Description

The present invention relates to a rod locking device having particular application to locking the tail rod of a blowout preventer ram in position to prevent movement of the ram once it has been closed.

When oilfield ram type-blowout preventers are in use, it occasionally becomes necessary to lock the rams in the closed position. The prior art of blowout preventers has numerous devices for locking a ram in its closed position. Such devices range from a simple mechanical screw which is threaded through the bonnet to engage the outer end of the ram tail rod or piston to prevent its movement in the outward direction to complicated devices such as shown in U. S. Patent No. 4,305,565 wherein a locking cone responds to fluid pressure during the movement of the ram to move the locking wedges into engagement with the tapered inner surfaces of the housing.

A known rod locking device includes wedges actuated by pistons which are actuated when the rod is in its position for locking and the wedges are moved into locking engagement with a tapered surface on the rod to prevent retraction of the rod from its locked position. A typical example of this type of device is disclosed in U. S. Patent No. 3,208,357.

Other prior art patents, such as U. S. Patents Nos. 4,052,995, 4,076,208 and 4,290,577 disclose ram locks wherein a lock nut is stopped from rotating by a clutch mechanism which has ratchet teeth.

According to the present invention there is provided a ram locking apparatus for locking a ram in a blowout preventer housing by engagement of the outer end of a tail rod connected to the ram comprising

a lock housing having a first pair of hollow aligned legs and a second pair of hollow aligned legs, which are connected to said first pair at an angle so that the interiors of all legs are in communication, one leg of the first pair being mounted so that its hollow interior is positioned to receive the ram tail rod therein,

a body positioned within one of said second pair of legs of said lock housing and slidable therein responsive to pressure and having a surface for engagement with the end of the ram tail rod,

means for supplying pressure to move said body in said second pair of legs of said lock housing between a locked position engaging the end of the ram tail rod and a retracted position disengaged from the end of the ram tail rod, characterised in that said apparatus includes a threaded rod extending from the end of said body remote from the tail rod engaging surface of said body,

a nut threaded on said threaded rod and mounted in said one housing leg of the second pair containing said body, said nut being rotatable in said housing leg and having means for restraining said nut against axial movement of said one housing leg,

a sleeve surrounding and spaced radially outward from said threaded rod,

a braking piston surrounding said sleeve and having ratchet means engaging said nut to prevent rotation of said nut in the direction of retraction of said ram from closed position, and

means for delivering pressure to said braking piston to cause it to slide axially out of engagement with said nut to release said nut and allow retraction of said ram from its closed position.

The invention will be described now by way of example only, with particular reference to the accompanying drawings. In the drawings:

FIGURE 1 is a schematic sectional view of a ram type blowout preventer with a ram lock apparatus in accordance with the present invention installed on both bonnets.

FIGURE 2 is a sectional view of a ram lock apparatus in accordance with the present invention with the ram lock in its unlocked or retracted position and the ram tail rod in its open position.

FIGURE 3 is a sectional view similar to FIGURE 2 with the ram tail rod in its closed position and the ram lock in its locked position prevent movement of the ram from its closed position.

FIGURE 4 is an enlarged partial view of the ratchet teeth of the nut and braking piston.

FIGURE 5 is a sectional view taken along line 5 - 5 in FIGURE 2 to show the means for preventing rotation of the braking piston.

Brief Description of the Drawing

Blowout preventer 10 shown in FIGURE 1 includes an improved lock 12 of the present on each of its each of its rams 14. Blowout preventer 10 includes the housing 16 having a central bore 18 extending therethrough and opposed, aligned guideways 20 extending outwardly form such bore 18 in which the rams 14 are positioned. Rams 14 are moved in guideways 20 by pressure responsive means 22, normally a piston 24 reciprocally positioned in a cylinder 26 defined within the bonnet 28. Tail rod 30 is secured to the outer side of piston 24 and extends through the outer end of bonnet 28 into lock housing 32 as shown. Lock housing 32 is suitably secured to bonnet 28 as by threads (not shown).

Lock 12 is shown in FIGURES 2 and 3 in its unlocked position (FIGURE 2) and in its ram lock-

ing position (FIGURE 3). Lock housing 32 is generally cross-shaped with inner leg 34 connecting to bonnet 28 and receiving the outer end of tail rod 30 therein, outer leg 36 aligned with leg 34 and of sufficient size to receive the tail rod extension 38 which is secured to the outer end of tail rod 30 as shown and hereinafter described. The other two leg 40 and 42 of housing 32 are hollow and extend at right angles to legs 34 and 36 and are aligned with each other to allow the reciprocating movement of lock body 44 therein. Anti-rotation pin 37 is secured on the side of tail rod extension 38 and rides in groove 39 on the interior of leg 34 to prevent rotation of extension 38.

The outer ends of legs 40 and 42 are open and closed by closure plate 46 secured to the end of leg 42 by cap screws 48 and closure plate 50 secured within leg 40 by cap screws 52 threaded into cap 54 which is held within the interior of leg 40 by snap ring 56. Seal ring 58 seals between leg 42 and closure plate 46. Body 44 reciprocates in bore 60 in leg 40 and bore 62 in leg 42 which are aligned and of the same size to allow the necessary freedom of movement of body 44 as it reciprocates therein. Leg 40 includes first counterbore 64, second counterbore 66, third counterbore 68 and groove 70 in which snap ring 56 is positioned.

Since body 44 is to be moved within legs 40 and 42, seal ring 72 is provided in groove 74 extending around the exterior of the portion of body 44 closet to the outer end of leg 40. Fluid is delivered through passage 76 in closure plate via fitting 78 and line 80 to the outer end of leg 42. Fluid is delivered to the outer end of leg 40 through line 82 and fitting 84 through to the interior of cap 54. Fluid is also delivered into the interior of leg 40 at counterbore 66 through line 86 and fitting 88. Passage 89 extends through tail rod extension 38 and tail rod 30 to deliver fluid to the inner or opening side of piston 24.

Body 44 includes wedge surface 90 on its underside as shown and bore 92 through which tail rod extension 38 extends when rams 14 are in their retracted position as shown in FIGURE 2. Bore 94 extends into the outer end of body 44 in leg 40 and includes offset bore 96 which is provided to prevent rotation of threaded rod 98 which is held in bore 96 by snap ring 100. Nut 102 is threaded onto rod 98 and is supported within counterbore 64 for free rotation by bearing 104 and 106. Ring 108 is positioned within counterbore 64 against shoulder 110 between counterbore 64 and bore 60. Bearing 104 is supported in the recess 112 in ring 108 as shown. Flange 116 on nut 102 is positioned between bearings 104 and 106. Bearing 106 is positioned in recess 118 in sleeve 114 which is held in position by cap 54 which engages against the outer end of sleeve 114 as shown. Braking piston 120 is positioned in surrounding relationship to sleeve 114 and is provided with ratchet teeth 122 which engage with the ratchet teeth 124 in the outer end of flange 116. Ratchet teeth 122 and 124 are shaped to allow freedom of rotation of nut 102 during the locking movement of body 44 but to restrain against any reverse movement of body 44. Ratchet teeth 122 and 124 are best shown in FIGURE 4. Such teeth are square on one side and tapered at 45 degrees on the other side.

Braking piston 120 is slidably mounted in counterbore 66 with suitable seals 126 and on the interior of cap 54 with pin 128 extending through leg 40 into slot 130 on the exterior of piston 120. Pin 128 is secured therein by cap screws 132 which extend through plate 134 into leg 40 as best seen in FIGURE 5. Springs 136 are positioned on the interior of cap 54 and the outer end of piston 120 to urge piston 120 so that ratchet teeth 122 and 124 are maintained in engagement. Fluid under pressure delivered through line 86 and fitting 88 is sufficient to move piston 120 to the left as shown in the drawings against the force exerted by springs 136. This movement of piston 120 is sufficient to cause the disengagement of ratchet teeth 122 and 124 and allow nut 102 to rotate freely so that body 44 is not restrained in its retracting movement from locked position.

