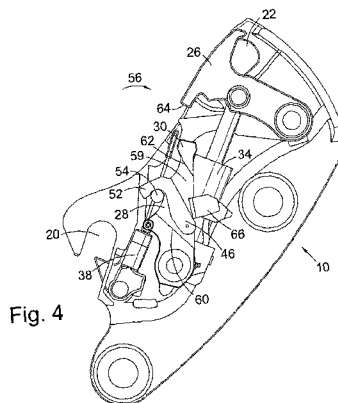
(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ,
CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO,
DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,
HN, HR, HU, ID, IL, IN, IS, JP, KE, KG,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

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

Published:

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

(54) Title: BLOCKING BAR MECHANISM FOR AN EXCAVATOR COUPLING



(57) Abstract: A blocking bar (28) for a latching mechanism (26) of an excavator coupler (10), the blocking bar (28) comprising a free end (31) for providing a latch-blocking function of the blocking bar (28) and a catch mechanism (46) for selective restraint of movement of the blocking bar (28) between a blocking position and a non blocking position of the blocking bar (28). The catch mechanism (46) prevents release of the blocking bar (28) unless the coupler (10) is inverted towards a crowd position.

BLOCKING BAR MECHANISM FOR AN EXCAVATOR COUPLING

The present invention relates to a blocking bar for an excavator coupler, and in particular a blocking bar for a fully automatic coupler for coupling accessories, such as buckets, onto the free end of an arm of an excavator.

Blocking bars for the purpose of preventing inadvertent opening of latching mechanisms within couplers for excavators are well known. See, for example, GB 2330570. See also GB 2450202 and GB 2450127. The known blocking bars typically operate under the influence of gravity, although springs can be added to moderate the degree of freedom of operation of those blocking bars. Alternatively they can be controlled by independently driven hydraulic rams, for allowing a powered release thereof. These blocking bars, however, although being highly reliable, have scope for improvement, such as to offer further control over the circumstances needed for a release of the blocking bar (i.e. a movement thereof from a blocking position into a non-blocking position). Such additional control could in turn further reduce the opportunities for accidental, unintentional or non-required release of the blocking bar, and thus potentially also unintended decouplings (partial or otherwise) of an accessory from the coupler.

According to the present invention there is provided a blocking bar for a latching mechanism of an excavator coupler, the blocking bar comprising:

- a free end for providing a latch-blocking function of the blocking bar, and
- a catch mechanism for selective restraint of movement of the blocking bar between a blocking position and a non blocking position of the blocking bar.

Preferably the blocking bar is a pivotal member for pivotal movement relative to a frame of the coupler. Preferably the blocking bar comprises a pivot bearing, a pivot axis or a pivot axle, about or with which it can be pivotably mounted onto the frame of the coupler.

Preferably the catch mechanism takes the form of a hook.

Preferably the catch mechanism is pivotably attached to the blocking bar.

Preferably the point of attachment of the catch mechanism to the blocking bar lies between the free end of the blocking bar and a pivot axis of the blocking bar.

5 Preferably the catch mechanism is adapted to be selectively engageable against a member of the frame. Preferably that member of the frame is fixed member of the frame, and more preferably it is a stop for the blocking bar for preventing an excessive degree of motion of the blocking bar within the coupler. Preferably that stop restrains degree of movement freedom of the blocking bar to prevent the blocking bar from moving through a final blocking position thereof when moving from a non-blocking position.

10 Preferably the member of the frame takes the form of a pin, or some other round sectioned member.

15 Preferably the member extends perpendicular to the sidewalls of the coupler's frame.

Preferably the blocking bar is a powered blocking bar. Preferably the power is provided by a hydraulic cylinder. The hydraulic cylinder may be supplied as an attached part of the blocking bar, or it may be integrated into the blocking bar, as per the disclosure in GB1002018.8. Alternatively the hydraulic cylinder may be taken to be a separate component of the coupler that is simply attached to the blocking bar, for example at a pivot point.

20 The hydraulic cylinder may be pivotably mounted to the frame of the coupler – at a different location to the blocking bar.

25 Preferably the blocking bar's control is generally independent to the control of the latching mechanism, for example such that the blocking bar can be controlled from the cab of the excavator independent to the movement of the latching mechanism from its latching position. The movement of the latching mechanism from that latching position, however, is subject to the control of the blocking bar – the blocking bar needs to have been moved from a blocking position into a non-blocking position before that latching mechanism can be moved into a non-latching position.

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Preferably the movement of the latching mechanism is under the control of a primary hydraulic cylinder of the coupler. That primary hydraulic cylinder is thus preferably independent to any hydraulic cylinder that may be provided for powering the blocking bar.

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Independent control of the blocking bar, however, may be gravity based, as per GB2330570, rather than under the control of a hydraulic cylinder. Nevertheless, it is preferred that the two separate, dedicated, hydraulic circuits be provided for operational control of the blocking bar and the latching mechanism of a coupler featuring the blocking bar of the present invention.

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The present invention also provides an excavator coupler comprising pair of jaws for attaching an excavator accessory thereto via a pair of parallel-spaced attachment pins, one of the jaws being associated with a powered latching mechanism and a blocking bar as described above, the blocking bar being for selective control of the movement of the powered latching mechanism from a latching position into a non-latching position.

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Preferably the coupler features a secondary latching mechanism, associated with the other jaw, for latching a second attachment pin of the accessory in that other jaw.

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Preferably a dedicated hydraulic circuit is provided for controlling the secondary latching mechanism of the coupler.

Preferably the first powered latching mechanism is a latch for a rear jaw of the coupler.

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Preferably the secondary latching mechanism is a latch for a front jaw of the coupler.

Preferably the front jaw of the coupler opens generally outwards at the front of the coupler whereas the rear jaw preferably opens generally outwards downwardly relative to the frame of the coupler.

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Preferably the blocking bar is arranged within the coupler such that the blocking bar has a primary axis, between its free end and its pivot axis, that extends generally towards the rear of the first powered latching mechanism from the pivot axis of the blocking bar.

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The blocking bar is preferably pivotable relative to the frame of the coupler, whereby it can then preferably have a range of movements between a final blocking position and a non blocking position through a range of angles of up to 45°.

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Preferably the non-blocking position is a raised position relative to the frame of the coupler.

