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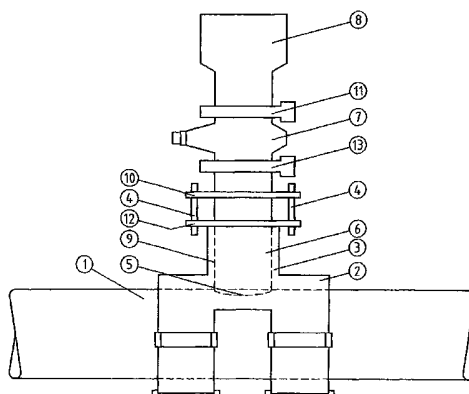
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(54) Title: APPARATUS FOR PENETRATING A PIPEWALL, COMPRISING AN INNER PIPE EQUIPPED WITH SEAL AND A PRETENSIONING DEVICE AND A METHOD FOR PENETRATING A PIPEWALL AND SETTING UP A CONNECTION POINT



(57) Abstract: Apparatus for penetrating the pipewall and setting up a connection point in a pipeline (1) containing fluid under pressure, in that the apparatus comprises a mounting device (2) for stable and correctly aligned mounting on the pipeline, a transition section (3) from the mounting device to a pretensioning device (4), a seal (5) for sealing against the pipeline surface, a volume (6) for holding the pipeline pressure, a valve (7) and a borer (8), and optionally additional mechanical connections, valves or devices. The apparatus is distinguished that the volume (6) is formed by an inner pipe (9) that fits into and is longitudinally movable in the transition section (3), wherein the inner part in one end towards the pipeline is equipped with a seal (5) and further away from the pipeline is equipped with one or more first reaction points (19) for affixing the pretensioning device (4), the valve (7), and further in the other end with a first mechanical coupling (11) for connecting the borer (8), wherein the inner pipe (9) via the one or more first reaction points (10) and the pretensioning device (4) is connected to one or more second reaction points (12) on the transition section. With the invention it is also provided methods with use of the apparatus, and use of the apparatus.



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Apparatus for penetrating a pipewall, comprising an inner pipe equipped with seal and a pretensioning device and a method for penetrating a pipewall and setting up a connection point

Field of the invention

The present invention regards an apparatus and a method for penetrating the pipewall and setting up a connection point in a pipe containing fluid under pressure. The invention is relevant for pipes situated on land, in water or buried, containing fluid of any type under pressure, but is in particular relevant for pipelines containing hydrocarbons under pressure, in particular pipelines laid out under water, where to a connection point is to be set up without prior shut down of the pipe line. Such setting up of a connection point in a pipeline under pressure, and the connection point itself, is termed a "hot tap" in the petroleum industry. In a particular embodiment the invention regards a method for diverless, remote setting up of a connection point in a pipeline under water containing fluid under pressure, hence a remote hot tap.

Prior art

At present two main types of apparatuses and methods for setting up a connection point of the above mentioned type exist.

The first main type of apparatus comprises sealing with a saddle formed plate laid against the pipeline surface. Sealing against the pipeline surface is achieved by gluing the saddle formed sealing plate against the pipeline surface (EP235917 and EP304246), brazing (EP235917) or welding. Another apparatus with saddle formed sealing plate is pretensioned against the surface of the pipeline, with a sealing material of elastomer or equivalent between the sealing surfaces. The pretensioning is achieved by fastening a clamp on the pipeline under pressure.

The second main type of apparatus, with associated methods for penetrating the pipewall and setting up a connection point in a pipe containing fluid under pressure, comprises the technology which is used by the petroleum industry at present. The practical use is in particular to connect a new pipeline to an older pipe line, for example for later field development. Thereby the cost of the new pipeline is reduced, while the old pipeline can have a prolonged life. The technology is in particular relevant for all the pipelines deployed in water without preinstalled devices for T-hot tap (T-indicates hot tap perpendicular to the pipeline), whereby a pressure container is constructed around the point for penetration of the pipewall, which pressure container constitutes a part of a fastening device against the pipeline. The fastening device/pressure container is either welded to the pipeline under pressure or the sealing is achieved with elastomeric seals integrated in a fastening clamp. In both cases,

welding or clamp, the pressure container may encompass the whole pipeline and the pressure. More specific the method including the welding (Stolt Halliburton Joint Venture, Stavanger, Norway) includes that two half clamps of plate structure are welded to the initial pipe by divers. Two longitudinal weld seams and two radial weld seams are made in each end of the clamp. Then the clamp is pressure tested, a borer is connected as found appropriate, and additional equipment. The method involving welding has been used twice on the Norwegian continental shelf. Oilstates Hydrotech Systems, Inc., Houston, TX, USA, is the leading supplier of clamps with integrated elastomer based seals. These are casted relatively heavy constructions with elastomer seals along the two splits and radially around the pipe under pressure in both ends of the clamp. Said clamps are used in the Oceaneering International's Deep Tap System, a remotely operated system for hot tap usable to 10000 foot depth, which system has to be installed in a vertical position, in addition to that the system is dependent on elastomer based seals integrated in the fastening clamp against the pipeline.

