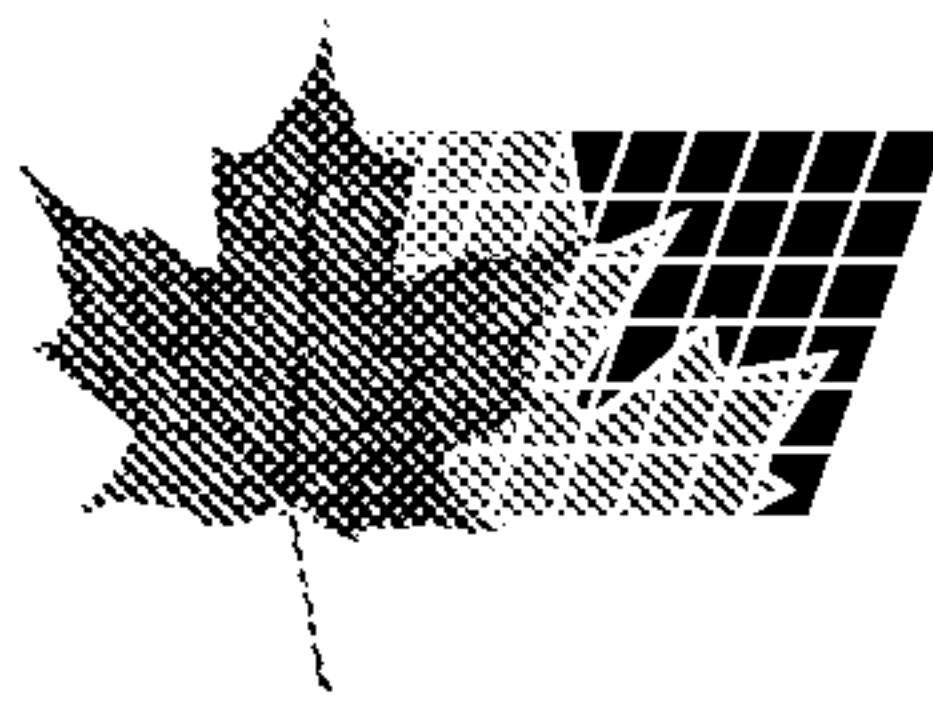




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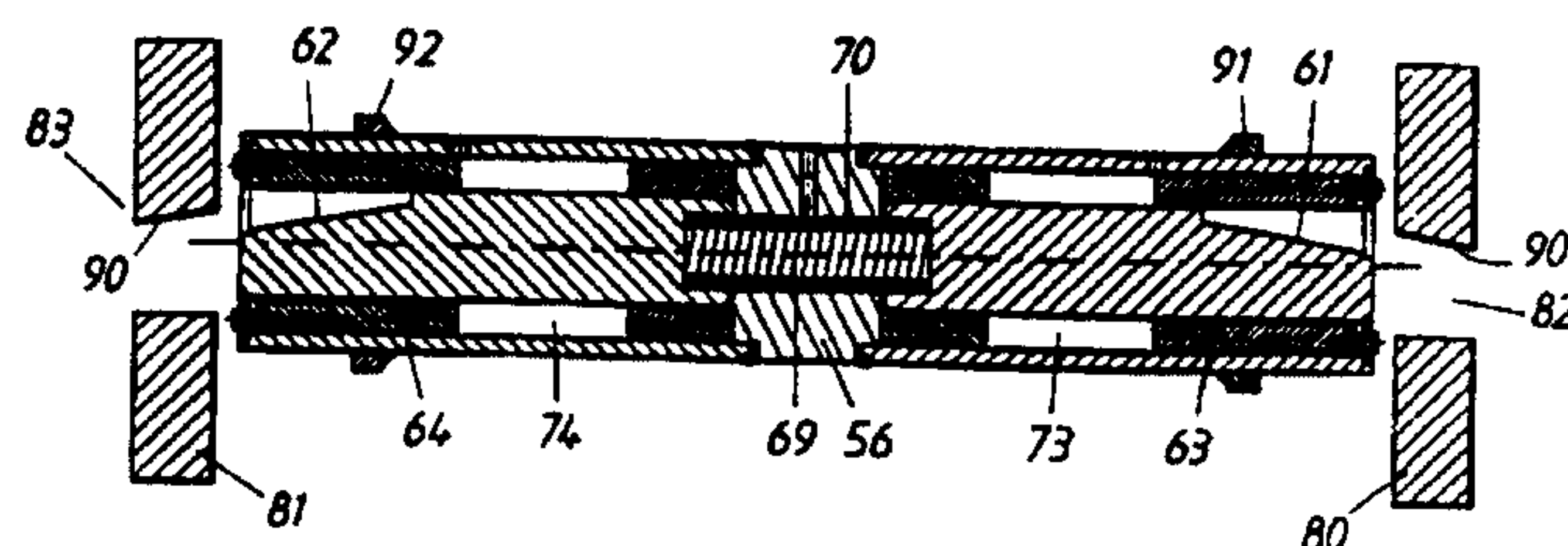
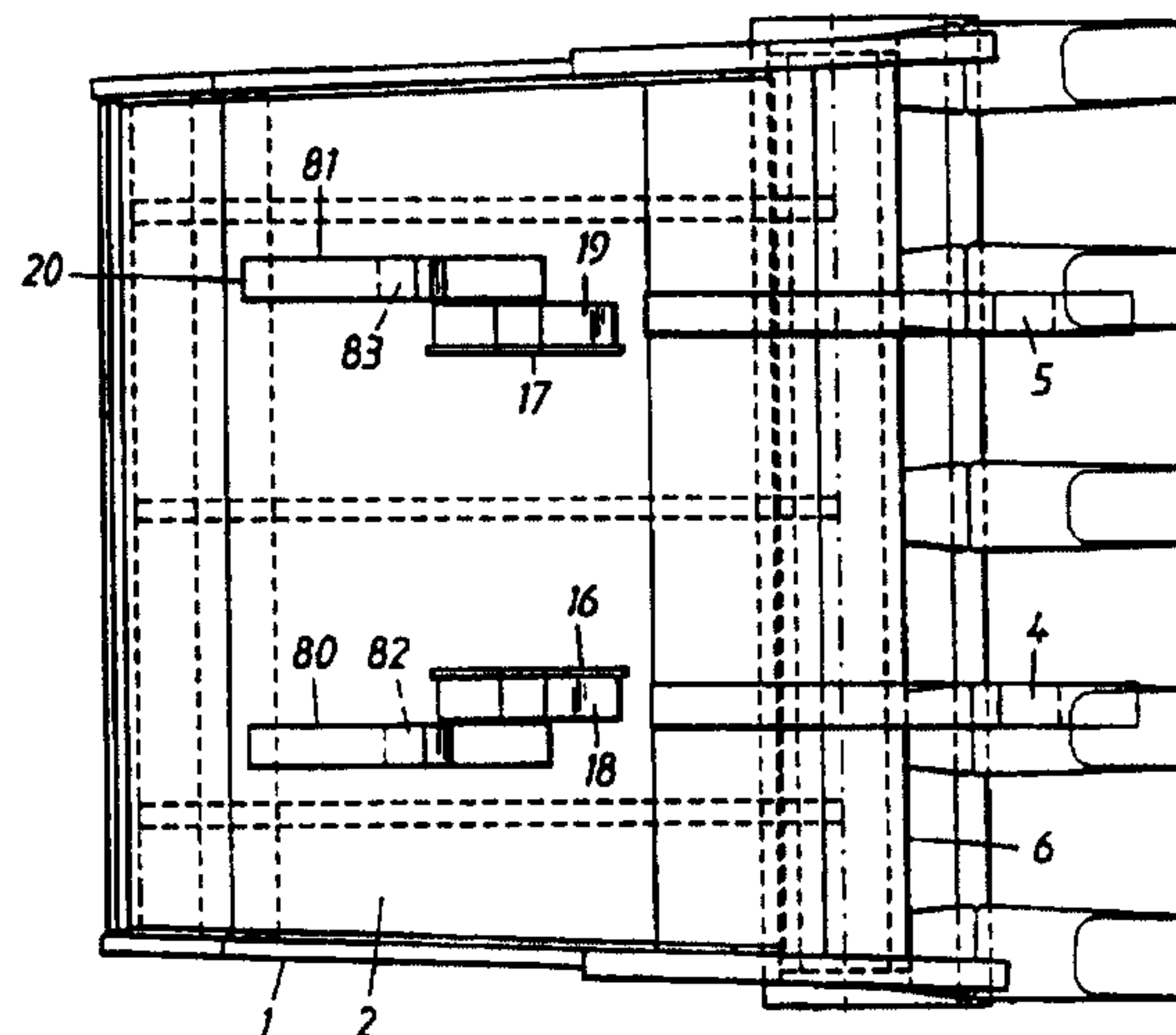
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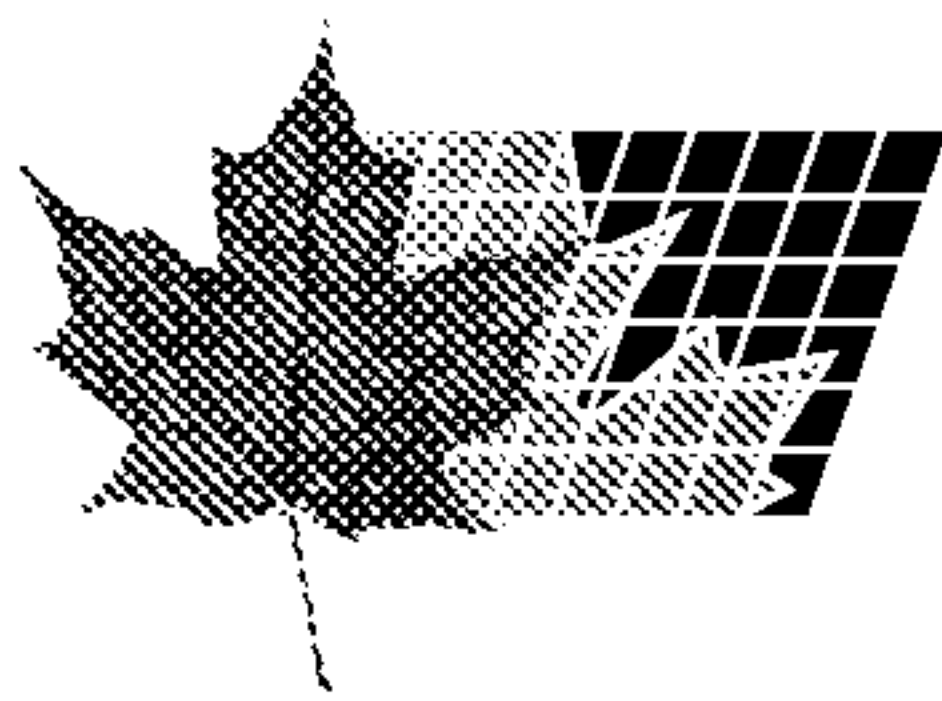
(54) **DISPOSITIF DE COUPLAGE AMOVIBLE D'UN OUTIL AU
BRAS DE COMMANDE D'UNE EXCAVATRICE**

(54) **DEVICE FOR DETACHABLE COUPLING OF AN IMPLEMENT
TO THE OPERATING ARM OF AN EXCAVATOR**



(57) L'invention concerne un dispositif permettant de fixer un outil (1) au bras de commande d'une excavatrice. Ce dispositif comprend une fixation (25) qui est destinée au bras de commande et est dotée d'un organe de verrouillage (50) possédant un vérin