Preferably the catch mechanism of the blocking bar is arranged to be gravity operated.

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Preferably, when the coupler is arranged in a generally horizontal orientation, and with the blocking bar in its blocking position – the default, at rest, orientation, the catch mechanism will have fallen into a position of engagement with the member of the frame.

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The catch mechanism preferably hooks over the member of the frame in this condition, thereby preventing movements of the blocking bar from that blocking position into a non-blocking position, even upon powering the blocking bar's hydraulic cylinder.

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Preferably the catch mechanism is arranged such that by default it will control or restrict movement of the blocking bar until it is released from a default, catching condition, that default, catching condition being achieved whenever the coupler is arranged in the default, at rest, orientation.

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Preferably the catch mechanism includes a hooking member for engaging a catch (such as the member of the frame). Preferably that hooking member is oriented to point away from the free end of the blocking bar.

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The catch mechanism, when operating, is thus arranged to prevent the movement of the blocking bar from a blocking position into a non blocking position, even upon powering the blocking bar's hydraulic cylinder. Further, due to the direction of operation of the catch mechanism – in this embodiment, the hooking member points away from the free end of the blocking bar, with that hooking member being arranged underneath the blocking bar, but between the pivot axle of the blocking bar and the free end of the

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blocking bar – the catch mechanism will also prevent the movement of the blocking bar

from a blocking position into a non blocking position even throughout an inversion where that inversion occurs in a uncurling direction – i.e. such that the coupler is rotated about the end of the arm of the excavator in a direction taking it away from the cab of the excavator, and then back again to the default, at rest orientation. Such rotational operations of the coupler are frequently carried out during digging operations. The catch mechanism of the blocking bar thus provides a mechanical lock-down for the blocking bar during normal digging operations.

However, by rotating the coupler from that horizontal, default, at rest, orientation into an inverted condition towards the crowd direction – the crowd direction being where the coupler, and any excavator attachment attached thereto are rotated underneath the excavator arm, towards the cab of the excavator, the catch mechanism can release from its catch, upon the inversion occurring (a rotation beyond the perpendicular, i.e. beyond the vertical), thereby allowing the blocking bar to be powered to a non-blocking position (or for it to release to a non-blocking position under the influence of gravity, if it is a gravity operated blocking bar instead of a powered one).

Such rotations towards the crowd position are rarely performed during conventional digging operations. The release of the blocking bar will thus not be able to occur during digging operations, and would typically only occur upon a deliberate, unusual, towards-the-cab curling operation of the excavator.

The catch mechanism of the present invention therefore serves to prevent inadvertent decoupling procedures during normal digging procedures, only allowing a decoupling procedure to occur, due to the mechanical catching mechanism, upon a deliberate repositioning of the coupler into the required, curled, inverted orientation.

The blocking bar may feature a pair of catch mechanisms, one on either side of the blocking bar.

Preferably the catch mechanism is attached to the blocking bar with a pivot pin.

Preferably the catch mechanism is mounted onto the side of the blocking bar in a rebated section thereof.

Preferably the catch mechanism is bifurcated so as to engage on both sides of the blocking bar's main body.

Preferably the rebates are provided on both sides of the main body of the blocking bar.

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The or each rebate can allow a range of rotation of the catch mechanism relative to the blocking bar's main body – end walls of the rebate(s) may provide rotation stops for the catch mechanism. These stops can thus serve to limit the available degrees of rotation of the catch mechanism such that the catch mechanism cannot rotate into an inoperable, non-gravity recoverable, state, such as a position lying over the top of the blocking bar. A bifurcated catch mechanism, however, cannot rotate over the top of the blocking bar anyway.

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The free end of the catch mechanism, which may form the hooking member, preferably comprises a chamfered or angled or rounded outer surface for facilitating a reengagement of the catch mechanism over the member of the frame into a catching condition when the blocking bar drops to a default or blocking position relative to the frame. Alternatively the member may be so profiled so as to facilitate that reengagement.

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The catch mechanism may itself be powered for independent control thereof. It might even be selectively biased towards a catching condition, with an independent powered release being adapted to overcome the biasing force for selective release of the catch mechanism.

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These and other features of the present invention will now be described in greater detail with reference to the accompanying drawings, in which:

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Figure 1 illustrates a cutaway view of a coupler of the present invention, including a blocking bar of the present invention in a raised, non-blocking position;

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Figure 2 shows the same coupler as Figure 1 but in which a latching mechanism for a rear jaw thereof has been powered into a fully closed position. The blocking bar, however, is still maintained in a raised, or non-blocking, position, by the extended state of its dedicated hydraulic cylinder;

Figure 3 shows that same coupler again, but in which the blocking bar has been dropped into a blocking position and in which its catch mechanism has dropped into a catching position relative to a member of the frame;

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Figure 4 shows a side elevation of the same coupler again, but rotated into an inverted condition via a non-crowd direction;

Figure 5 shows that same coupler again, but rotated through a different direction of rotation – towards a crowd position, whereupon the catch mechanism releases from the member of the frame;

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Figure 6 illustrates, in perspective, the same coupler again, again rotated towards a crown direction, but this time in a more vertical condition than in Figure 5; and

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Figure 7 illustrates a blocking bar assembly of the present invention, with hydraulic pipes attached.

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Referring first of all to Figure 1, there is shown a broken away view of a coupler of the present invention, broken away to show the internal working mechanisms of the coupler. As can be seen, the coupler 10 comprises a frame 12 with a top half 14 and a bottom half 16 (only part of which is readily visible). The top half 14 comprises two pairs of attachment-pin-receiving holes, only two of which are illustrated – the broken away part of the coupler would feature the two missing holes of the two pairs of holes 18. As for the bottom half 16 it comprises a front jaw 20 and a rear jaw 22 for receiving attachment pins of an accessory.

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The front jaw 20 of the coupler has an opening extending generally towards the front 24 of the coupler and the rear jaw 22 has an opening extending generally downwards relative to, or out of the bottom of, the coupler 10. It will be appreciated that the “forwards” and “downwards” directions are relative since these couplers 10 are designed to be rotated between horizontal and vertical orientations by the operations of an arm of the excavator. Nevertheless, they refer to directions when the coupler is in a generally horizontal, and non-inverted orientation, with the front jaw facing towards the cab of the excavator.

