1. (WO1992018746) BLOCKING ROBOT FOR HIGH-PRESSURE OIL WELLS

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Title
(EN) BLOCKING ROBOT FOR HIGH-PRESSURE OIL WELLS
(FR) ROBOT DE BLOCAGE DES PUITS DE PETROLE SOUMIS A DE TRES FORTES PRESSIONS

Abstract:
(EN)A robot for sealing and blocking pipes which are subject to very high pressure. The robot comprises a counter-pressure device below the main blocking portion for simultaneously acting on the inner wall, at depth in the pipe, by expansion caused by a single linear movement of a tapered shaft in a cylinder having therein a tapered bore; said shaft having a diameter which is 50 % greater than the difference between the inner taper diameters of the two ends of the cylinder, which cylinder has a slot running the full length thereof and is controlled by hydraulic jacks; a centre pipe allowing oil flow and normalising the upward pressure during the insertion process; and two pantographs for centering the system in the well in spite of the very high pressure. The high pressure in the well helps ensure blocking of the system.

(FR)L'invention concerne un robot pour la fermeture et le blocage des tuyaux soumis à de très fortes pressions, comportant des moyens d'oppositions à la pression situés au-dessous de la partie de blocage principale, et agissant simultanément sur la paroi intérieure, en profondeur dans le tuyau, par extension, obtenue par un seul mouvement linéaire d'un axe cônique dans un cylindre comportant à l'intérieur un fraisage cônique; l'axe ayant 50 % de plus de diamètre de la différence des diamètres intérieurs côniques des deux bouts du cylindre, comportant une fente sur toute sa longueur, commandé par des vérins hydrauliques; comportant un conduit central assurant l'afflux du pétrole, normalisant la pression ascendante durant le processus de son introduction; comportant aussi deux pantographes permettant le centrage du système dans le puits malgré les très fortes pressions; la forte pression du puits agit pour la fermeté du blocage du système.

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Blocking robot for high-pressure oil wells

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RÉSUMÉ

A robot for sealing and blocking pipes which are subject to very high pressure. The robot comprises a counter-pressure device below the main blocking portion for simultaneously acting on the inner wall, at depth in the pipe, by expansion caused by a single linear movement of a tapered shaft in a cylinder having therein a tapered bore; said shaft having a diameter which is 50 % greater than the difference between the inner taper diameters of the two ends of the cylinder, which cylinder has a slot running the full length thereof and is controlled by hydraulic jacks; a centre pipe allowing oil flow and normalising the upward pressure during the insertion process; and two pantographs for centering the system in the well in spite of the very high pressure. The high pressure in the well helps ensure blocking of the system.

DESCRIPTION Langue du texte original : Français (Le texte OCR peut contenir des erreurs.)

ROBOT LOCK OIL WELLS SUBJECT TO VERY STRONG PRESSURE

The present invention relates to a robot for closing and locking of pipes subjected to very high pressures, with two means of opposition pressure, located below the main locking system, acting simultaneously on the inside wall depth in the pipe, by extension, obtained by one linear movement of a conical pin into a cylinder having therein a countersinking, with the axis (50%) more than the diameter difference between the diameters conical inner of the two ends of the cylinder having a slot along its entire length; hydraulic cylinder with controlled; the high pressure in the well is for the strength of the locking system.

The lower part of the robot comprises two conical parts (1, 2) and a straight portion (3), for centering the penetration into the pipe system, screw threaded on the central axis.

The first device against the pressure in the pipe is composed of a cylinder (7) formed with a material having the quality of being soft and expandable (eg copper, lead, etc..) About the central axis (8) tapered (6), and acting via the blotissement against the pipe wall by the pressure distribution by compensating according to the reaction of compo ¬ nents of the different parts of the system to the pressure obtained by the axial movement of the ring (9) on the area of (80 M) of the stroke of the central axis at the time of locking, and that allocation of the pressure is limited to the first device by the abutment of the opposite screws (10 a, 10 b) in the lower parts of the vertical milling made on the central axis, benefiting of (20%) of the second device opposition. The second device and opposite locking consists of a cylinder (11) formed with a material having the qualities of being soft, extensible (eg copper, lead, etc..) Surrounding the central axis cone (14), and act ¬ ing by blotissement against the pipe wall by the pressure exerted by its abutment against the edge of the cylinder (17) obtained by the linear movement of the lock from the central axis, as drape imperfections.