In order to set up a connection point in a pipeline under pressure it is required that the seal is integrated with or cooperating with a space to contain the pipeline pressure, a valve to close the pressure, a borer or a connection for this, and a fastening device for fastening against the pipeline.

Still some obvious disadvantages exist with the above-mentioned known embodiments. The embodiments based on gluing are insufficient with respect to withstanding high pressure. The embodiments with pretensioning of a whole saddle formed plate placed towards the pipeline surface further require a large pretensioning pressure and a very fine, even surface on all sealing surfaces, in order to function satisfactorily. The embodiments at present used by the petroleum industry on pipelines deployed in water, require welding and/or use of divers. Welding subsea, hyperbaric welding, requires setting up of a dry chamber and comprehensive use of divers and support functions, and diving is at present in the Norwegian sector limited to depths less than 180 meters.

The large areas of the pipeline surface that has to be encapsulated and the resulting long sealing distances increase the risk for leakage, the requirements to the preparations and the geometrical condition of the pipe. Further, a larger force is required for pretensioning, and uncertainty exists with respect to the long term durability of elastomeric seals.

Pipelines transporting petroleum components are often buried, the surface is often coated with concrete and other coatings difficult to remove, the surface roughness is often considerable, and small geometrical deviations from the nominal are not unusual. This puts considerable requirements to the preparations before hot tapping, and can result in insurmountable restrictions.

Still a significant demand exists for an apparatus that is less demanding with respect to the above-mentioned conditions, and which further neither requires welding nor is so large, heavy and unmanageable that adaption to remote diverless operation in practice is very difficult.

Summary of the invention

With the present invention an apparatus is provided for penetrating the pipewall and setting up a connection point in a pipeline containing fluid under pressure, which apparatus comprises a mounting device for stable and correctly aligned mounting on the pipeline, a transition section from the mounting device to a pretensioning device, a seal for sealing against the pipeline surface, a volume for holding the pipeline pressure, a valve and a borer, and optionally additional mechanical connections, valves or devices, and the apparatus is distinguished in that the volume is formed by an inner pipe that fits into and is longitudinally movable in the transition section, where the inner pipe in one end towards the pipeline is equipped with seal and further away from the pipeline is equipped with one or more first reaction points for affixing the pretensioning device, the valve, and further in the other end with a first mechanical coupling for connecting the borer, where the inner pipe via the one or more first reaction points and the pretensioning device is connected to one or more second reaction points on the transition section.

With the apparatus of the invention a seal is provided which forms a smaller area and shorter sealing length on the pipeline surface for containing the pipeline pressure, which sealing surface is found on the end of a pipe that is pretensioned by displacement in longitudinal direction against the pipeline under pressure. Because of the smaller area and the shorter sealing length a smaller pretensioning force is required for satisfactorily sealing, which again reduces the required dimensions for the fastening to the pipeline. By appropriate choice of seal, for example a metal seal, the pretensioning and the deformation can be adapted such that roughnesses on the pipeline surface and any other maladjustments are eliminated by the pretensioning, such that a good, stable seal is achieved.

An essential feature of the apparatus according to the invention is the inner pipe which for pretensioning is movable in the longitudinal direction in a transition section on the mounting device. The transition section is usually in the form of an outer pipe section where the inner pipe can be pretensioned against the pipeline by axial movement in the transition section. The pretensioning takes place between reaction points on the inner pipe and reaction points on the transition section. All sealing against the pipeline pressure is achieved with the seal on the end of the inner pipe, there is no seal on the mounting device with function to hold the pipeline pressure.

The invention also regards a method for penetrating the pipewall and setting up a connection point in a pipeline containing fluid under pressure, whereby the apparatus according to the invention is used. The method comprises that the mounting device first is mounted stable and correctly aligned on the pipeline, the inner pipe is put into the transition section, a mechanical connection is set up between the one or more first reaction points on the inner pipe and the one or more second reaction points on the transition section, the pretensioning device is mounted between said reaction points and is used to pretension the seal against the pipe surface with a predetermined force, whereafter, if present, a second mechanical coupling is set up, with subsequent mounting of the valve; the borer is mounted on the first mechanical coupling; pressure equalization to the pipeline pressure and pressure testing in the volume and the borer that is to contain the pipeline pressure is undertaken, and the borer is used to penetrate the pipewall, whereafter the borer is withdrawn sufficiently so that the valve can be closed, whereafter the borer is removed and the first mechanical coupling is connected to a second pipeline that is a branch to the main pipeline or is blanked for subsequent connection

The above mentioned method can be practiced on land, in the sea by use of divers, and for connection to pipelines containing fluid of any type under pressure.

With the present invention it is also provided a method for penetrating the pipewall and setting up a connection point in a pipeline containing fluid under pressure, which pipeline is situated deployed in water at depths with low accessibility or inaccessible for divers, whereby the apparatus according to the invention is utilized in a remotely controlled operation, with the Pipeline Repair System (PRS) (operated by Statoil) and further support functions. