Description

This invention relates to a tool for use in gravel packing wells, more particularly a tool for the retention and release of a gravel pack screen assembly when gravel packing wells.

In wells in geological formations where the production of sand from the formation along with the liquids and gases being produced therefrom is a problem, it is well known in the art to install a screen in the production tubing and to pack gravel around the screen to prevent the sand from the formation flowing into the production tubing. In such an arrangement, a gravel pack screen assembly is run into the formation on a string of tubing to the desired location, and gravel (typically coarse sand mixed in a gelled liquid) is pumped down to the exterior of the gravel pack screen assembly to fill the area between the screen assembly and the formation. After a sufficient amount of gravel has been pumped down to the exterior of the gravel pack screen assembly, the screen assembly is released from the tubing string and the tubing removed from the well with production tubing subsequently being installed in the well.

Typical prior art tools used to retain and subsequently release gravel pack screen assemblies have required the rotation of the tubing string to release the tool and tubing attached thereto from the gravel pack screen assembly. If rotation of the tubing is required to release the tool and tubing string from the gravel pack screen assembly, this means that equipment capable of rotating the tubing string must be provided at the well.

While hydraulic releasing tools, which do not require rotation of the tubing string to operate, have been employed in squeeze-type and wash-down gravel packing jobs, prior art circulation-type gravel packing jobs, based on retrievable gravel packers, require rotation of the tubing string to release from the packed screen at the end of the job. One example of a hydraulic release tool for wash-down gravel-packing jobs is disclosed in US-A-3997006. A further example of a hydraulic release tool for gravel-packing jobs is disclosed in US-A-4175778 and comprises a tubular tool case, a hydraulic releasing tool for releasing a tool string from a gravel screen, comprising: a tubular tool case having a cylindrical bore therein, said bore including recess means opening thereon, said tool case further including means for securing a gravel screen to said tool at the bottom thereof; a sleeve having a lower end thereof disposed in said tool case, said sleeve including an adapter means above said tool case for securing said tool string thereto, sleeve means below said adapter means but above said tool case having ports extending through the wall thereof, and locking means proximate and extending into said recess means, and a tubular releasing mandrel slidably disposed in said sleeve, and covering said ports, said releasing mandrel including a ball seat above and in communication with an axial bore on the interior thereof, and shoulder means on the lower exterior thereof, said shoulder means contacting and outwardly biasing said locking means into said recess means.

In contrast to the prior art, we have now devised an apparatus especially suitable for effecting hydraulic release of a screen on a circulation-type gravel pack job.

According to the present invention, there is provided a hydraulic releasing tool for releasing a tool string from a gravel screen, characterised in that said sleeve is a collet sleeve, said locking means are collet means, said shoulder means are collet shoulder means, said tool further comprises collet body means slidably disposed in said tool case and including a plurality of circumferentially disposed longitudinally oriented resilient collet fingers extending between an upper collet ring and a lower collet ring and including said collet means associated with said collet fingers and said tool also further comprises reversing boot means disposed about said collet sleeve and adapted to permit flow through said ports from the interior of said tool to the exterior thereof when pressure inside said tool exceeds that outside said tool.

The use of collet body means and a collet sleeve similar to that described above, but for releasably locking a parking tool in a landing nipple is disclosed in US-A-4407364.

In a tool of the invention, reversing ports are incorporated in the wall of the upper collet sleeve, to be uncovered when the release mandrel moves downward therein, to positively identify release from the screen and to permit displacement of gravel slurry from the tubing string and annulus above the releasing tool with a clean fluid prior to removal of the string from the well bore. A reversing boot is employed about the collet sleeve proximate the reversing ports therein, to prevent back flow in the tool.

The general method employing the aforesaid tool briefly comprises transmitting pressure down to the ball seat in the releasing tool with a ball disposed above the seat; moving the releasing mandrel down, thus disengaging the collets from the tool case and pulling the collet sleeve and releasing mandrel out of the tool case, leaving the gravel screen and attached tool case in the wellbore.

A preferred embodiment of the present invention will now be more particularly described by way of example and with reference to the accompanying drawings, wherein:

Figures 1A-1D show a schematic full sectional

vertical elevation of one embodiment of hydraulic releasing tool of the present invention, suspended from a retrievable gravel packer at the end of a tubing string, and having a gravel screen suspended from the bottom thereof;

Figures 2A-2D show a detailed half-sectional elevation of a preferred embodiment of the hydraulic releasing tool of the present invention.