(57) A device for the coupling of an implement (1) to the operating arm of an excavator, comprising an operating arm attachment (25) and a locking member (50) with a hydraulic cylinder (51) and a control unit (41) for supplying the cylinder with an operating pressure, the



hydraulique (51) et une unité de commande (41) permettant d'alimenter le vérin en pression de travail. Le vérin possède des pistons doubles (57, 58) avec des tiges (52, 53) formant des coins de serrage. La zone de pression du piston est supérieure sur le côté plus destiné au verrouillage que sur le côté moins destiné à l'ouverture. Ce dispositif comprend également une fixation d'outil dotée d'organes de couplage (4, 5) et d'éléments de verrouillage (84, 85) à l'aide desquels la fixation d'outil est attachée à la fixation du bras de commande avec la coopération de l'organe de verrouillage. La fixation du bras de commande possède deux liaisons (26, 27) dotées d'une contre-bouterolle (39) destinée à coopérer avec les contre-bouterolles (16, 17) de la fixation d'outil. L'organe de verrouillage exerce ainsi une pression sur les liaisons pour les plaquer contre l'organe de couplage. Selon l'invention, le vérin est monté amovible dans les ouvertures (93, 94) des liaisons, et les éléments d'arrêt sont placés sur le vérin et une liaison pour empêcher la rotation du vérin. En outre, l'unité de commande met en pression les chambres (71, 72) sur les côtés plus même pendant le verrouillage et les chambres (73, 74) sur les côtés moins, même lorsque les coins de serrage sont amenés de la position d'ouverture en position de verrouillage, les coins de serrage prenant alors la position de verrouillage. Un clapet de non-retour (45) est placé dans la connexion de verrouillage entre l'unité de commande et les chambres (71, 72) sur les côtés plus, ce clapet pouvant être ouvert pour vider lesdites chambres par la pression de travail.

cylinder having double pistons (57, 58) with piston rods (52, 53) forming locking wedges, wherein the pressure area of the piston is greater on the plus side for locking than on the minus side for opening, said device also comprising an implement attachment with coupling members (4, 5) and locking elements (80, 81) by means of which the implement attachment is coupled to the operation-arm attachment under the influence of the locking member, which operating-arm attachment is provided with two links (26, 27) having counter-supports (39) for cooperation with counter-supports (16, 17) on the implement attachment, the locking member thus exerting pressure on the links in order to press them against the coupling member. According to the invention the cylinder is loosely mounted in openings (93, 94) in the links and stop members are arranged on the cylinder and a link to prevent rotation of the cylinder. Furthermore the control unit also pressurizes the chambers (71, 72) on said plus sides even during locking. The control unit pressurizes the chambers (73, 74) on said minus sides even when the locking wedges are moved from opening to locking position and when the locking wedges assume locking positions. A non-return valve (45) is arranged in the locking connection between the control unit and the chambers (71, 72) on said plus sides, this valve being openable to the emptying of the latter chambers by means of the operating pressure.

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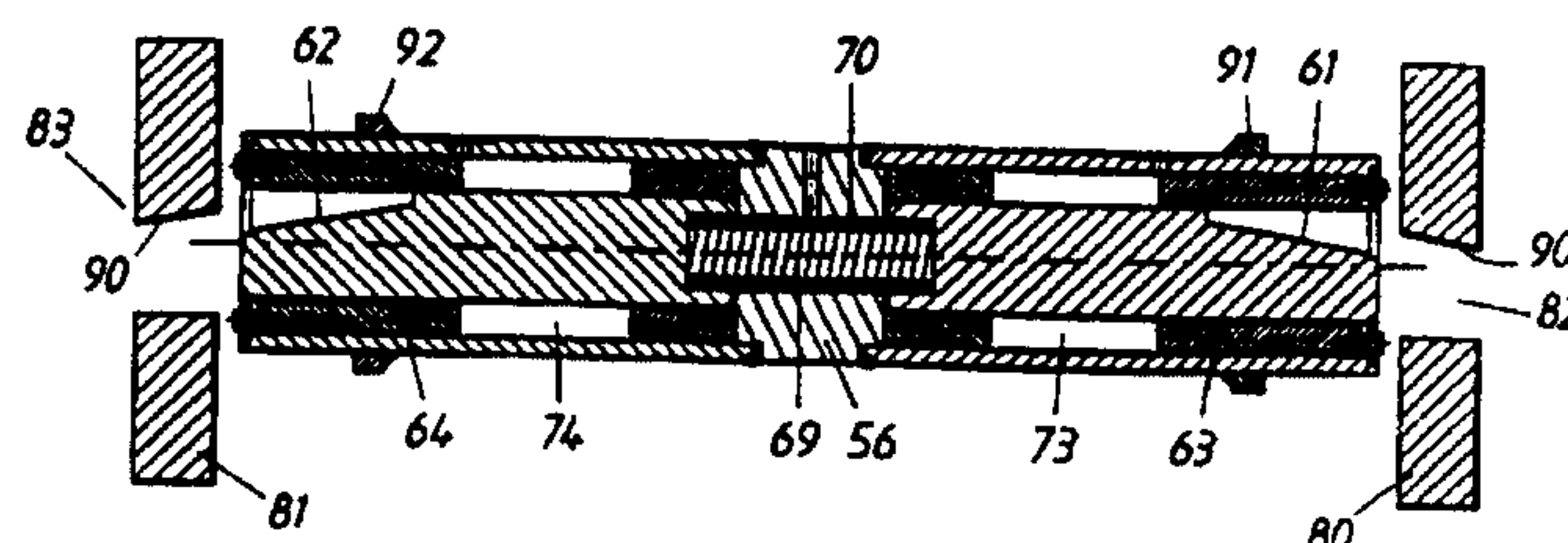
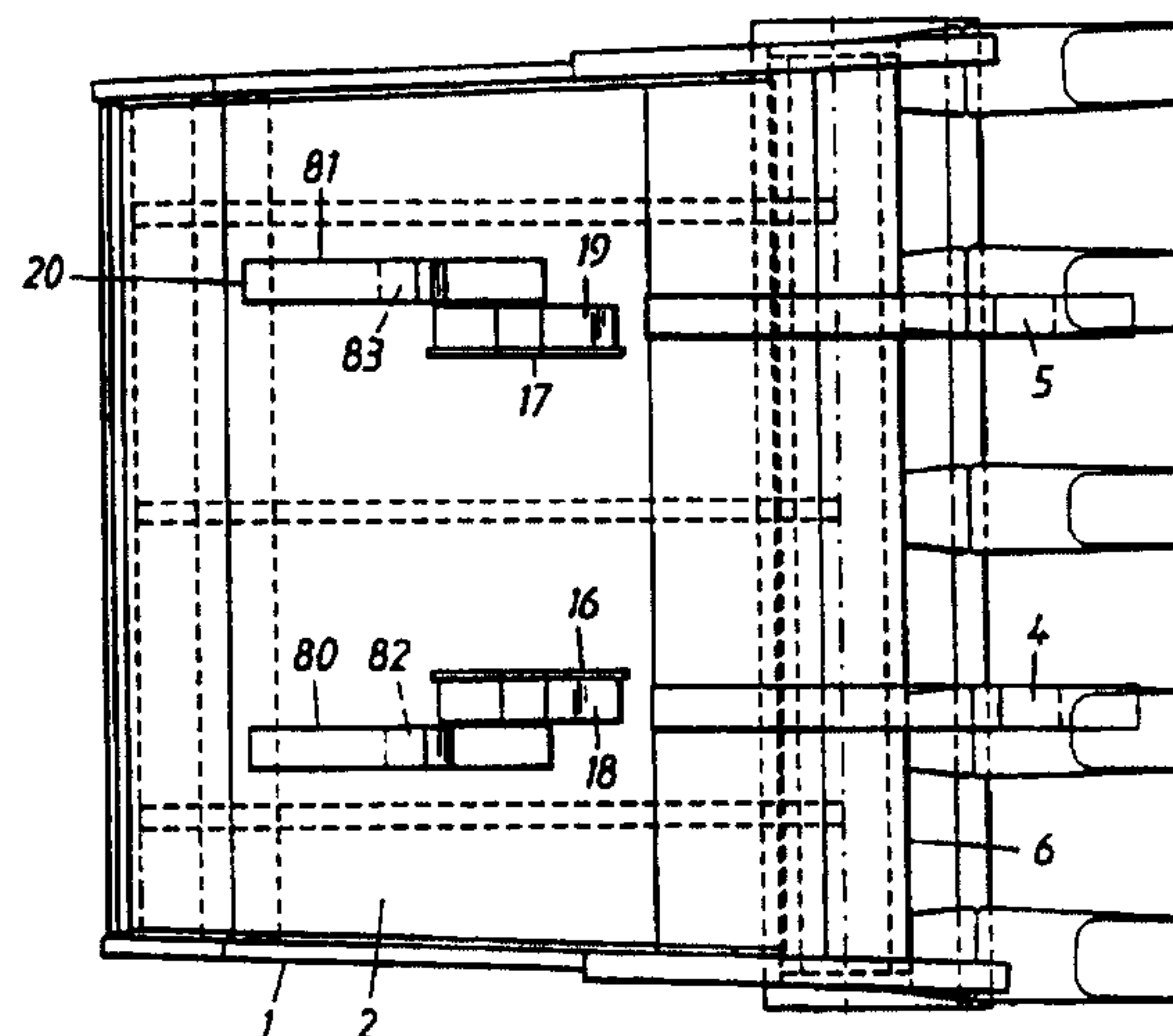
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(54) Title: DEVICE FOR DETACHABLE COUPLING OF AN IMPLEMENT TO THE OPERATING ARM OF AN EXCAVATOR