With the locks 12 installed on blowout preventer as shown in FIGURE 1 and with both of the rams 14 in their retracted position with tail rod extension 38 positioned within leg 36 as shown in FIGURE 2, fluid under pressure is supplied to the outer sides of pistons 24 to move rams 14 to their closed positions. Fluid under pressure is also delivered through line 82 and fitting 84 to the interior of cap 54. This pressure is exerted on body 44 to cause it to move in leg 40 toward leg 42. With tail rod extension 38 in its lower position its upper surface 91 is engaged by wedge surface 90 with sufficient force to ensure that rams 14 do not retract unless body 44 is first positively retracted as hereinafter described. In this position the components of the lock are positioned as shown in FIGURE 3. During the movement of body 44, threaded rod is pulled through nut 102 which causes nut 102 to rotate. The rotation of nut is possible since its ratchet teeth 124 will ratchet over the ratchet teeth 122 of braking piston 120 causing piston to move to the left as shown in the drawings. It should be noted that in the lock position of body 44, seal ring is still positioned within leg 40 so that it will respond to pressure supplied through line 80, fitting 78 and passage 76 into the interior of leg 42.

The retraction of lock body 44 is accomplished by the supplying of fluid under pressure through line 86 and fitting 88 to cause braking piston 120 to move to the left a sufficient distance to disengage

its ratchet teeth 122 from ratchet teeth 124 of nut 102. With braking piston 120 retracted by fluid pressure, fluid pressure exerted on body 44 from the interior of leg 42 causes body to retract into leg 40 so that the bore 92 in body 44 is aligned with tail rod extension 38 to ram 14 to retract ram 14 from its closed position and fluid pressure is delivered through passage 89 to piston 24.

The advantage of the improved lock of the present invention is that the engagement of wedge surface 90 with the outer end of tail rod extension 38 ensures that the rams 14 are maintained in their closed position. Further, the nut - braking piston combination prevents retraction of body 44 until it is positively retracted responsive to fluid pressure intentionally delivered to accomplish such retraction.

Claims

A ram locking apparatus (12) for locking a ram in a blowout preventer housing (16) by engagement of the outer end of a tail rod (30) connected to the ram (14) comprising

a lock housing (32) having a first pair of hollow aligned legs (34, 36) and a second pair of hollow aligned legs (40; 42), which are connected to said first pair at an angle so that the interiors of all legs are in communication, one leg of the first pair (34, 36) being mounted so that its hollow interior is positioned to receive the ram tail rod (30) therein,

a body (44) positioned within one of said second pair of legs (40, 42) of said lock housing (32) and slidable therein responsive to pressure and having a surface (90) for engagement with the end of the ram tail rod (30),

means (76, 78, 80) for supplying pressure to move said body (44) in said second pair of legs (40, 42) of said lock housing (32) between a locked position engaging the end of the ram tail rod (30) and a retracted position disengaged from the end of the ram tail rod (30), characterised in that said apparatus includes a threaded rod (98) extending from the end of said body (44) remote from the tail rod engaging surface (90) of said body (44),

a nut (102) threaded on said threaded rod (98) and mounted in said one housing leg of the second pair (40, 42) containing said body (44), said nut being rotatable in said housing leg and having means (106, 108) for restraining said nut (102) against axial movement of said one housing leg,

a sleeve (114) surrounding and spaced radially outward from said threaded rod (98),

a braking piston (120) surrounding said sleeve (114) and having ratchet means (122) engaging said nut (102) to prevent rotation of said nut (102) in the direction of retraction of said ram (14) from closed position, and

means (86, 88) for delivering pressure to said braking piston (120) to cause it to slide axially out of engagement with said nut (102) to release said nut (102) and allow retraction of said ram (14) from its closed position.

2. Ä ram locking apparatus (12) according to claim 1, wherein said ratchet means includes

a plurality of ratchet teeth (124) on said nut (102), said annular braking piston (120) having ratchet teeth (122) which can engage the nut ratchet teeth (124),

said braking piston (120) being slidable in said one housing leg of said second pair (40, 42) between positions of engagement and disengagement of the nut ratchet teeth (124) by the braking piston ratchet teeth (122), and

means (136) biasing said braking piston (120) towards a position in which the ratchet teeth (124, 122) are in engagement.

3. A ram locking apparatus (12) according to claim 2, wherein

the angle of slope on the inclined side of the ratchet teeth (122, 124) is approximately 45°.

4. A ram locking apparatus (12) according to any preceding claim, wherein

said lock housing (32) is a hollow, cross-shaped structure with the ram tail rod (30) extending into said one leg of said first pair (34, 36) and movable into the other aligned leg (36) of said first pair, and

said body (44) is positioned in a leg of said second pair (40, 42) extending transverse to the leg of the first pair which houses said rod (30).