The main part of the lock is made by the extension of the central axis (15) tapered with (50%) more than the diameter of the conical inner diameters difference of both ends of the cylinder (17) having a slot along its entire length which allows the extension for locking. The main part also includes a locking section (16) forming part ¬ by the central axis (15), and a milling (13) wider than the slot (20) formed in the cylinder, and having a bead of lead copper or over the entire length of the slot, the profile (16) exerts pressure on the molding of lead or copper, in the milling (13) draping the slot (20) by linear movement of the central axis When blocking the pipe. The outer wall of the cylinder block

REVENDICATIONS Langue du texte original : Français (Le texte OCR peut contenir des erreurs.)

CLAIMS

1) Robot for closing and locking of pipes subjected to very high pressures, characterized in that it has two means of opposition pressure, located below the primary locks, and acting simultaneously on inner wall, towards the pipe 3 by extension sion, obtained by a single linear motion of a conical pin, in a cylindrical ¬ dre having therein a conical milling, having (503.) over diameter Unlike the tapered inner diameters of both ends of the cylinder, also having a slot over its entire length, controlled by hydraulic actuators, the well pressure is high for the strength

10, blocking system.

2) The robot according to claim 1, characterized in that its lower part comprises two conical parts (1, 2) and a straight portion (3), for centering the penetration into the pipe system, screwed on the central axis threaded.

March 15) The robot according to claim 1, characterized in that the first provi ¬ tive opposition to the pressure in the pipe is composed of a cylinder (7) formed with a material having the qualities of being soft and extensible (eg, copper, lead, etc..) surrounding the central axis (8) tapered (6), and acting via the huddling against the pipe wall, for the distribution of the pres-

L 0 by clearing sion of reaction components in different parts of the system pressure achieved by the axial movement of the ring (9) close to (80%) of the stroke of the central axis at the moment of locking, the distri ¬ bution of the pressure is limited to the first opposition of the device by the stop screw (10 a, 10 b) in the lower part of the millings

25 made on the central vertical axis, benefiting nearly (20%) the second ¬ th device, opposition and blocking.

4) The robot according to claims 1 and 3, characterized in that the second opposing means and consists of a locking cylinder (11) formed with a material having the qualities of being soft and expandable (eg 0 the copper, lead etc..) surrounding the central conical pin (14) and acting by huddling against the pipe wall by the pressure of its abutment against the edge of the cylinder (17) obtained by the linear movement of blocking the central axis, also draping imperfections in the pipe.

5) The robot according to claim 1, characterized in that the main part of the lock is made by the extension of the conical center axis (15) with (50%) from the difference in diameter of the conical inner diameters both ends of

comprises two parts completely b grooved (17) to have a better aggrippe ent on the pipe wall, and a portion covered with lead or copper (12).

The length of the axes (21 a, 21 b, 21 c, 21 d), and the length of the extension of the central axis (22) are variable depending on the level of the depth of the lock ¬ in the pipe or wells. The axes (21 a, 21 b, 21 c, d 1021) are fixed by one end in threaded holes (19 a, 19 b, 19 c, 19 d) on the edge of the upper cylinder (17) in steel, and the other ends of the support (23) of the cylinders. The extension of the central axis (22) of the locking system passes through a hole in the first support and the second support is fixed with nuts (30 a, 30 b). 15 The support (23) carrying the hydraulic cylinders (24 a, 24 b, 24 c, 24 d), the pistons of the cylinders are fixed to the second support (28) with screws (29 a, 29 b, 29 c, 29 d). The final locking of the system is obtained by the introduction ¬ cylinders (31 a, 31 b) into the pipe, and by tightening the nuts (30 a, 30 b) on the end of the central axis (22) . Two angle sensors 20 attached to the system, transmit the variations of angles during the insertion, to an electronic computer which controls the movements of the crane cylinders introducing the system in the pipe, and corrects the angle of the pipe .

A first alternative is achieved by reversing the conical locking system. - A second alternative is achieved by controlling the linear movement of the lock with rotary engines.

A third alternative is provided by the system to hang with screws (see figure 2).