(57) Abstract

A device for the coupling of an implement (1) to the operating arm of an excavator, comprising an operating arm attachment (25) and a locking member (50) with a hydraulic cylinder (51) and a control unit (41) for supplying the cylinder with an operating pressure, the cylinder having double pistons (57, 58) with piston rods (52, 53) forming locking wedges, wherein the pressure area of the piston is greater on the plus side for locking than on the minus side for opening, said device also comprising an implement attachment with coupling members (4, 5) and locking elements (80, 81) by means of which the implement attachment is coupled to the operation-arm attachment under the influence of the locking member, which operating-arm attachment is provided with two links (26, 27) having counter-supports (39) for cooperation with counter-supports (16, 17) on the implement attachment, the locking member thus exerting pressure on the links in order to press them against the coupling member. According to the invention the cylinder is loosely mounted in openings (93, 94) in the links and stop members are arranged on the cylinder and a link to prevent rotation of the cylinder. Furthermore the control unit also pressurizes the chambers (71, 72) on said plus sides even during locking. The control unit pressurizes the chambers (73, 74) on said minus sides even when the locking wedges are moved from opening to locking position and when the locking wedges assume locking positions. A non-return valve (45) is arranged in the locking connection between the control unit and the chambers (71, 72) on said plus sides, this valve being openable to the emptying of the latter chambers by means of the operating pressure.



Device for detachable coupling of an implement to the
operating arm of an excavator

The present invention relates to a device for detachable
5 coupling of an implement and the operating arm of an
excavator together, said implement having an upper side
with a forward edge facing the operating arm, said device
comprising an attachment member which is supported by the
stick and operating cylinder of the operating arm and
10 comprises a shaft journalled horizontally at the stick, a
shaft journalled horizontally at the operating cylinder,
said shafts being parallel to and arranged at a
predetermined distance from each other, and a hydraulic
locking member comprising a hydraulic cylinder and a
15 control unit for supplying the hydraulic cylinder with a
predetermined operating pressure via a locking connection
and an opening connection, which hydraulic cylinder has
double pistons with piston rods facing away from each
other which can be inserted and withdrawn to opening and
20 locking position, the free outer end parts of said piston
rods having a surface sloping outwardly to form locking
wedges, each of the pistons defining a rear pressure
chamber that forms the plus side of the piston, and a
forward pressure chamber that forms the minus side of the
25 piston, wherein the pressure area of the piston is
greater on the plus side than on the minus side, said
device also comprising an attachment member supported by
the implement and comprising a coupling member and
locking element, by means of which coupling member and
30 locking element the implement attachment member is
arranged to be detachably coupled to the attachment
member of the operating arm under the influence of said
hydraulic locking member, the implement thus being
pivotal about the shaft of the stick by means of said
35 operating cylinder, the attachment member of said
operating arm comprising two link arms having a
counter-support facing the implement and arranged below

the shaft of the operating cylinder, which implement
attachment member comprises two counter-supports arranged
to cooperate with the counter-support of the link arms,
which locking member is arranged to exert a pressure on
5 the link arms in order to press these directly against
the coupling member thereby achieving intimate contact
between opposing support surfaces.