Referring to Figures 2A-2D of the drawings, a hydraulic releasing tool 500 of the present invention includes tool case 502, collet sleeve 504 and releasing mandrel 506. Tool case 502 includes a generally tubular hookup nipple 510 having a cylindrical exterior 512, leading to a lower adapter 514 welded thereto at 516, and having a cylindrical exterior 518 leading to chamfered surface 520 and threads 522. The top of tool case nipple 510 is defined by radially flat annular shoulder 524, below which upper collet sleeve seal bore 526 extends on the case interior, collet bore 528 extending downward to the top of lower adapter 514 and having annular collet recess 530 cut therein. The interior of lower adapter 514 comprises lower collet sleeve seal bore 532.

Collet sleeve 504, the lower end of which is disposed in tool case 502, includes upper adapter 534 having cylindrical exterior surface 536 and threaded upper interior bore 538 necking down at annular shoulder 540 to define lower smooth bore 542, below which seal bore 544 carries O-ring 546 above threaded exit bore 548, terminating at bottom rim 549.

Upper adapter 534 is secured to ported sleeve 550 at threaded surface 552, seal surface 553 at the top of sleeve 550 sealing against O-ring 546. Below surface 552, annular reversing boot surface 554 extends to annular shoulder 556, extending radially outwardly to cylindrical sleeve outer surface 558, which terminates at lower seal surface 560 carrying O-ring 562, below which threaded trailing surface 564 extends to the bottom of ported sleeve 550. Elastomeric annular reversing boot 566 is disposed about check sleeve surface 554 over reversing ports 555 and maintained thereon between the bottom ring 549 of upper adapter 534 and annular shoulder 556. The interior of ported sleeve 550 includes mandrel seal bore 568 leading to annular reversing recess 570 therebelow, which in turn terminates at beveled shoulder 572 extending inwardly to mandrel bore 574. Radial shear pin apertures 576 extend through the wall of ported sleeve 550 proximate the bottom thereof, shear pins 578 extending inwardly therefrom.

Collet body 580 is secured to ported sleeve 550 by threaded bore 582, seal bore 583 thereabove sealing with O-ring 562, collet body comprising upper collet ring 584, lower collet ring 586, and a plurality of longitudinally extending, circumferentially spaced collet fingers 588 extending therebetween. The upper exterior of upper collet ring 584 comprises cylindrical surface 590, below which annular bearing surface 592 rests on annular shoulder 524 at the top of tool case housing 510. Below bearing surface 592, seal surface 594 carrying O-ring 596 effects a seal against upper sleeve seal bore 526. The interior of upper collet ring 584 below threaded bore 582 comprises shear pin support bore 598 leading to radially flat annular surface 600, from which smooth bore 602 extends downward to collet fingers 588.

Each collet finger 588 includes a collet 604 disposed proximate the midpoint thereof, collets 604 each including tapered upper and lower radially outer edges 606 and 608 bracketing a vertically extending intermediate case bearing edge 610, and tapered upper and lower radially inner edges 612 and 614 bracketing on intermediate mandrel bearing edge 616.

Lower collet ring 586 comprises an assembly of a collar 618 at the lower extent of collets 588 secured at threaded junction 620 to wash pipe adapter 622, and prevented from backing off therefrom by set screws 624. The exterior of washpipe adapter 622 includes set screw recess 626 below which the bottom of collar 618 rests on annular shoulder 628, the lower end of which includes chamfered edge 630 leading to recessed exterior surface 632. Nipple seal surface 634, carrying O-ring 636, bears against lower sleeve seal bore 532 of lower adapter 514, frusto-conical trailing surface 638 leading therebelow to cylindrical washpipe extension 640, ending with threaded surface 642.

Returning to the top of hydraulic releasing tool 500, releasing mandrel 506 is of generally tubular configuration, the exterior thereof being defined by collet sleeve seal surface 644 carrying O-ring 646, necking inward via chamfered edge 648 to cylindrical shear pin bore 650 having annular shear pin recess 652 cut therein, the exterior further necking down therebelow at tapered edge 654 to extension surface 656 carrying tapered annular collet shoulder 658 at the bottom thereof, shoulder including upper and lower oblique surfaces 660 and 662 bracketing cylindrical intermediate collet bearing surface 664 therebetween. The interior of releasing mandrel 506 includes check ball bore wall 666 ending at a frusto-conical ball check seat 668 which necks down to fluid return bore 670, extending to the bottom of mandrel 506. Check ball 672 is maintained in check ball bore 674 by roll pin 676 thereabove.

Referring to Figures 1A-1D and 2A-2D, a gravel packer 10 suspended from a tubing string (not shown) is schematically depicted in wellbore casing or liner 8, a hydraulic releasing tool 500 of the present invention being disposed below gravel

packer 10 through slip joint 700 and a gravel screen 702 suspended from hydraulic releasing tool 500 below blank pipe. Gravel screens and slip joints are well known in the art. A washpipe or tailpipe 704 is suspended from hydraulic releasing tool 500 and extends into screen 702, which extends across producing formation 6. As the tubing string is run into the wellbore, fluid can move around packer element means 310 via bypass passage 1006, and the tubing string is filled through circulation passages 1004 and intake passage 1000, due to inward deflection of sleeve 446 in response to the wellbore/tubing string pressure differential.

After running the tubing string into the wellbore, the bottom of the wellbore is tagged with gravel screen 702 and slip joint 700 is compressed. The string is then picked up to extend the slip joint 700 while leaving the screen 702 on the bottom.

Gravel packer 10 is then set by application of right-hand rotation through mandrel assembly 12, which moves J-slot lugs 212 to positions above the open bottoms of J-slots 412 from which they were removed when the tubing string was picked up. The tubing string is then set down, which sets lower slips 350 against lower slip wedge collar 323 (FIG. 1B) through movement of mandrel assembly 12 with respect to housing assembly 14, the latter's movement being restricted by drag blocks 390. After lower slips 350 set against casing 8, continued downward travel of mandrel assembly 12 closes bypass passage 1006 (FIG. 1A) by bringing seal 184 against packer saddle 270, after which upper slip assembly 130, biased by spring 160, contacts upper slip wedge collar 230 and forces it and upper bypass case downward, compressing packer element means 310 against casing 8 after which upper slips 138 contact and set against casing 8. The downward travel of mandrel means assembly 12 results in ratchet dogs 330 engaging ratchet teeth 188, locking gravel packer 10 in a set mode, spring 160 aiding in maintaining it therein. The packer is then pulled upward by the tubing string to test the ratchet engagement and upper slips, and the annulus 4 between the tubing string and casing 8 is pressured up to test the seal of packer element means 310 against casing 8.

Gravel packer 10 may then be released from gravel screen 702 via hydraulic releasing tool 500, if desired. To effect release the tubing string is picked up to pull a specified force, for example, 1000 pounds (445ON), against the set gravel packer 10. Tubing pressure is then applied through intake passage 1000 of gravel packer 10, past ball 482 which is biased downward against spring 484, through slip joint 700 to seat ball 672 against seat 668 in hydraulic release tool 500. Pressure is continued until shear pins 578 shear, and releasing mandrel 506 moves downward inside collet sleeve 504, releasing collets 588 from the outward bias of annular shoulder 658 at the bottom of releasing mandrel 506, and uncovering reversing ports 555, which results in a perceptable pressure drop at the surface. Tubing pressure is then relieved, and weight set down on the gravel packer 10. This will align crossover ports 40 with crossover apertures 60 in crossover assembly 20; pressure is then applied to annulus 4, which will establish reverse circulation if screen release has been effected, through crossover assembly 20, return passage 1002, through slip joint 700, into hydraulic releasing tool 500, out reversing ports 555 past reversing boot 566, up the annulus 5 below gravel packer 10, into gravel packer 10 through circulation passages 1004 past sleeve 446 and up to the surface through intake passage 1000 and the tubing string.

Alternatively, screen 702 may be released via pressuring annulus 4 after setting down to open crossover assembly 20, which will be transmitted to hydraulic releasing tool 500 through the reverse circulation path described in the preceding paragraph, forcing releasing mandrel 506 downward.