A fourth variant is made by multiplying or reducing the avail-0 sitifs oppositions pressure.

Two pantographs are set at two levels of blocking ensuring its centering in the pipe subjected to very high pressures, ¬ panto each graph has four bearings (the 2 lb z, z, z l) for axial movement, which are welded to the edges of the locking system, and 5 axes (z 2a, 2b z) with bearings ensuring movements in one direction, and two other bearings (3a z, z 3b) also allowing the axial movement, which are welded to the ends of the two axes (z 2a, 2b z), with a third axis (z 4) ensuring the movement in the other direction; rings (5a z, z 5b, 5c z, z 5d) are screwed the threaded portions at the ends of the axes, limiting the movements of the two fields of the pantographs pipe radius, and the axes (4 z) of the two pantographs are held firmly with a crane D may be two double movement helping to find the angle of the pipe accurately.

Of angle sensors attached to the locking system, transmit the modi ¬ fications of the angles during the process of introduction of the system to an electronic computer which controls the movements of the cylinders of the crane 10 and corrects the angle of the pipe.

A variant of the centering is performed by controlling the movement ¬ ments of the locking system in all directions of the two pantographs with motors or hydraulic cylinders.

The central axis (8) taper (6) of the fifth embodiment is constituted by '5 the extension (22) of the piston (27) of the jack (24), or is screwed to the piston. Two axes (21 a, 21 b) are fixed from one end on the edge of the cylinder (17), and the other end of the cylinder body (24 x), the length of the axes (21 a, 21 b), and the length of the extension of the central axis (22), are variable according to the level of the depth of the blockage in the pipe. A sixth variant -0 comprises a conduit (34) in nearly the entire length of the central axis (15, 22) for the outlet of oil or gas through the pipe (36 a, 36 b) normalizing the upward pressure exerted by the multi ¬ cation of the biasing force by decreasing the surface of the dis-fluement by the introduction of the pipe or in the well; the dispo-sition 25 opposite the two pipes ensures the balance of system.

After blocking the wells, blocking the pipes (36 a, 36 b) is done with solenoid valves (35 a, 35 b) comprising electronic means responsive to locking and unlocking commands transmitted by radio control, and the solenoid valves (35 a, 35 b) are mounted on the pipes (36 a, 36 b). The main cylinder 30 (17) comprising locking therein a countersinking is composed of several layers of two metals having different ¬ ments comprises pressure, two layers are made of steel, and the third soft metal (eg . copper) providing a tolerance in the behavior of the cylinder (17) during the blocking process. - '5 The basic system includes a conduit tapered with the larger diameter towards the bottom (33), and several other conduits (33 a, 33 b) which flow to the central duct (34) increasing the flow extension. 6) The robot according to claims 1, 5, characterized in that the main portion 5 of the lock also comprises a wider than the slot profile (16) fixed to the central axis (15) and milling (13) (20) formed in the cylin ¬ dre, and comprising a bead of lead or copper on the entire length of the slot (20), the profile (16) exerts pressure on the ridge of lead and copper in the milling cutter (13) draping the slot (20) 10 by the linear movement of the central pin.

7) The robot according to any one of claims, characterized in that the outer wall of the blocking cylinder comprises two fully grooved portions (17) to have the best aggrippement on the inner wall of the pipe, and a portion covered with lead or copper (12). 158) robot according to claim 1, characterized in that the length of the pins (21 a, 21 b, 21 c, 21 d) and the length of the extension of the central axis (22) are variable depending on the level the depth of the blockage in the pipe, the axes (21 a, 21 b, 21 c, 21 d) are secured by one end in threaded holes (19 a, 19 b, 19 c 19 d) formed on the edge of the? 0 top of the cylinder (17) made of steel, and the other ends to a support (23) of the jacks, the extension of the central axis (22) of the locking system passes through a hole in the first support, and fixed on the second support (28) with nuts (30 a, 30 b).

9) The robot according to claims 1 and 8 characterized in that the carrier 25 (23) carries the hydraulic cylinders (24 a, 24 b, 24 c, 24 d) and the pistons of the jacks are fixed on the second support (28) with screws (29 a, 29 b, 29 c, 29 d).