A device, known as a quick-coupling, with hydraulic
10 locking members of the type described above is known
through EP-0 139 652, see Figure 8. The known device
lacks satisfactory locking if a fault should occur in the
hydraulic system and its locking wedges are unprotected
and may therefore be damaged in inoperative positions.
15 This may result in poorer locking function which in turn
may deteriorate the influence of the link arms on the
coupling member so that contact between the support
surfaces of said counter-supports is insufficient and
play occurs between them. Neither is the known locking
20 member easy to install. SE-B-454 192 shows a similar
quick-coupling but this lacks a hydraulic locking member.

EP-0 448 788 describes a quick-coupling with a hydraulic
locking member but lacks the two attachment members which
25 are significant for the quick-coupling described in
EP-0 139 652 and according to the present invention with
cooperating counter-supports, and also lacks a locking
member with locking wedges to transfer compressive force
at said counter-supports and eliminate play at their
30 contact surfaces. No auto-adjustment of the locking
positions of the locking pistons can therefore be
obtained with the known locking member since wear appears
gradually on the movable surfaces. It will be understood
that the problem of play at opposing movable surfaces
35 increases with increased wear.

The object of the present invention is to eliminate the problems discussed above and provide an improved device of the type described in the introduction, with a hydraulic locking member that ensures locking even if a
5 fault should arise in the hydraulic system, where the locking wedges are protected from external influence in inoperating positions, which is easy to install, and which is self-adjusting upon wear in the contact surfaces so that play is eliminated and efficient locking and
10 coupling functions are ensured even after extended use.

The coupling device according to the invention is characterized in that

- by means of its end parts facing away from each other,
15 the hydraulic cylinder is loosely mounted in corresponding, opposing openings in the link arms to form loose connections without locking engagement preventing axial movement of the hydraulic cylinder,
- cooperating stop members are arranged on the hydraulic
20 cylinder and at least one link arm to prevent rotation of the hydraulic cylinder in said openings,
- the control unit is arranged to continuously supply the pressure chambers on the plus sides of the pistons with said predetermined operating pressure even when the
25 locking wedges assume their withdrawn locking positions,
- the control unit is arranged to supply the pressure chambers on the minus sides of the pistons with said predetermined operating pressure even when the locking
30 wedges are moved from opening position to locking position and when the locking wedges assume their locking positions to achieve a controlled, reduced locking action of the locking wedges corresponding to the area difference on the plus and minus sides of the pistons, and
- 35 - a pilot-controlled non-return valve is arranged in the locking connection between the control unit and the pressure chambers on the plus sides of the pistons, the

non-return valve being openable to permit emptying of the pressure chambers on the plus sides of the pistons through the influence of said predetermined operating pressure, the non-return valve being connected via a
5 branch connection to said opening connection for supplying said predetermined operating pressure when the locking connection is disconnected.

10 The invention will be described in more detail in the following, with reference to the drawings.

Figure 1 shows schematically a bucket from above.

15 Figure 2 shows a coupling device from the side.

Figure 3 shows from above the operating-arm attachment member of the coupling device according to Figure 2.

20 Figure 4 shows in section a first embodiment of the hydraulic locking member of the coupling device according to Figure 2 in operative, locking state.

25 Figure 5 shows the locking member according to Figure 4 in inoperative, opened state.

Figure 6 is a circuit diagram for the locking member according to Figure 4 and its control unit.

30 Figure 7 shows a section through a second embodiment of the hydraulic locking member according to the invention.

Figure 8 shows an end view of the locking member according to Figure 7.

35 Figure 9 shows a section through a third embodiment of the hydraulic locking member according to the invention, with its control unit set to open the locking member.

Figure 10 shows the locking member and control unit in operative locking state.

- 5 The drawings show the bucket 1 of an excavator which is provided on its upper side 2 facing away from the digging edge, with an attachment member 20 to a quick-coupling. This bucket attachment member 20 comprises a coupling member in the form of two inwardly facing hooks 4, 5,
10 spaced from each other, which are welded to the upper side 2 at the forward edge 6 of the opening of the bucket 1. The inwardly facing hooks are provided with functional support surfaces 9, concave or semi-cylindrical in shape, with predetermined radii to achieve intimate cooperation
15 with corresponding support surfaces on an attachment member 25 supported by the operating arm of the excavator, as will be described below. The two support surfaces 9 are aligned with each other and perpendicular to the plane of symmetry of the bucket.
- 20 The bucket attachment member 20 comprises two locking elements 80, 81 provided with openings 82, 83 aligned with each other and having inclined support surfaces 90 which slope downwardly-outwardly. The bucket attachment
25 member 20 also comprises two heel-shaped counter-supports 16, 17 welded to the upper side 2 and arranged between the locking elements and hooks 4, 5, in the vicinity of the former. Each counter-support 16, 17 is provided with a flat, functional support surface 18, 19, these support
30 surfaces lying in the same plane and inclining inwardly towards the hooks 4, 5 for cooperation with corresponding support surfaces 40 on the operating-arm attachment member 25, as will be explained below.
- 35 The operating arm of the excavator comprises a stick (not shown) and a hydraulic operating cylinder (not shown) arranged on its front side (facing away from the

excavator). The stick supports a horizontal shaft 23 at its free end, the shaft pivotably supporting the bucket 1 and thus forming the centre of pivoting of the bucket, while said hydraulic cylinder directly or indirectly via
5 links, supports a horizontally arranged shaft 24 lying parallel with the shaft 23 of the stick and thus situated in front of this and indirectly joined to the bucket 1 to obtain a controlled swinging movement of the bucket about the centre of the shaft 23.

10

Said shafts 23, 24 form parts of said attachment member 25 of the operating arm. The operating-arm attachment member 25 also comprises two parallel link arms 26, 27, each of which has a locking end part 86 and a coupling
15 end part 87. At its locking end part 86, at a predetermined distance from the coupling end part 87, each link arm is provided with a cylindrical sleeve with a horizontal aperture to receive the shaft 24 and a lever-like press part 36 that protrudes into the rearward
20 extension of the link arms.