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The coupler 10 also features a pivotable latching hook 26 that is associated with the rear jaw 22. It provides a primary latching mechanism for the coupler 10, and can achieve a latching of an accessory to the coupler 10 when combined with the front jaw and the rear jaw – a first attachment pin of the accessory is engaged into the front jaw 20 of the coupler 10, a second attachment pin of the accessory is engaged into the rear jaw 22, and the primary latching mechanism cooperates with the rear jaw to latch the second attachment pin within that rear jaw 22, the accessory (not shown) thus being securely mounted onto the bottom half 16 of the coupler 10 by that jaw/latching mechanism interaction. These coupling operations, and the general operations of the above mentioned features, are all commonly known in the art of quick, or automatic, couplers for excavators, as per GB 2330570 and GB 2450202. A further discussion of their operation is therefore not needed here.

The development of those prior art couplers resides in relation to a blocking bar that is provided for interacting with the primary latching mechanism (herein for the rear jaw). That blocking bar 28 comprises a main body 29 with a free end 31 at one end thereof and a pivot axle 32 is located at the other end thereof. The pivot axle 32 defines the axis about which the blocking bar 28 can rotate within the frame 12 of the coupler 10.

The pivot axle 32 takes the form of a pivot pin extending through the sides of the frame 12 of the coupler 10. It is a common pivot axle also for a primary hydraulic ram 34 of the coupler – the hydraulic ram (or hydraulic cylinder) for the pivotable latching hook 26.

A greasing nipple 36 is provided in the blocking bar 28 for greasing that pivot axle 32 to allow regular lubrication of the blocking bar 28 (and the hydraulic cylinder) from a single location. This ensures that there can be rotation of the blocking bar (and independent thereto, the hydraulic cylinder) relative to that axle 32.

The blocking bar 28 in this embodiment also features its own dedicated hydraulic ram 38. It is for powering the blocking bar 28 between a blocking position (Figures 1 and 2) and a non-blocking position (Figures 3 and 4), and potentially vice-versa, if the ram is double-acting, although a sprung return may be preferred.

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The dedicated hydraulic ram 38 is also pivotably mounted to the frame 12 of the coupler 10, this time by a further pivot axle 40, which axle is not coaxial with the earlier axle 32. A driving moment against the blocking bar 28 can thus be achieved with that dedicated hydraulic ram 38, as explained below.

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In this embodiment, that further pivot axle 40 also is a dual purpose axle – it additionally provides a pivot axle for the coupler's secondary latch 42 – a latch that is provided for the front jaw 20.

10 The dual purposes for the two axles 32, 40, although being preferred for keeping costs down, is only optional – dedicated axles can thus instead be provided separately for each pivotal member.

15 It should also be noted that although the axles 32, 40 mount the pivoting members (the ram 34, the blocking bar 28, the secondary latch 42 and the dedicated ram 38) pivotally to a fixed location on the frame, via the sides of the frame, it is possible instead for the axles 32, 40 to mount onto internal components of the coupler instead, including moving parts thereof. Fixed locations on the frame 12 of the coupler 10, however, are preferred for the axles since that provides added strength or stability for the various
20 internal components of the coupler.

The first end of the dedicated hydraulic ram 38 is mounted in a pivotal manner at a fixed location relative to the frame of the coupler, as explained above. That location is shown to be at a lower location than the axle 32 for the blocking bar. The other end of
25 that dedicated hydraulic ram 38, here the rod end, then is connected to the underside of the body 29 of the blocking bar 28 at another pivot point, or a mounting position 44. Preferably that mounting position 44 is located on a downwardly extending flange or projection on the underside of the blocking bar 28. The dedicated hydraulic ram 38 is thus mounted wholly below, or lower down than, the blocking bar 28. Preferably, and
30 as shown, it lies least underneath the blocking bar, and underneath the pivot axis 32 of the blocking bar 28. With this arrangement, a lifting the blocking bar into a non-blocking position (a release of the blocking bar 28) is performed by extending the dedicated hydraulic ram 38, whereas dropping the blocking bar 28 into a blocking position is performed by contracting the dedicated hydraulic ram 38 (by reverse powering it, or

using a spring bias). Other arrangements, and other orientations, however, will be within the scope of the invention.

5 Although a powered blocking bar is illustrated and described, it should also be remembered that a blocking bar operable under the influence of gravity (as in GB2330570), but modified to include the catch mechanism of the present invention's blocking bar, can instead be provided within the scope of the invention. See also the other GB applications mentioned above.

10 The new operational characteristics of the blocking bar of the present invention will now be described in greater detail:

The blocking bar 28 is modified over prior art blocking bars at least by the provision of a catch mechanism 46 therefor. In this embodiment, that catch mechanism 46 takes
15 the form of a pivoting hook that is pivotably mounted to the main body 29 of the blocking bar 28.

As shown, the catch mechanism 46 has a pivot pin 48 at a first end thereof, which pivot pin connects the catch mechanism 46 to the main body 29 of the blocking bar 28. In
20 this embodiment, a single, bifurcated catch mechanism 46 is provided – it has a bifurcated first end, whereby two tines of that first end extend either side of the main body 29 of the blocking bar 28, with the pivot pin 48 then extending through both of those tines and the main body 29 of the blocking bar 28, thus securing that hook onto the main body 29 in a secure, but pivotable manner relative to that main body.

25 Other arrangements, however, would of course be possible, such as a catch mechanism 46 only extending on one side of the blocking bar, or two separate catch mechanisms 46, one on either side of the blocking bar.

30 At the end of the catch mechanism 46, away from the two tines, there is a hooking member 52. It is formed as a foot of the hook 46, with the leg extending up to the main body 29 of the blocking bar. As shown in figures 1 and 2, that hooking member 52 will rest, under the influence of gravity, against a member 54 of the frame 12 – a catch for the catch mechanism when the blocking bar is lifted into a non-latching position. That
35 member 54 is in the form of a pin that extends between the sidewalls of the frame 12 of

the coupler. It serves two functions: firstly it provides a stop for the blocking bar 28, as shown in Figure 4 – the underside of the blocking bar 28 rests against that member 54. See also Figure 3. Secondly, it provides a member or catch over which the hooking member 52 can engage, as also shown in Figure 4, when the blocking bar is lowered down into a lower-most blocking position. The swinging of the hook 46 underneath that member 54 will be under the influence of gravity due to the centre of gravity of the hook lying to the side of the pivot pin 48, rather than directly underneath it.