10) The robot according to any one of claims, characterized in that the final locking of the system is obtained by the introduction of rollers (31

30 a, 31 b) into the pipe, and by tightening the nuts (30 a, 30 b) on the end of the central axis (22).

11) The robot according to claim 1, characterized in that two angle sensors attached to the system transmit changes in angles at the time of introduction, to an electronic computer which controls the movements

- 5 cylinders of the crane in the system entering the pipe, and corrects the angle of the pipe.

12) The robot according to any one of claims, characterized in that, a first embodiment is performed by reversing the taper of the locking system. 13) The robot according to any one of claims, characterized in that, a second embodiment is achieved by controlling the linear movement of lock with rotary engines. May 14) robot according to any one of claims, characterized in that, a third embodiment is achieved by controlling the linear movement with locking screws (see picture 2).

15) The robot according to any one of claims, characterized in that, a fourth embodiment is realized by multiplication or by lower

10As soon devices opposition to the pressure in the pipe.

16) The robot according to any one of claims, characterized in that it comprises a centering system for introduction into a pipe subjected to very high pressures, comprising two pantographs, located at two levels of each blocking system comprising four bearings (the z 5, lb z, z, z-ld) for axial movement, which are welded to the edges of the locking system, and two axes (Z 2a, Z 2b) with bearings ensuring movements in a direction, and two other bearings (z 3a, 3b z) also permitting axial movement, which are welded to the ends of the two axes (Z 2a, Z 2b), with a third axis (z 4) ensuring the movement

Ments 20 in the other direction, and the rings (z 5a, 5b z, z 5c, 5d z) screwed onto threaded portions at the ends of the axes of motion limiting the scope of the two pantographs pipe radius.

17) The robot according to claims 1, 11, 16, characterized in that the two axes (4 z) of the pan geographers, are held firmly with a crane

25 may be two double touuver helping the movement angle of the pipe; angles of sensors attached to the locking system, the transmit modi ¬ fications of angles during the process of introduction of the system to an electronic computer which controls the cylinder movements of the crane

rate of the affluement , and decreasing the pressure upward to allow the introduction of the system into the well with the minimum of stress.

A seventh embodiment comprises the cylinder, a milling ellipsoidal (52), and locking is obtained by pivotal movement of a quarter of a turn of a five axis ellipsoidal shape (52 a) in the cylinder having a slot him enabling the extension, and the grooves (17) on the outer side of Interior ¬ its entire length.

The length of the extension of the cylinder (53) and the central axis will vary depending on the depth of the level of blockage in the pipe. The basic system includes a conduit tapered with the larger diameter toward the bottom, connected to the central duct (34) formed in almost the entire length of the axis, the upward pressure exerted normalizing by multiplying by the biasing force the reduction in the surface of the pipe by the in ¬ troduction of the system. After blocking the wells, blocking the conduit is provided by solenoid valves (35 a, 35 b) comprising electronic means sensitive to lock and release commands by radio remote control. A horizontal axis (48) welded to the cylinder the cylinder (24) which controls the movement of the blocking piston (27) biasing the member (47) welded to the central axis, and the ball bearing (45) fixed to the central axis, and part of its outer curve of the cylinder facilitates the pivoting of a quarter turn of the locking and unlocking.

The means against the pressure is comprised of a copper cylinder (11 a) integral with the locking cylinder (17) having helical-shaped base (51) below which a further cylinder having in the upper part helicopter coïdale form made of steel, and fixed to the central axis, by providing the pivoting movement of a quarter turn of the locking cylinder of copper blotissement against the inner wall of the pipe. A variant of the seventh embodiment is achieved by replacing the hydraulic cylinder by a rotating motor, fastened vertically above the system, the rotor of the motor forming part of the central axis, and the stator of the cylinder. The engine has electronic controls sensitive soft ¬ ments of rotation and stop.

The centering system is composed of the first, two pantographs, allowing the system to lock the movement in all directions in the field of work of the pipe radius.

The accompanying drawings are examples and do not limit the processes of the invention.

3018) Robot according to claims 1, 11, 16, 17, characterized in that a variant of the centering system is performed by controlling the movement of the locking system in all directions of the two pantographs with mo ¬ tors or hydraulic cylinders.