To gravel pack, a ball 455 is then dropped or circulated down the tubing string through intake passage 1000 to ball seat 454 in check valve assembly 444. Pressure is then applied to shear pins 462, which when sheared permit check valve assembly 444 to move downward, uncovering circulation passages 1004 and establishing circulation through passages 1004, into annulus 5, down to gravel screen 702, through the apertures 706 therein, up washpipe 704, through hydraulic releasing tool 500 past unseated ball 672, through slip joint 700 and into return passage 1002, out of crossover assembly 20 through apertures 60 and ports 40, and up annulus 4 to the surface.

A fluid injection rate is then established by pulling up on the tubing string to close crossover assembly 20, and pressuring up the tubing until it is ascertained that fluid can be pumped into formation 6 at a desired rate and pressure. If not, the formation may have to be treated with acid to increase its permeability. If the injection rate is satisfactory, bypass passage 1006 can then be opened to "spot" the gravel-laden slurry to gravel packer 10 by pulling against the tubing string, applying pressure to annulus 4, rotating the tubing string to the right 12 to 16 turns to release ratchet dogs 330 from ratchet threads 188 and seal 184 from packer saddle 270, indicated by a relieving of the pressure in annulus 4. Slurry can then be spotted down to the gravel packer 10 without circulating fluid through screen 702, as fluid below packer element means 310 will be displaced upward into annulus 4 via bypass passage 1006 by the slurry traveling down the tubing string and into

intake passage 1002. After slurry spotting, the tubing string is set down to close bypass passage 1006 and open crossover assembly 20. The slurry is circulated out of passage 1004 and down to screen 702, the gravel being deposited outside screen 702 adjacent formation 6, fluid returns being taken up washpipe 704.

After the gravel pack is placed, the tubing string is again pulled against the set gravel packer 10 to close crossover assembly 20, and the pack slurry is squeezed into the formation and against screen 702 through intake passage 1000, circulation passages 1004 and lower annulus 5. If desired, the operator may alternate between circulating and squeezing several times to place more gravel and ensure the integrity of the pack. It should be noted that gravel packer 10 permits squeezing without subjecting the casing above packer element means 310 to squeeze pressure, an important feature in wells with old or otherwise deteriorated casing.

If the screen 702 has not previously been released, the tubing string is set down, and annulus 4 is pressurized, this pressure being transmitted through crossover assembly 20 and down return passage 1002 to hydraulic releasing tool 500 as previously described, to move releasing mandrel 506 downward.

Excess slurry can be reverse circulated out of the tubing string, gravel packer 10, annulus 5, by circulating clean fluid down annulus 4 to crossover assembly 20, down return passage 1002, through slip joint 700, out reversing ports 555 past boot 566, up annulus 5, into circulation passages 1004, and up intake passage 1000 to the surface through the tubing string.

The gravel pack can be retested if desired in the circulate and/or squeeze mode, and repacking done if necessary, in the same manner described above.

The gravel packer 10 may then be unset, by pulling the tubing string against gravel packer 10, applying pressure to the annulus, rotating the tubing string to the right to release the ratchets and open bypass passage 1006 (indicated by relief of annulus pressure). The tubing string is then pulled up to retract upper slips 138, unset packing element means 310, unset lower slips 350 and return lugs 212 back into J-slots 412. Gravel packer 10, with slip joint 700, collet sleeve 504 and releasing mandrel 506 may then be removed from the wellbore, leaving tool case 502 and screen 702 in place with the gravel packed about the latter. Subsequently, a tubing seal assembly on production tubing may be stabbed over tool case 502 (specifically hookup nipple 510) and formation 6 produced through screen 702.

It should be noted that the preferred embodiment of the hydraulic releasing tool of the present invention would be modified by the deletion of check ball 672 and roll pin 676 for use with the gravel packer disclosed in U.S. Patent Application Serial No 757036 publ. 28.01.87, (& US-A-4633943, publ. 06.01.87) and the corresponding European patent application EP-A-210028, due to the fact that the gravel packer disclosed therein possesses a releasable check ball retention assembly. This assembly will drop a check ball to the hydraulic releasing tool disposed therebelow in response to tubing pressure applied above a ball dropped to a ball seat in the gravel packer.