5. A ram locking apparatus (12) according to claim 4, including

bearings (106, 112) rotatable supporting said nut (102) within said housing (32).

Patentansprüche

1. Verriegelungsvorrichtung (12) zur Verriegelung eines Stößels (14) in einem Bohrlochschiebergehäuse (16) durch Eingriff des äußeren Endes einer mit dem Stößel (14) verbundenen Endstange (30), umfassend

ein Verriegelungsgehäuse (32) mit einem ersten Paar von ausgerichteten hohlen Schenkeln (34, 36) und einem zweiten Paar von ausgerichteten hohlen Schenkeln (40, 42), die

its ratchet teeth 122 from ratchet teeth 124 of nut 102. With braking piston 120 retracted by fluid pressure, fluid pressure exerted on body 44 from the interior of leg 42 causes body to retract into leg 40 so that the bore 92 in body 44 is aligned with tail rod extension 38 to ram 14 to retract ram 14 from its closed position and fluid pressure is delivered through passage 89 to piston 24.

The advantage of the improved lock of the present invention is that the engagement of wedge surface 90 with the outer end of tail rod extension 38 ensures that the rams 14 are maintained in their closed position. Further, the nut - braking piston combination prevents retraction of body 44 until it is positively retracted responsive to fluid pressure intentionally delivered to accomplish such retraction.

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a body (44) positioned within one of said second pair of legs (40, 42) of said lock housing (32) and slidable therein responsive to pressure and having a surface (90) for engagement with the end of the ram tail rod (30),

means (76, 78, 80) for supplying pressure to move said body (44) in said second pair of legs (40, 42) of said lock housing (32) between a locked position engaging the end of the ram tail rod (30) and a retracted position disengaged from the end of the ram tail rod (30), characterised in that said apparatus includes a threaded rod (98) extending from the end of said body (44) remote from the tail rod engaging surface (90) of said body (44),

a nut (102) threaded on said threaded rod (98) and mounted in said one housing leg of the second pair (40, 42) containing said body (44), said nut being rotatable in said housing leg and having means (106, 108) for restraining said nut (102) against axial movement of said one housing leg,

a sleeve (114) surrounding and spaced radially outward from said threaded rod (98),

a braking piston (120) surrounding said sleeve (114) and having ratchet means (122) engaging said nut (102) to prevent rotation of said nut (102) in the direction of retraction of said ram (14) from closed position, and

means (86, 88) for delivering pressure to said braking piston (120) to cause it to slide axially out of engagement with said nut (102) to release said nut (102) and allow retraction of said ram (14) from its closed position.

2. Ã ram locking apparatus (12) according to claim 1, wherein said ratchet means includes

a plurality of ratchet teeth (124) on said nut (102), said annular braking piston (120) having ratchet teeth (122) which can engage the nut ratchet teeth (124),

said braking piston (120) being slidable in said one housing leg of said second pair (40, 42) between positions of engagement and disengagement of the nut ratchet teeth (124) by the braking piston ratchet teeth (122), and

means (136) biasing said braking piston (120) towards a position in which the ratchet teeth (124, 122) are in engagement.

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the angle of slope on the inclined side of the ratchet teeth (122, 124) is approximately 45°.

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said lock housing (32) is a hollow, cross-shaped structure with the ram tail rod (30) extending into said one leg of said first pair (34, 36) and movable into the other aligned leg (36) of said first pair, and

said body (44) is positioned in a leg of said second pair (40, 42) extending transverse to the leg of the first pair which houses said rod (30).

5. A ram locking apparatus (12) according to claim 4, including

bearings (106, 112) rotatable supporting said nut (102) within said housing (32).

Patentansprüche

1. Verriegelungsvorrichtung (12) zur Verriegelung eines Stößels (14) in einem Bohrlochschiebergehäuse (16) durch Eingriff des äußeren Endes einer mit dem Stößel (14) verbundenen Endstange (30), umfassend

ein Verriegelungsgehäuse (32) mit einem ersten Paar von ausgerichteten hohlen Schenkeln (34, 36) und einem zweiten Paar von ausgerichteten hohlen Schenkeln (40, 42), die