19) The robot according to any one of claims, characterized in that the cone axis 5 of the system of the fifth embodiment is constituted by the prolongation ¬ tion (22) of the piston (27) of the jack (24).

20) The robot according to any one of claims, characterized in that the conical axis of the system according to the fifth embodiment is screwed to the piston (27) of the jack (24).

21) The robot according to any one of claims, characterized in that two pins (21 a, 21 b) are fixed on the one end edge of the cylinder (17),

5 and the other end of the cylinder body (24). The length of the pins (21 a, 21 b), and the length of the extension of the central axis (22) are variable by ¬ ble level of depth in the pipe blockage.

22) The robot according to any one of claims, characterized in that sensors and pressure angles mounted on the locking system, 0 transmit changes of the angles of a computer system that controls electro ¯ nic movements rectify the crane cylinders, cylinders and centering for all parameters during the introduction of the system in the well.

23) The robot according to any one of claims, characterized in that a sixth embodiment according to the invention comprises a conduit (34) in nearly the entire length of the central axis (15, 22) providing affluement petro ¬ or gas, through the pipes (36 a, 36 b) normalizing the upward pressure exerted by the multiplication of the biasing force by decreasing the surface of the affuement by introducing into the pipe system or well, the opposite pipes available (36 a, 36 b) ensure the system which equilibrium.

24) The robot according to claim 23, characterized in that after the blocking of the wells, • locking the pipes (36 a, 36 b) is provided with solenoid ¬ nes (35 a, 35 b) comprising electronic means sensitive controls locking and unlocking transmitted by radio-control, valves (35 a, 35 b) are mounted on the pipes (36 a, 36 b).

25) The robot according to any one of claims, characterized in that the cylinder (17) for blocking, comprising on the inside a conical milling consists of several layers of metals with different behavior in the pressure, one of these layers being made of soft metal (eg copper) providing a tolerance in the behavior of the cylinder (17) during the locking process.

26) The robot according to claims 23, 24, characterized in that the base system comprises a conical duct, having the larger diameter down (33), and several other conduits (33 a, 33 b) to which flow the central conduit (34) multiplying the flow of affluement and descending upward pressure to allow the introduction into the well of the system with the minimum of stress.

27) Robot according to claims 23, 24, 26, characterized in that a variant of the sixth embodiment is achieved by increasing or decreasing the outputs of the affluement. May 28) robot according to any one of claims, characterized in that the locking cylinder of the seventh embodiment comprises a milling-dal ellipsoid (52), and the locking system is obtained by the rotation of a quarter turn, in an axis ellipsoidal shape (52 a) in the cylinder (17). 1029) The robot according to claim 28, characterized in that the extension of the cylinder (53) and the central axis varies with the level of depth of the lock ¬ cant wells.

30) Robot according to claims 28, 29, characterized in that the hori ¬ zontal axis (48) fixed on the cylinder, the support cylinder (24) which controls the lock 5 by movement of the piston (27) exerted on the axis (47) fixed on the central axis, the ball bearing (45) fixed on the central axis is curved with its outer portion of the cylinder, thus facilitating pivoting movement of the locking and unlocking system.

31) Robot according to claims 28, 29, 30, characterized in that the means of 0 against the pressure consists of a copper cylinder (11) integral with the

which a further cylinder with the upper helical shape, made of steel, and fixed to the central shaft, ensures the rotational movement of a quarter turn of locking , huddling of the copper cylinder 5 against the inner wall of the pipe.

32) Robot according to claims 28, 29, 30, 31, characterized in that a variation of the seventh variant, is achieved by replacing the hydraulic cylinder by a rotary engine mounted vertically above the system, forming the rotor of the motor part of the central axis of the cylinder and the stator; Ole engine comprising electronic means sensitive to controls pivoting movements of the locking 'and unlocking system.

Drawings 1/25 at 10/25 are all gathered together on the same system "UNIVERSAL 1". Drawings 11/25 to 18/25 are all gathered together on the same system "UNTVERSAL 2" drawings 19/25 at 24/25 are all gathered together on the same system "UNIVERSAL 3" 5 25 drawing is the third system variant "UNTVERSAL 4".

CITATIONS HORS BREVETS

Référence		
1	*	See references of WO9218746A1

* Cité par l'examinateur

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