Claims

1. A hydraulic releasing tool (500) for releasing a tool string from a gravel screen, comprising: a tubular tool case (502) having a cylindrical bore therein, said bore including recess means (530) opening thereon, said tool case further including means (514) for securing a gravel screen to said tool at the bottom thereof; a sleeve (504) having a lower end thereof disposed in said tool case, said sleeve including an adapter means (534) above said tool case for securing said tool string thereto, sleeve means (550) below said adapter means but above said tool case having ports (555) extending through the wall thereof, and locking means (604) proximate and extending into said recess means, and a tubular releasing mandrel (506) slidably disposed in said sleeve, and covering said ports, said releasing mandrel including a ball seat (668) above and in communication with an axial bore on the interior thereof, and shoulder means (658) on the lower exterior thereof, said shoulder means contacting and outwardly biasing said locking means into said recess means, characterised in that said sleeve is a collet sleeve, said locking means are collet means, said shoulder means are collet shoulder means, said tool further comprises collet body means (580) slidably disposed in said tool case and including a plurality of circumferentially disposed longitudinally oriented resilient collet fingers (588) extending between an upper collet ring (584) and a lower collet ring (586) and including said collet means associated with said collet fingers and said tool also further comprises reversing boot means (566) disposed about said collet sleeve and adapted to permit flow through said ports (555) from the interior of said tool to the exterior thereof when pressure inside said tool exceeds that outside said tool.

2. Apparatus according to claim 1, further comprising shear pin means (578) releasably con-

intake passage 1002. After slurry spotting, the tubing string is set down to close bypass passage 1006 and open crossover assembly 20. The slurry is circulated out of passage 1004 and down to screen 702, the gravel being deposited outside screen 702 adjacent formation 6, fluid returns being taken up washpipe 704.

After the gravel pack is placed, the tubing string is again pulled against the set gravel packer 10 to close crossover assembly 20, and the pack slurry is squeezed into the formation and against screen 702 through intake passage 1000, circulation passages 1004 and lower annulus 5. If desired, the operator may alternate between circulating and squeezing several times to place more gravel and ensure the integrity of the pack. It should be noted that gravel packer 10 permits squeezing without subjecting the casing above packer element means 310 to squeeze pressure, an important feature in wells with old or otherwise deteriorated casing.

If the screen 702 has not previously been released, the tubing string is set down, and annulus 4 is pressurized, this pressure being transmitted through crossover assembly 20 and down return passage 1002 to hydraulic releasing tool 500 as previously described, to move releasing mandrel 506 downward.

Excess slurry can be reverse circulated out of the tubing string, gravel packer 10, annulus 5, by circulating clean fluid down annulus 4 to crossover assembly 20, down return passage 1002, through slip joint 700, out reversing ports 555 past boot 566, up annulus 5, into circulation passages 1004, and up intake passage 1000 to the surface through the tubing string.

The gravel pack can be retested if desired in the circulate and/or squeeze mode, and repacking done if necessary, in the same manner described above.

The gravel packer 10 may then be unset, by pulling the tubing string against gravel packer 10, applying pressure to the annulus, rotating the tubing string to the right to release the ratchets and open bypass passage 1006 (indicated by relief of annulus pressure). The tubing string is then pulled up to retract upper slips 138, unset packing element means 310, unset lower slips 350 and return lugs 212 back into J-slots 412. Gravel packer 10, with slip joint 700, collet sleeve 504 and releasing mandrel 506 may then be removed from the wellbore, leaving tool case 502 and screen 702 in place with the gravel packed about the latter. Subsequently, a tubing seal assembly on production tubing may be stabbed over tool case 502 (specifically hookup nipple 510) and formation 6 produced through screen 702.

It should be noted that the preferred embodiment of the hydraulic releasing tool of the present invention would be modified by the deletion of check ball 672 and roll pin 676 for use with the gravel packer disclosed in U.S. Patent Application Serial No 757036 publ. 28.01.87, (& US-A-4633943, publ. 06.01.87) and the corresponding European patent application EP-A-210028, due to the fact that the gravel packer disclosed therein possesses a releasable check ball retention assembly. This assembly will drop a check ball to the hydraulic releasing tool disposed therebelow in response to tubing pressure applied above a ball dropped to a ball seat in the gravel packer.

Claims

1. A hydraulic releasing tool (500) for releasing a tool string from a gravel screen, comprising: a tubular tool case (502) having a cylindrical bore therein, said bore including recess means (530) opening thereon, said tool case further including means (514) for securing a gravel screen to said tool at the bottom thereof; a sleeve (504) having a lower end thereof disposed in said tool case, said sleeve including an adapter means (534) above said tool case for securing said tool string thereto, sleeve means (550) below said adapter means but above said tool case having ports (555) extending through the wall thereof, and locking means (604) proximate and extending into said recess means, and a tubular releasing mandrel (506) slidably disposed in said sleeve, and covering said ports, said releasing mandrel including a ball seat (668) above and in communication with an axial bore on the interior thereof, and shoulder means (658) on the lower exterior thereof, said shoulder means contacting and outwardly biasing said locking means into said recess means, characterised in that said sleeve is a collet sleeve, said locking means are collet means, said shoulder means are collet shoulder means, said tool further comprises collet body means (580) slidably disposed in said tool case and including a plurality of circumferentially disposed longitudinally oriented resilient collet fingers (588) extending between an upper collet ring (584) and a lower collet ring (586) and including said collet means associated with said collet fingers and said tool also further comprises reversing boot means (566) disposed about said collet sleeve and adapted to permit flow through said ports (555) from the interior of said tool to the exterior thereof when pressure inside said tool exceeds that outside said tool.

2. Apparatus according to claim 1, further comprising shear pin means (578) releasably con-

* C L M S *

necting said releasing mandrel and said collet sleeve.

3. Apparatus according to claim 1 or 2, wherein said reversing boot means comprises a tubular elastomeric reversing boot.

4. Apparatus according to any of claims 1 to 3, further including seal means (646) disposed between the exterior of said releasing mandrel and the interior of said collet sleeve.

5. Apparatus according to any of claims 1 to 3, further including a check ball (672) disposed above said ball seat in said releasing mandrel.

6. Apparatus according to claim 5, wherein said check ball is retained in said releasing mandrel by retaining means (676).

7. Apparatus according to any of claims 1 to 6, further including means (642) associated with said lower collet ring to secure a tailpipe thereto.

Revendications

1. Un outil de dégagement hydraulique (500) pour dégager le chapelet d'outils d'un crible à gravier, comprenant: un fourreau d'outil (502) doté d'un alésage cylindrique intérieur, le dit alésage comprenant un mode d'évidement (530) à l'intérieur, le dit fourreau d'outil comprenant en outre un moyen (514) de fixer un crible à gravier au dit outil à sa partie inférieure; un manchon (504) dont l'extrémité inférieure est disposée dans le dit fourreau d'outil, le dit manchon comprenant un mode d'adaptateur (534) au-dessus du dit fourreau d'outil pour fixer le dit chapelet d'outils dessus, un mode de manchon (550) au-dessous du dit mode d'adaptateur mais au-dessus du dit fourreau d'outil ayant des ouvertures (555) percées à travers la paroi de celui-ci, et un mode de verrouillage (604) à proximité du et s'étendant dans le dit mode d'évidement, et un mandrin de dégagement tubulaire (506) coulissable dans le dit manchon, et recouvrant les dites ouvertures, le dit mandrin comprenant un siège à bille (668) au-dessus de et en rapport à un alésage axial à l'intérieur du dit mandrin, et un mode d'épaule à la partie basse extérieure de celui-ci, le dit mode d'épaule en contact avec et retenant extérieurement le dit mode de verrouillage dans le dit mode d'évidement, caractérisé par le fait que le dit manchon est un manchon à collier, le dit mode de verrouillage est un mode à collier, le dit mode d'épaule est un mode d'épaule à collier, le dit outil comprenant en outre un mode de corps à collier (580) coulissable dans le dit fourreau d'outil et comprenant une pluralité de doigts de collier résilients (588) disposés périphériquement et logitudinalement orientés s'étendant entre une bague (584) à collier supérieure et une bague (586) à collier inférieure et comprenant le dit mode de collier associé aux dits doigts de collier et le dit outil comprenant en outre aussi un mode de patin de recul (566) disposé de part et d'autre du dit manchon à collier et adapté pour permettre l'écoulement à travers les dites ouvertures (555) depuis l'intérieur jusqu'à l'extérieur du dit outil lorsque la pression à l'intérieur du dit outil excède celle à l'extérieur du dit outil.

2. Dispositif suivant revendication 1, comprenant en outre un mode de goupille à cisaillement (578) connectant d'une façon relâchable le dit mandrin de dégagement et le dit manchon à collier.