Upon engaging the hooking member 52 under that member 54, even upon actuating the hydraulic ram 38 for the blocking bar 28, the blocking bar 28 cannot be moved into a non-blocking position. That is because the catch/hooking member will together resist such a movement of the blocking bar 28 – the influence of gravity, combined with the shape of the hooking member, allows this to occur (the hooking member's catch-facing surface returns sufficiently around the catch 54 for that purpose, so as not to release itself, under loading from the dedicated hydraulic ram 38, from the catch 54). The catch mechanism 46 thus provides a control mechanism for the operation of the blocking bar 28, in that the catch mechanism must be disengaged before the blocking bar can be raised into a non-blocking position.

To prevent an overload within the dedicated hydraulic ram 38 when the catch mechanism is preventing a lifting of the blocking bar 28, an overload prevention circuit might be built into the hydraulic ram 38, such as a pressure relief valve or a displacement ram. This will prevent any build up in hydraulic pressure, as a result of an operation of that hydraulic ram while the catch mechanism is in a catching condition, from overloading or breaking one or more of the blocking bar, the hydraulic ram or the catch mechanism 46, or any of the connections therebetween.

Figure 4 shows the status of the catch mechanism 46 upon rotation of the coupler 10 into an inverted position via a rotation through the direction shown by the arrow 56 – a rotation referred to as an uncurling rotation, a non-crowding rotation or a rotation from the horizontal orientation, with the front 24 of the coupler 10 pointing towards the cab of the excavator, away from the cab of the excavator to an inverted orientation. As indicated above, it is desired that the coupler cannot release the accessory from the jaws 20, 22 of the coupler 10 during digging operations and such an uncurling rotation of the coupler is a frequently performed rotation during digging operations, such as

when emptying collected material from the bucket. That rotation, as shown, does not release the hooking member 52 from the member 54 of the frame, whereby the blocking bar cannot be released from its blocking position. This is a highly desirable result.

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Referring next to Figures 5 and 6, the status of the catch mechanism 46 is shown instead upon rotating the coupler 10 in the other direction, as shown by arrow 58 in Figure 5, i.e. into a curled condition or towards a crowd position (a rotation from the horizontal orientation, with the front 24 of the coupler 10 pointing towards the cab, towards the cab of the excavator to an inverted orientation). As can be seen from these Figures, this alternative rotation direction causes the catch mechanism 46 to operate differently. Instead of maintaining an engagement against or "under" the member 54 of the frame 12, the hooking member 52 falls under the influence of gravity away from that member 54 and into a non-catching position. This undoing of the catch mechanism thus allows the blocking bar 28 now to be operated by the dedicated hydraulic ram 38 between its blocking position (as shown in Figures 5 and 6) and its non-blocking position (as shown in Figures 1 and 2).

The above comparative illustrations thus show that the blocking bar 28 is mechanically restrained from movements between a blocking position and a non-blocking position when the coupler is rotated in a uncurling direction, and is not mechanically restrained from such movements, i.e. it is free to be powered into a non-blocking position, when the coupler is rotated instead towards a crowd position, and this is without the provision of a spring arm that engages against the arm of the excavator – the equivalent solution provided in GB2330570.

Further details of the catch mechanism 46, and the blocking bar 28, will now be provided.

The catch mechanism 46 has the two tines of the catch mechanism 46. They are located within recesses or rebates 59 formed in the sides of the blocking bar 28. Those recesses 59 are defined by corresponding ends 60, 62. Those ends 60, 62 can serve to define stops for controlling the degree of rotation of the catch mechanism 46 relative to the blocking bar 28. In this illustrated embodiment, however, only one of those ends 60 provides that function. The other end merely reinstates a given casting-

thickness for the blocking bar 28 at the free end 30 of the blocking bar for giving a wider cross section for that free end, whereby a more positive engagement against the flange at the rear of the pivotable latching hook 26 is achievable in the event that the pivoting latching hook 26 was to be powered towards a non latching position by its hydraulic ram 34 prematurely (the rear 64 of the hook 26 would bear against the free end 30 of the blocking bar 28).

The blocking bar's main body might, of course, be cast with those recessed already in the casting.

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Instead of using the second end wall as a stop, a stop for the rotation of the catch mechanism 46 in the other direction can instead be provided by either one or both of two other features. Firstly a manifold 66 for the hydraulics of the dedicated hydraulic ram is provided on the top of the blocking bar 28. That manifold 66 has an underside that overlaps slightly across the recessed sides of the blocking bar 28. That underside therefore can provide a surface against which the catch mechanism 46 can engage, as shown in Figure 5, for acting as a stop. Secondly, due to the bifurcated nature of the catch mechanism 46, the catch mechanism itself will have an internal surface that would ultimately bear against the underside of the blocking bar 28, thereby providing a stop.

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The catch mechanism thus cannot rotate relative to the blocking bar's main body 29 beyond a given range of rotations, which range allow the hooking member 52 always either to rest against or away from the member 54 of the frame, but without getting stuck on top of that member (which would disable the blocking bar).

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Referring now again to the manifold 66 on the top of the blocking bar, it comprises two fluidly linked holes. One hole - usually the upper hole, is for receiving the hydraulic supply pipe 74 (see Figure 7) from the excavator's hydraulic control system (not shown), whereas the second hole is for feeding hydraulic fluid from that primary supply pipe to the dedicated hydraulic ram 38. For that purpose, a short pipe 76 (shown in figure 7) is provided. It extends from that second hole to a hole 68 in the head of the dedicated hydraulic ram 38. As such, a blocking bar assembly can be provided as a separately replaceable, preassembled component of the coupler 10, which assembly features the blocking bar 28, with its catch mechanism 46 and the dedicated hydraulic

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ram 38, and with its pipe connecting the hole 72 in the manifold 68 to the hole 68 in the head of the ram 38.

5 The present invention has therefore now been described above purely by way of example. Modifications in detail, however, may be made to the invention within the scope of the claims appended hereto.