Furthermore, each link arm 26, 27 is provided at its locking end part 86 with a counter-support 39, shaped with said functional, flat support surface 40, arranged
25 to abut said functional support surface 18, 19 of the counter-supports 16, 17 of the bucket attachment member with a wedge-producing action. Said functional support surfaces 18, 19 and 40 incline towards the hooks 4, 5 and have the same inclination. The support surfaces 18, 19
30 and 40 of the counter-supports preferably slope so that their extended planes form an acute angle of from 20° to 65°, preferably about 40°, with a centre plane extending through the centre of the shafts 23, 24. The counter-support 39 is arranged immediately below said
35 sleeves.

Each link arm 26, 27 is also provided or constructed at its coupling end part 87 with a shaft carrying sleeve 88 having a horizontal aperture for receipt of the shaft 23. The sleeve 88 is cylindrical and provided externally with
5 a functional, semi-cylindrical support surface 89 extending transversely or axially (in relation to the shaft 23), and having a predetermined radius corresponding to the radius of the semi-circular support surfaces 9 on the hooks 4, 5, so that maximum contact is
10 achieved between these support surfaces. The support surfaces 9 of the hooks encompass a sector angle within the interval 45° - 180° .

The attachment member 25 of the operating arm comprises a
15 locking member 50 in the form of a cassette or ancillary device that enables simple and quick mounting in both new and existing quick-couplings. The locking member 50 comprises a hydraulic cylinder 51 containing two coaxial piston rods 52, 53 arranged in one part each of the
20 hydraulic cylinder to press the parts out and in via their opposite ends from an inner, pressed-in, inoperative position protected from external influence to an outer, operative position pressed out of the respective parts. The hydraulic cylinder 51 may be
25 constructed as a single pipe. However, for ease of manufacture it is constructed of two identical cylindrical pipe sections 54, 55, the facing ends of which are welded to a central body 56 as shown in Figures 4 and 7 (omitted in Figure 6). Each piston rod 52, 53 is
30 provided at its inner end part with a piston 57, 58 and has an outer end part shaped to function as a locking wedge 59, 60. The locking wedge has a flat surface 61 inclining outwardly towards the centre plane of the piston rod. The most preferred inclination is 10° . The
35 piston rod runs in a sealed guide 63, 64 situated in the pipe sections 54, 55 to sealingly close this, and is retained in the pipe section by means of an end lid

65, 66 screwed firmly on. The inner end part of the piston rods 52, 53 is provided with a coaxial cylindrical recess 67, 68 to receive the end of a compression spring 69. In the embodiment shown in Figures 2-5 a single
5 spring 69 is used which is tensioned between the two piston rods 52, 53 which thus receive one end each of the spring. The spring thus extends through a coaxial cavity 70 in the central body 56. In the embodiment shown in Figure 7 two springs 69a, 69b are used, which are
10 tensioned between the central body 56 and the piston rods 52, 53, respectively.

The compression spring 69 in the embodiment shown in Figures 3-5 is arranged to pre-stress the piston rods
15 52, 53 in their outer locking positions so that these locking positions will always be ensured in the event of faults occurring in the hydraulic system during operation. In the embodiment shown in Figure 7 the two compression springs 69a, 69b are arranged to pre-stress
20 the piston rods 52 and 53, respectively, in corresponding manner.

Each piston 57, 58 defines a first pressure chamber 71, 72 between itself and the central body 56, forming
25 the plus side for activation of the locking wedges 59, 60. Each piston defines a second pressure chamber 73, 74 between itself and the piston-rod guides 63, 64, forming the minus side for de-activation of the locking wedges 59, 60. As can be seen in Figures 4 and 5, for
30 instance, the pressure area is considerably larger on the plus side than on the minus side.

In the described embodiment of the quick-coupling the compressive force is transferred from the locking wedges
35 59, 60 to the hooks 4, 5 via the counter-supports 39, the link arms 26, 27 and their sleeves 88, which press directly against the hooks 4, 5 and the shaft 23 is

therefore not affected by this compressive load. At the stresses arising due to movement of the bucket with the aid of the operating arm, therefore, compressive forces appear on the exterior 89 of the sleeves 88, i.e. the support surfaces towards or away from the support surfaces 9 of the hooks, and on the interior of the sleeves towards or away from the shaft 23. The joint is completely rigid at the support surfaces 9 of the hooks 4, 5.

10

The locking member 50 comprises a control unit 41 which includes a valve block located at a suitable point on the excavator and coupled to the hydraulic system of the excavator. The hydraulic system may have a servo-pressure source or a system pressure source. The servo-pressure source is low-pressure acting, e.g. 50 bar, and can therefore be used without reduction, whereas the system pressure source is high-pressure acting and requires pressure reduction upon connection to the hydraulic cylinder. The control units shown in Figures 6 and 9, 10 can be connected to either type of pressure source. The control units shown have a gate P for connection to the system pressure source if the excavator lacks a servo-pressure system, and a gate Ps for connection to the servo-pressure system if the excavator is provided with a servo-pressure system.

25

A gate T is provided for connection to a drainage tank when the locking member is to be detached from the work implement. The control unit 41 also has a gate A for connection to the two pressure chambers 71, 72 of the hydraulic cylinder on the plus side of the pistons 57, 58 via a hose 77 and a T-shaped connection 42 in the intermediate piece 56, which connection 42 is formed by a radial channel 75 and an axial channel 76. The control unit 41 is also provided with a gate B for connection to the two pressure chambers 73, 74 of the hydraulic