3. Dispositif suivant revendication 1 ou 2, où le dit mode de patin de recul comprend un patin de recul élastomérique tubulaire.

4. Dispositif suivant quelconque des revendications 1 à 3, comprenant en outre un mode de joint (646) disposé entre l'extérieur du dit mandrin de dégagement et l'intérieur du dit manchon à collier.

5. Dispositif suivant quelconque des revendications 1 à 3, comprenant en outre une bille de retenue (672) disposée au-dessus du dit siège à bille dans le dit mandrin de dégagement.

6. Dispositif suivant revendication 5, où la dite bille de retenue est retenue à l'intérieur du dit mandrin de dégagement par un mode de retenue (676).

7. Dispositif suivant quelconque des revendications 1 à 6, comprenant en outre un mode (642) associé à la dite bague à collier inférieure pour fixer un tube d'embout à celle-ci.

Patentansprüche

1. Hydraulische Freigabevorrichtung (500) zum Lösen eines Rohrstranges von einem Kiessieb, enthaltend ein rohrförmiges Gerätegehäuse (502) mit einer darin befindlichen Zylinderbohrung, die eine sich dazu öffnende Ausnehmung (530) enthält, und mit Mitteln (514) zur Befestigung eines Kiessiebes am unteren Ende

der Vorrichtung; eine Hülse (504), deren unteres Ende in dem Gerätegehäuse angeordnet ist, mit Adaptermitteln (534) oberhalb des Gerätegehäuses zur Befestigung an dem Rohrstrang und mit unterhalb der Adaptermittel, aber oberhalb des Gerätegehäuses angeordneten Hülsenmitteln (550), die durch ihre Wandung verlaufende Öffnungen (555) enthalten; Riegelmittel (604), die nächst der Ausnehmung angeordnet sind und sich in diese hineinerstrecken; und einen in der Hülse gleitfähig angeordneten, die Öffnungen abdeckenden Lösedorn (506) mit einem Kugelsitz (668) oberhalb und in Verbindung mit einer Axialbohrung in seinem Inneren und Schultermitteln (658) außen an seinem unteren Ende, die mit den Riegelmitteln in Kontakt stehen und diese nach außen in die Ausnehmung vorspannen,

dadurch gekennzeichnet, daß die Hülse eine Klemmhülse, die Riegelmittel Klemm-Mittel und die Schultermittel Klemmschultermittel bilden, daß die Vorrichtung ferner Klemmkörpermittel (580) aufweist, die gleitfähig in dem Gerätegehäuse angeordnet sind und eine Vielzahl von am Umfang angeordneten, längsgerichteten, federnden Klemmfingern (588), die sich zwischen einem oberen Klemmring (584) und einem unteren Klemmring (586) erstrecken, und die den Klemmfingern zugeordneten Klemm-Mittel enthalten, und daß die Vorrichtung weiterhin eine Umkehrabdeckung (566) aufweist, die um die Klemmhülse angeordnet und derart eingerichtet ist, daß sie einen Durchfluß durch die Öffnungen (555) aus dem Inneren der Vorrichtung nach außen ermöglichst, wenn deren Innendruck ihren Außendruck übersteigt.

2. Vorrichtung nach Anspruch 1, gekennzeichnet durch Scherstiftmittel (578), die den Lösedorn und die Klemmhülse lösbar verbinden.

3. Vorrichtung nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß die Umkehrabdeckung eine rohrförmige, elastomere Umkehrabdekkung ist.

4. Vorrichtung nach einem der Ansprüche 1 bis 3, gekennzeichnet durch Dichtmittel (646) zwischen dem Äußeren des Lösedorns und dem Inneren der Klemmhülse.

5. Vorrichtung nach einem der Ansprüche 1 bis 3, gekennzeichnet durch eine Sperrkugel (672) oberhalb des Kugelsitzes im Lösedorn.

6. Vorrichtung nach Anspruch 5, dadurch gekennzeichnet, daß die Sperrkugel durch Haltemittel (676) in dem Lösedorn gehalten ist.

7. Vorrichtung nach einem der Ansprüche 1 bis 6, gekennzeichnet durch dem unteren Klemmring zugeordnete Mittel (642) zur Befestigung eines Rohrendes.