CLAIMS:

1. A blocking bar for a latching mechanism of an excavator coupler, the blocking bar comprising:
 - 5 a free end for providing a latch-blocking function of the blocking bar, and
 - a catch mechanism for selective restraint of movement of the blocking bar between a blocking position and a non blocking position of the blocking bar.
- 10 2. The blocking bar of claim 1, wherein the blocking bar is a pivotal member for pivotal movement relative to a frame of the coupler.
3. The blocking bar of claim 1 or claim 2, wherein the blocking bar comprises a pivot axle, about which it can be pivotably mounted onto a frame of the coupler.
- 15 4. The blocking bar of any one of the preceding claims, wherein the catch mechanism takes the form of a hook.
5. The blocking bar of any one of the preceding claims, wherein the catch mechanism is pivotably attached to the blocking bar.
- 20 6. The blocking bar of any one of the preceding claims, wherein a point of attachment of the catch mechanism to the blocking bar lies between the free end of the blocking bar and a pivot axis of the blocking bar.
- 25 7. The blocking bar of any one of the preceding claims, wherein the catch mechanism is adapted to be selectively engageable against a member of the frame.
8. The blocking bar of claim 7, wherein that member of the frame is a fixed member of the frame.
- 30 9. The blocking bar of claim 7 or claim 8, wherein the member of the frame is a stop for the blocking bar for preventing an excessive degree of motion of the blocking bar within the coupler in a given direction.

10. The blocking bar of any one of the preceding claims, wherein the blocking bar is a powered blocking bar.

5 11. The blocking bar of claim 10, wherein the power is from a hydraulic cylinder that is adapted to be pivotably mounted relative to the frame of the coupler.

10 12. The blocking bar of any one of claims 1 to 9, wherein control of the blocking bar is gravity based, controlled by rotation of the blocking bar between inverted and non-inverted orientations.

13. The blocking bar of any one of the preceding claims, wherein control of the catch mechanism is gravity based, controlled by rotation of the blocking bar between inverted and non-inverted orientations.

15 14. The blocking bar of any one of the preceding claims, wherein the catch mechanism includes a hooking member for engaging a catch.

15 15. The blocking bar of claim 14, wherein that hooking member is oriented to point away from the free end of the blocking bar.

20 16. A coupler for an excavator, the coupler featuring a blocking bar according to any one of the preceding claims, and a latching mechanism associate therewith, wherein a movement of the latching mechanism from a latching position into a non latching position is subject to the control of the blocking bar such that the blocking bar
25 needs to have been moved from a blocking position into a non-blocking position before that latching mechanism can be moved into a non-latching position.

17. The coupler of claim 16, wherein the movement of the latching mechanism is under the control of a primary hydraulic cylinder of the coupler.
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18. An excavator coupler comprising pair of jaws for attaching an excavator accessory thereto via a pair of parallel-spaced attachment pins, one of the jaws being associated with a powered latching mechanism and a blocking bar according to any one of claims 1 to 15, the blocking bar being for selective control of the movement of
35 the powered latching mechanism from a latching position into a non-latching position.

19. The coupler of claim 18, being in accordance with claim 16 or claim 17.

20. The coupler of claim 18 or claim 19, the coupler featuring a secondary latching mechanism, associated with the other jaw, for latching a second attachment pin of the accessory in that other jaw.

21. The coupler of any one of claims 16 to 20, wherein the blocking bar is arranged within the coupler such that the blocking bar's primary axis, between its free end and its pivot axis, extends generally towards the rear of the latching mechanism for which it is provided from the pivot axis of the blocking bar.

22. The coupler of any one of claims 16 to 21, wherein the blocking bar is pivotable relative to the frame of the coupler, through a range of positions, between a lower-most blocking position and a non blocking position.

23. The coupler of claim 22, wherein the non-blocking position is a raised position relative to lower most blocking position, relative to the frame of the coupler.

24. The coupler of any one of claims 16 to 23, wherein when the coupler is arranged in a generally horizontal orientation, and with the blocking bar in its blocking position, the catch mechanism will have fallen into a position of engagement with a fixed member of the coupler.

25. The coupler of claim 24, wherein the catch mechanism hooks under the fixed member of the coupler.

26. The coupler of claim 24 or claim 25, wherein that fixed member of the coupler is a fixed member of the frame of the coupler.

27. The coupler of any one of claims 16 to 26, wherein due to the direction of operation of the catch mechanism, the catch mechanism will prevent the movement of the blocking bar from a blocking position into a non blocking position, during its normal use on an arm of an excavator, even during an inversion of the coupler where that inversion occurred through a rotation of the coupler from a horizontal, non-inverted orientation in an uncurling direction.

28. The coupler of any one of claims 16 to 27, wherein due to the direction of operation of the catch mechanism, the catch mechanism will allow the movement of the blocking bar from a blocking position into a non blocking position, during its normal use
5 on an arm of an excavator, during an inversion of the coupler where that inversion occurred through a rotation of the coupler from a horizontal, non-inverted orientation in a curling direction.

29. A blocking bar with catch mechanism substantially as hereinbefore described
10 with reference to any one or more of the accompanying drawings.

30. A coupler for an excavator substantially as hereinbefore described with reference to any one or more of the accompanying drawings.

15 31. A method of controlling the operation of a blocking bar in a coupler for an excavator substantially as hereinbefore described with reference to the accompanying drawings.