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mit dem ersten Paar unter einem solchen Winkel verbunden sind, daß ihre Innenhohlräume in Verbindung sind, wobei ein Schenkel des ersten Paars (34, 36) derart angeordnet ist, daß sein hohler Innenraum zur Aufnahme der Endstange (30) des Stößels angeordnet ist,
einen Körper (44), der in einem Schenkel des zweiten Paars (40, 42) des Verriegelungsgehäuses (32) und darin unter Druckeinfluß gleitend bewegbar ist und eine Fläche (90) zum Eingriff mit dem Ende der Endstange (30) des Stößels aufweist, und
eine Druckversorgungseinrichtung (76, 78, 80) zur Bewegung dieses Körpers (44) in dem zweiten Schenkelpaar (40, 42) des Verriegelungsgehäuses (32) zwischen einer arretierten Position, in der er mit dem Ende der Endstange (30) zusammenwirkt, und einer zurückgezogenen Position, in der er vom Ende der Endstange (30) des Stößels gelöst ist, **dadurch gekennzeichnet,** daß diese Vorrichtung (12) gebildet ist durch eine mit Gewinde versehene Stange (98), die sich vom Ende des Körpers (44) erstreckt, das von der Fläche (90) des Körpers (44), die mit der Endstange zusammenwirkt, entfernt ist,
eine auf die mit Gewinde versehene Stange (98) aufgeschraubte Mutter (102), die in einem Gehäuseschenkel des zweiten, den Körper (44) enthaltenden Paars (40, 42) befestigt ist, wobei diese Mutter (102) in diesem Schenkel drehbar ist und eine Einrichtung (106, 108) zu ihrer Arretierung gegen eine axiale Bewegung des einen Gehäuseschenkels aufweist,
eine Buchse (114), welche die mit Gewinde versehene Kolbenstange (98) in einem radialen Abstand umgibt,
einen diese Buchse (114) umgebenden Bremskolben (120) mit einem Sperrmittel (122), welches in die Mutter (102) eingreift, um ihre Drehbewegung in der Rückzugsrichtung des Stößels (14) aus deren geschlossener Position zu verhindern, und
eine Druckversorgungseinrichtung (86, 88) für den Bremskolben (120), damit er sich axial aus dem Eingriff mit der Mutter (102) bewegen kann, um sie freizugeben und die Zurückbewegung des Stößels (14) aus seiner geschlossenen Position zu ermöglichen.

2. Verriegelungsvorrichtung (12) nach Anspruch 1, **dadurch gekennzeichnet,** daß das Sperrmittel mehrere Sperrzähne (124) auf der Mutter (102), wobei der ringförmige Bremskolben (120) ebenfalls mit Sperrzähnen (122) versehen ist, welche in die Sperrzähne (124) der Mutter eingreifen können, und dieser Bremskolben (120) in einem Gehäuseschenkel des zweiten Paars (40, 42) zwischen den Positionen des Eingriffs und des Lösens der Sperrzähne (124) der Mutter durch die Sperrzähne (122) des Bremskolbens gleitend beweglich ist, und
Mittel (136), die den Bremskolben (120) in einer Position vorspannen, in der sich die Sperrzähne (124, 122) im Eingriff befinden, enthält.

3. Verriegelungsvorrichtung (12) nach Anspruch 2, **dadurch gekennzeichnet,** daß der Neigungswinkel der schrägen Seite der Sperrzähne (122,124) etwa 45° beträgt.

4. Verriegelungsvorichtung (12) nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet,** daß das Verriegelungsgehäuse (32) ein kreuzförmiger hohler Aufbau enthaltend die Stößelendstangen (30) ist, der sich in einen Schenkel des ersten Paars (34, 36) erstreckt und in dem anderen fluchtenden Schenkel (36) des ersten Paars beweglich ist, und der Körper (44) sich in einem Schenkel des zweiten Paars (40, 42) befindet, das quer zu dem Schenkel des ersten Paars, das die Stange (30) umgibt, verläuft.

5. Verriegelungsvorrichtung (12) nach Anspruch 4, **dadurch gekennzeichnet,** daß sie Lager (106, 112) enthält, welche die Mutter (102) im Gehäuse (32) drehbar beweglich halten.