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cylinders on the minus side of the pistons 57, 58 via a hose 78 and two branch connections 43, 44, which branch connections are suitably surrounded by a casing or other protective element to prevent them being damaged. In the flow path formed by the hose 77 and the T-shaped connection 42 is a pilot-controlled non-return valve 45 which is also connected via a connection 46 to the flow path formed by the hose 78 and one of the branch connections 43, 44. The control unit 41 comprises a pressure-reducing valve 98 arranged in the valve block, which can be pre-set at a desired lower pressure, e.g. 50 bar, and a directional valve 97. A channel 47 connects gate P to gate B, in which channel 47 the pressure-reducing valve 98 is arranged in order to emit a simulated servo-pressure upon locking and opening of the hydraulic locking member 50 when the excavator is not equipped with a servo-pressure system. The pressure-reducing valve 98 thus reduces the incoming system pressure at gate P to the pre-set value and the remaining oil is thus diverted to the drainage tank via a drainage channel 48 and gate T. The directional valve 97 is connected to gate A via a channel 49 and with gate T via a drainage channel 28, to which the drainage channel 48 of the pressure-reducing valve 98 is connected. The directional valve 97 is also connected to gate P via a channel 31 which is connected to channel 47 at a point downstream of the pressure-reducing valve 98. A channel 32 from gate Ps is also connected at the same point, which channel 32 is provided with a non-return valve 33. The directional valve 97 has a first closable passage 29 and a second closable passage 30. In non-activated state of the directional valve 97 its first passage 29 opens a flow path between gate P and gate A in order to set the locking member 50 in locking function, and this flow path is maintained continuously so that the locking member 50 producing a wedge action becomes self-adjusting when wear occurs on the wedge surfaces and other contact surfaces

of the two attachment members 20, 25. In activated state of the directional valve 97 its other passage 30 opens a flow path between gate A and gate T in order to set the locking member 50 in opening function by allowing oil to
5 flow from the pressure chambers 71, 72 along this flow path via the T-shaped connection 42 and hose 77, whereupon the pilot-controlled non-return valve 45 is opened for drainage purposes of the pressure exerted on it via the connection 46 still communicating with gate P.

10

On the outer side of each end part of the hydraulic cylinder 51 a support ring 91, 92 is arranged at a predetermined distance from the outer end of each end part. The hydraulic cylinder 51 is mounted at the two
15 link arms 26, 27 which are provided with opposing cylindrical openings 93, 94 in which the cylindrical pipe sections 54, 55 are received in a loose connection, i.e. without mechanically fixed connection between the actual link arms 26, 27 and the actual pipe sections 54, 55, in
20 order to avoid built-in stresses in the operating-arm attachment member 25. No welding or screwing is performed, therefore, and the connection is quite loose and thus not rigid. The distance between the two support rings 91, 92 thus corresponds to the distance between the
25 link arms 26, 27 which are to abut against the support rings 91, 92.

As can be seen more clearly in Figure 8, one support ring 91 is provided with a radial extension 95 with a slot 96
30 to receive a holding element (not shown), provided or applied on the inner side of the opposing link arm 26. Such stop members, i.e. at the position of the holder element in the slot 96, prevent the hydraulic cylinder 51 from turning, thereby ensuring that the positions in
35 circumferential direction of the locking surfaces 61, 62 of the locking wedges 59, 60 are always maintained.

Said openings 82, 83 in the locking elements 80, 81 of the bucket attachment member 20 have wedge-forming surfaces 90 with the same inclination as the wedge surfaces 61, 62 on the piston rod. The wedge-forming surface is situated at the uppermost part of the opening. Upon hydraulic activation of the locking wedges 59, 60 to their protruding locking positions, their wedge surfaces 61, 62 are brought into contact with the wedge surfaces 90 of the locking elements 80, 81 so that a wedge joint is obtained, whereupon the forces thus obtained are transferred to the hooks 4, 5 via the link arms 26, 27 and the cooperating counter-supports 39, 16, 17 so that a rigid joint is obtained between the two attachment members 20, 25.

Each of the second pressure chambers 73, 74, i.e. on the minus side of the piston, are also placed under pressure when the piston rods 52, 53 are to be activated for movement to their locking positions. A retarding effect is achieved due to said difference in the areas on the plus and minus sides of the piston 57, 58, when the piston rod 52, 53 is pressed out, thereby avoiding unfavourably high locking action. In other words, a controlled locking action is achieved.

In the embodiments shown in Figures 1-7 the pilot-controlled non-return valve 45 is arranged outside the hydraulic cylinder 51, namely in the hose 77 and for reasons of safety this arrangement necessitates the arrangement of one or two compression springs 69 to pre-stress the locking wedges 59, 60 in their locking positions. In the embodiment according to Figures 9 and 10 the pilot-controlled non-return valve 45 is integrated with the hydraulic cylinder 51 and the flow path between the non-return valve 45 and pressure chambers 71, 72 is therefore well protected from external damage. The compressive spring arrangement is avoided in this case.

According to this latter embodiment the pilot-controlled non-return valve 45 is arranged in the intermediate piece 56, more specifically in the radial channel 75 of the T-shaped connection 42. The intermediate piece 56 is
5 preferably provided with a radial extension 34 extending radially outside the pipe sections 54, 55 in order to house a part of the hose 77 and also the whole connection 46 connected to a special input on the non-return valve 45 to open the latter for drainage purposes when the
10 pressure ceases in the hose 77 for the purpose of releasing the locking wedges 59, 60.

The following is a description of the function of the locking member 50 with its control unit 41 connected to a
15 system pressure source to obtain a simulated servo-pressure according to Figures 9 and 10.

Locking

When the system pressure is released through gate P, the
20 oil first passes the pressure-reducing valve 98 which reduces the system pressure to the pre-set level, e.g. 50 bar, whereupon the remaining oil is drained to a tank via gate T. The oil then passes the electrically controlled directional valve 97 which, in non-activated
25 position, is in locking function. In this position the control unit allows oil through both gate A and gate B thus pressurising the hydraulic cylinder on both sides of each piston 57, 58. A favourable retardation of the locking function is obtained due to the area ratio, and
30 the locking member 50 does not lock with full force, but only sufficiently to achieve locking action. This is a desired result in order to eliminate excessive wedge effects between locking members and work implements of this type. The pressure for this locking function is
35 constant in order to achieve a self-adjusting play-free function between cooperating contact surfaces of

implement and attachment members 20, 25, including the wedge surfaces 61, 62, 90.

Opening

- 5 When the hydraulic locking member is to be opened, gate P is pressurized and the oil passes the pressure-reducing valve 98 which reduces the system pressure to the pre-set pressure, the remaining oil being drained to a tank via gate T. The directional valve 97 is activated and the
- 10 incoming oil is conveyed through gate B and into the two minus connections of the hydraulic cylinder, and via the pilot-controlled non-return valve 45 fitted in the central body 56 of the hydraulic cylinder so that the oil in the plus chambers 71, 72 can be drained to a tank. The
- 15 oil fills the two minus chambers 73, 74 and opens the locking member 50. This produces a force in the opening function which is approximately 50% greater than when the locking member is locked.
- 20 If the machine has a functioning servo-pressure system gate P may be plugged and the pressure hose connected to the servo-gate Ps of the control unit. The same effect is then achieved in the locking member.

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C L A I M S

1. A device for detachable coupling of an implement (1) and the operating arm of an excavator together, said
5 implement (1) having an upper side (2) with a forward edge (6) facing the operating arm, said device comprising an attachment member (25) which is supported by the stick and operating cylinder of the operating arm and comprises a shaft (23) journaled horizontally at the stick, a
10 shaft (24) journaled horizontally at the operating cylinder, said shafts (23, 24) being parallel to and arranged at a predetermined distance from each other, and a hydraulic locking member (50) comprising a hydraulic cylinder (51) and a control unit (41) for supplying the
15 hydraulic cylinder with a predetermined operating pressure via a locking connection (42, 77) and an opening connection (43, 44, 78), which hydraulic cylinder has double pistons (57, 58) with piston rods (52, 53) facing away from each other which can be inserted and withdrawn
20 to opening and locking position, the free outer end parts of said piston rods having a surface sloping outwardly to form locking wedges (59, 60), each of the pistons (57, 58) defining a rear pressure chamber (71, 72) that forms the plus side of the piston, and a forward pressure
25 chamber (73, 74) that forms the minus side of the piston, wherein the pressure area of the piston is greater on the plus side than on the minus side, said device also comprising an attachment member (20) supported by the implement (1) and comprising a coupling member (4, 5) and
30 locking element (80, 81) by means of which coupling members (4, 5) and locking elements (80, 81) the attachment member (20) is arranged to be detachably coupled to the attachment member (25) of the operating arm under the influence of said hydraulic locking member
35 (50), the implement (1) thus being pivotable about the shaft (23) of the stick by means of said operating cylinder, the attachment member (25) of said operating

arm comprising two link arms (26, 27) having a counter-support (39) facing the implement and arranged below the shaft (24) of the operating cylinder, which implement attachment member (20) comprises two

5 counter-supports (16, 17) arranged to cooperate with the counter-support (39) of the link arms, which locking member (50) is arranged to exert a pressure on the link arms (26, 27) in order to press these directly against the coupling member (4, 5) thereby achieving intimate

10 contact between opposing support surfaces (9, 89), characterized in that

- by means of its end parts facing away from each other, the hydraulic cylinder (51) is loosely mounted in corresponding, opposing openings (93, 94) in the link

15 arms (26, 27) to form loose connections without locking engagement preventing axial movement of the hydraulic cylinder,

- cooperating stop members are arranged on the hydraulic cylinder (51) and at least one link arm (26) to prevent

20 rotation of the hydraulic cylinder (51) in said openings,

- the control unit (41) is arranged to continuously supply the pressure chambers (71, 72) on the plus sides of the pistons (57, 58) with said predetermined operating pressure even when the locking wedges (59, 60) assume

25 their withdrawn locking positions,

- the control unit (41) is arranged to supply the pressure chambers (73, 74) on the minus sides of the pistons (57, 58) with said predetermined operating pressure even when the locking wedges (59, 60) are moved

30 from opening position to locking position and when the locking wedges (59, 60) assume their locking positions to achieve a controlled, reduced locking action of the locking wedges (59, 60) corresponding to the area difference on the plus and minus sides of the pistons

35 (57, 58), and

- that a pilot-controlled non-return valve (45) is arranged in the locking connection between the control

unit (41) and the pressure chambers (71, 72) on the plus sides of the pistons (57, 58), the non-return valve (45) being openable to permit emptying of the pressure chambers (71, 72) on the plus sides of the pistons (57, 58) through the influence of said predetermined operating pressure, the non-return valve (45) being connected via a branch connection (46) to said opening connection for supplying said predetermined operating pressure when the locking connection is disconnected.

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2. A device as claimed in claim 1, characterized in that the pressure chambers (73, 74) on the minus sides of the pistons (57, 58) are also arranged to be placed under pressure upon activation of the piston rods (52, 53) for displacement to locking positions, said difference in pressure areas on the plus and minus sides of the pistons (57, 58) resulting in a retarding effect when the piston rods are pressed out, thereby achieving a controlled locking action.

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3. A device as claimed in claim 1 or claim 2, characterized in that supports (91, 92) are arranged at equal distance from the ends of the hydraulic cylinder, which supports (91, 92) have support surfaces to cooperate with the link arms (26, 27), the distance between the support surfaces corresponding to the distance between the link arms (26, 27), and in that the distance between each end of the hydraulic cylinder and the adjacent support (91, 92) is equal to or substantially equal to the thickness of the link arms (26, 27).

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4. A device as claimed in any one of claims 1-3, characterized in that the inclination of the cooperating support surfaces (90) of the locking elements (80, 81) and the surfaces (61, 62) of the locking wedges (59, 60)

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is 9-11°, preferably 10°, in order to achieve a controlled wedge action without auto-locking.

5. A device as claimed in any one of claims 1-4,
5 characterized in that a transverse central body (56) forming a wall is arranged in the hydraulic cylinder (51) and is provided with a T-connection included in said locking connection and having a radial channel (75) and an axial channel (76) connecting the two pressure
10 chambers (71, 72) on the plus sides of the pistons (57, 58), and in that said non-return valve (45) is arranged in said radial channel (75).

6. A device as claimed in any one of claims 1-4,
15 characterized in that said non-return valve (45) is arranged in locking connection at a point situated spaced from the hydraulic cylinder (51), and in that the two locking wedges (59, 60) are prestressed by individual compression springs or a common compression spring (69)
20 to retain them in outer active positions if the hydraulic pressure has unintentionally ceased to act on the plus sides of the pistons (57, 58).

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