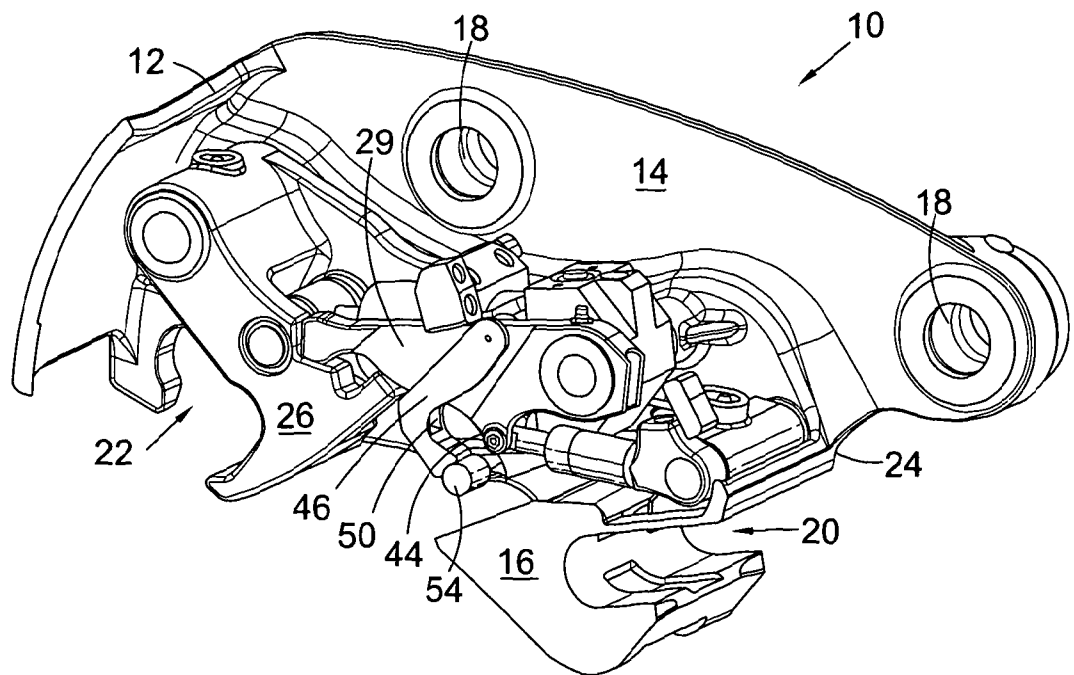


Fig. 1

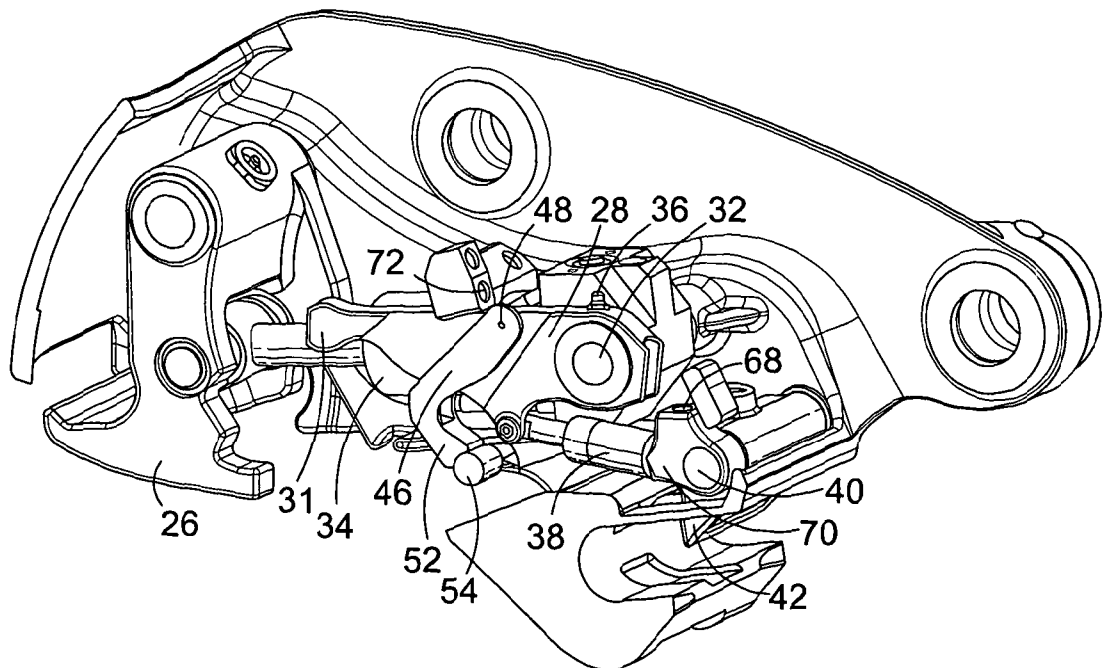


Fig. 2

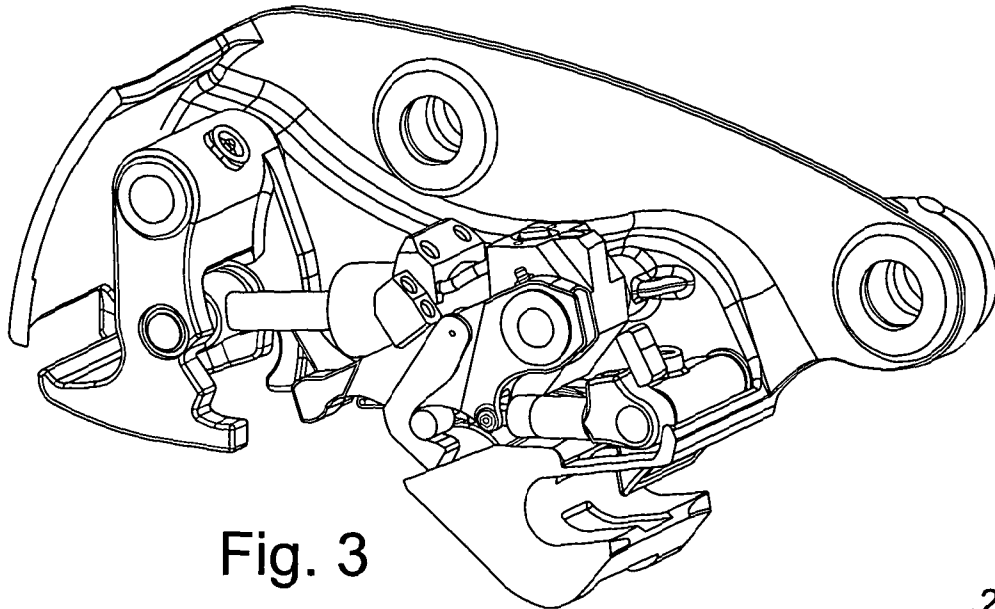


Fig. 3

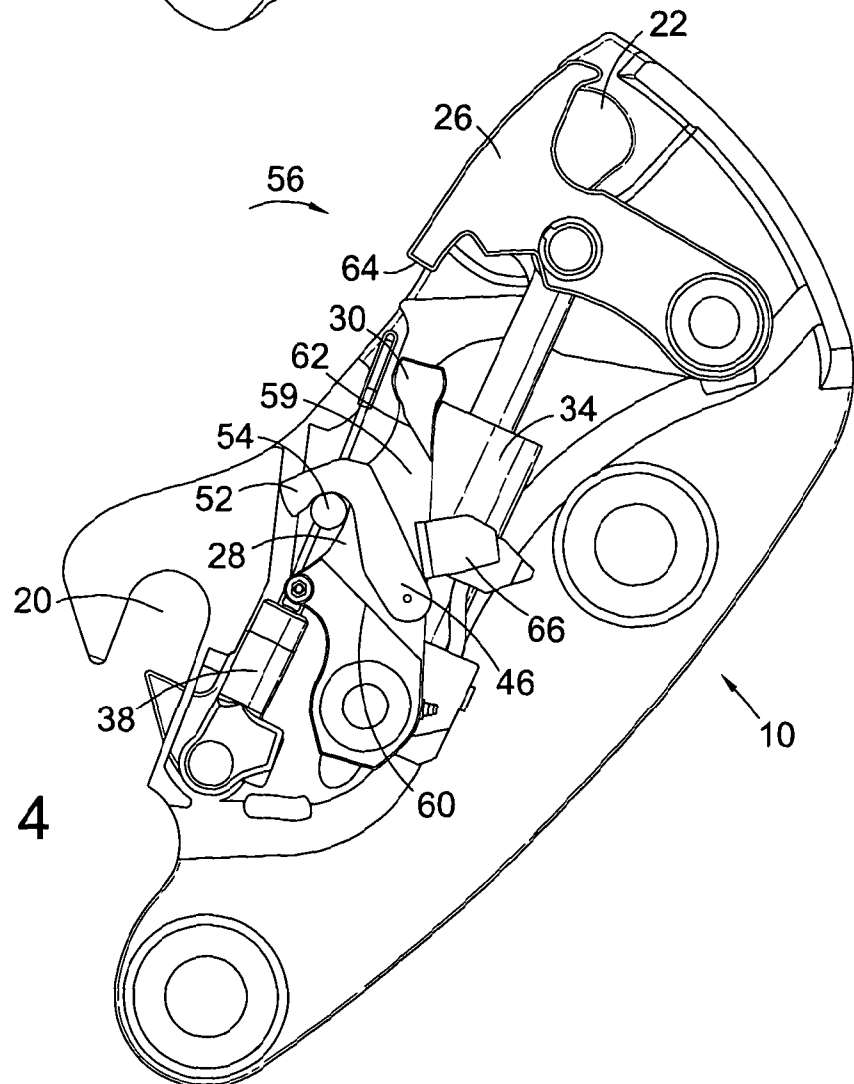


Fig. 4

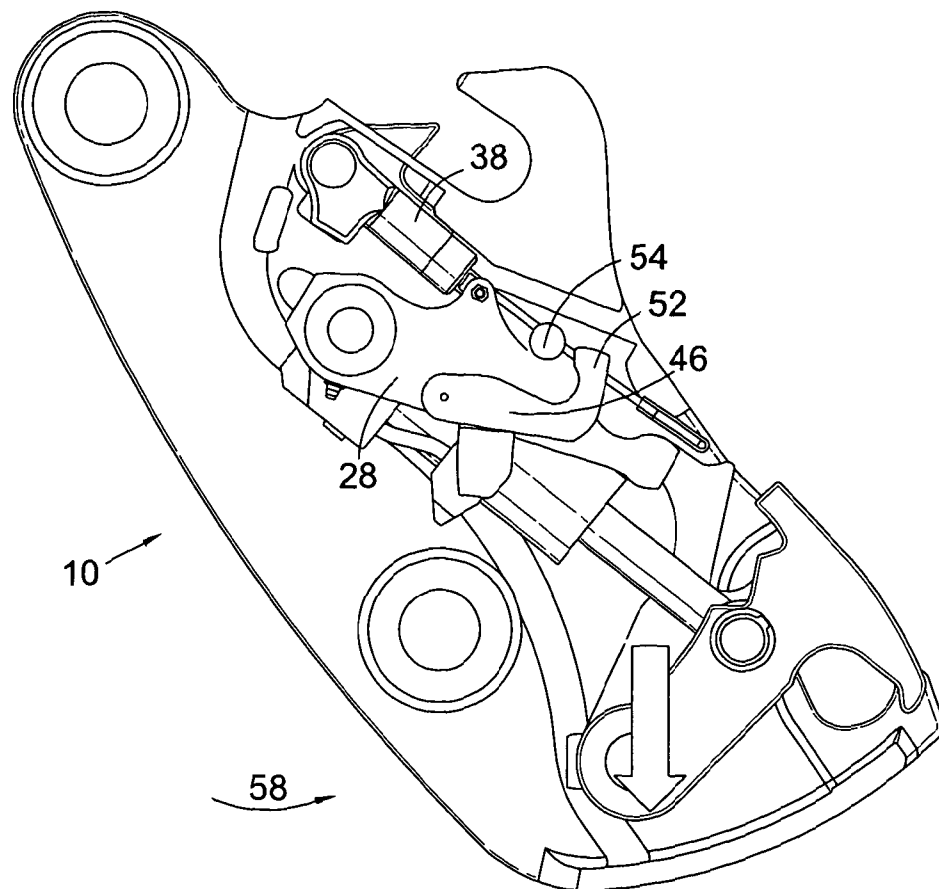


Fig. 5

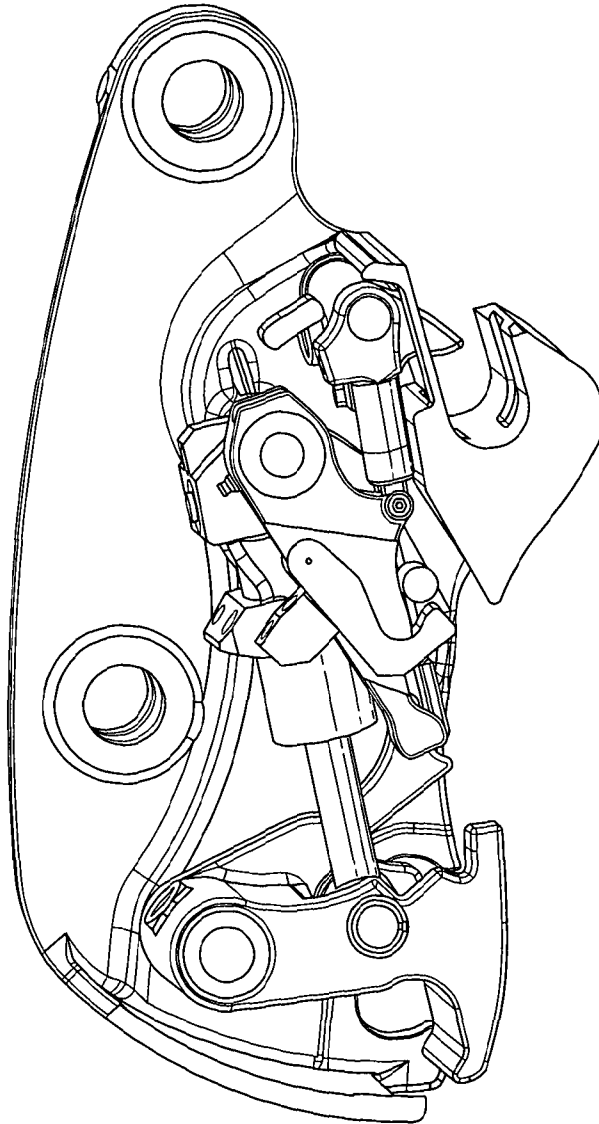


Fig. 6

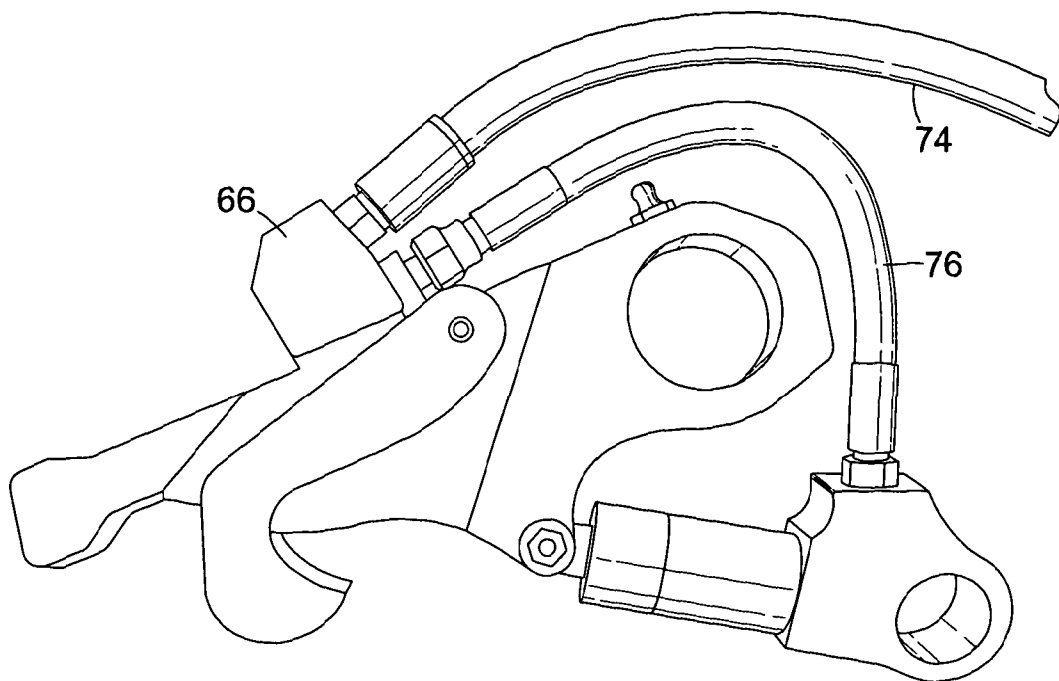


Fig. 7

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2011/001141

A. CLASSIFICATION OF SUBJECT MATTER
INV. E02F3/36
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
E02F A01B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2 330 570 A (MILLER RONALD KEITH [GB]; MILLER GARY [GB]; MILLER DOREEN JACQUELINE []) 28 April 1999 (1999-04-28) cited in the application	1-18, 21-23
Y A	page 8, line 4 - page 9, line 4; figures 6,7 last paragraph; figure 13 -----	10,11 24-28
X	GB 2 463 298 A (MILLER UK LTD [GB]) 10 March 2010 (2010-03-10)	1-9, 12-18, 21-23
Y A	page 17, line 4 - line 26; figure 4 ----- -/--	10,11 24-28



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