Revendications

1. Dispositif de verrouillage de coulisseau (12), permettant de verrouiller un coulisseau dans un boîtier (16) de bloc d'obturation antiéruption par venue en contact de l'extrémité extérieure d'une contre-tige (30) reliée au coulisseau (14), comprenant :
   - un boîtier de verrouillage (32) comportant une première paire de branches creuses (34, 36) alignées et une seconde paire de branches creuses (40, 42) alignées qui se raccordent à la première paire en faisant un certain angle de façon telle que les cavités de toutes les branches communiquent, une branche de la première paire (34, 36) étant montée de façon telle que sa cavité soit disposée de manière à recevoir la contre-tige (30) du coulisseau,
   - un corps (44) qui est disposé dans une première branche (40, 42) de la seconde paire de branches du boîtier de verrouillage (32) et est agencé de façon à pouvoir y coulisser sous l'action d'une pres-

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sion et qui comporte une surface (90) destinée à venir en contact avec l'extrémité de la contre-tige (30) du coulisseau et

- des moyens (76, 78, 80) permettant de fournir une pression pour déplacer le corps (44) dans la seconde paire de branches (40, 42) du boîtier de verrouillage (32), entre une position verrouillée où il est au contact de l'extrémité de la contre-tige (30) du coulisseau et une position rétractée dans laquelle il n'est plus au contact de cette extrémité de la contre-tige (30) du coulisseau,

caractérisé en ce qu'il comprend :

- une tige filetée (98) s'étendant à partir de l'extrémité du corps (44) qui est située à l'opposé de la surface (90) de ce corps (44) destinée à venir au contact de la contre-tige,
- un écrou (102) vissé sur la tige filetée (98) et monté dans ladite première branche de la seconde paire de branches (40, 42) qui contient le corps (44), l'écrou étant agencé de façon à pouvoir tourner dans ladite branche du boîtier et comportant des moyens (106, 108) permettant d'empêcher l'écrou (102) d'exécuter un déplacement axial vis-à-vis de ladite branche du boîtier,
- un manchon (114) entourant la tige filetée (98) et espacé radialement de cette dernière vers l'extérieur,
- un piston de freinage (120) entourant le manchon (114) et comportant des moyens de mécanisme à rochet (122) coopérant avec l'écrou (102) en vue d'empêcher une rotation de cet écrou (102) dans le sens de la rétraction du coulisseau (14) à partir de sa position fermée et
- des moyens (86, 88) permettant de fournir au piston de freinage (120) une pression le faisant coulisser axialement pour lui faire quitter le contact de l'écrou (102) en vue de libérer cet écrou (102) et permettre une rétraction du coulisseau (14) à partir de sa position fermée.

2. Dispositif de verrouillage de coulisseau (12) suivant la revendication 1, dans lequel les moyens de mécanisme à rochet comprennent, d'une part, plusieurs dents de mécanisme à rochet (124) formées sur l'écrou (102), le piston annulaire de freinage (120) comportant des dents de mécanisme à rochet (122) qui peuvent venir en prise avec les dents de mécanisme à rochet (124) de l'écrou, le piston de freinage (120) étant agencé de façon à pouvoir coulisser dans ladite première branche de la seconde paire de branches (40, 42) du boîtier entre des positions dans lesquelles les dents de mécanisme à rochet (124) de l'écrou sont respectivement en prise et hors de prise avec les dents de mécanisme à rochet (122) du piston de freinage, et, d'autre part, des moyens (136) repoussant élastiquement le piston de freinage (120) vers une position dans laquelle les dents de mécanisme à rochet (124, 122) sont en prise.

3. Dispositif de verrouillage de coulisseau (12) suivant la revendication 2, dans lequel l'angle d'inclinaison du flanc incliné des dents de mécanisme à rochet (122, 124) est approximativement égal à 45°.

4. Dispositif de verrouillage de coulisseau (12) suivant l'une quelconque des revendications précédentes, dans lequel le boîtier de verrouillage (32) est une structure creuse en forme de croix, la contre-tige de coulisseau (30) s'étendant dans ladite première branche de la première paire de branches (34, 36) et étant agencée de façon à pouvoir se déplacer dans l'autre branche (36) de la première paire qui est située dans son alignement, tandis que le corps (44) est disposé dans une branche de la seconde paire de branches (40, 42) s'étendant transversalement à la branche de la première paire qui sert à loger la contre-tige (30).

5. Dispositif de verrouillage de coulisseau (12) suivant la revendication 4, comprenant des roulements (106, 112) soutenant d'une manière rotative l'écrou (102) à l'intérieur du boîtier (32).