18 October 2011

Date of mailing of the international search report

28/10/2011

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB2011/001141

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claims Nos.: 19, 20, 29-31
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
see FURTHER INFORMATION sheet PCT/ISA/210
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of Item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No

PCT/GB2011/001141

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2 450 127 A (MILLER UK LTD [GB]) 17 December 2008 (2008-12-17) cited in the application	1-9, 12-18, 21-23
Y	page 12, line 29 - page 13, line 10;	10,11
A	figures 4,5	24-28
A	----- WO 2005/026454 A1 (MCCORMICK PATRICK [IE]; MCCORMICK CAROLINE [IE]; SEGARTY MARTIN [IE];) 24 March 2005 (2005-03-24) page 5, line 30 - page 7, line 9; figures 5-8	1-18, 21-28
A	----- WO 2008/031590 A2 (HILL IAN [GB]) 20 March 2008 (2008-03-20) page 7, line 30 - page 8, line 30; figures 1-4	1-18, 20-28

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2011/001141

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		EP 2076631 A2 08-07-2009	
		US 2010067982 A1 18-03-2010	

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.2

Claims Nos.: 19, 20, 29-31

Claims 19, 20 are not clearly defined. They result in parallel dependencies, whereby the term "...in accordance with claim..." is not understood. Article 6 PCT. Claims 29 to 31 relate to devices and a method defined by reference "substantially" to the description and drawings, contrary to the requirements of Rule 6.2(a) PCT. The use of this unusual reference in the present context is considered to lead to a lack of clarity because the claim does not clearly identify the devices encompassed by it. This makes it impossible to compare the claim to the prior art. As a result, the application further does not comply with the requirement of clarity under Article 6 PCT.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.2), should the problems which led to the Article 17(2) declaration be overcome.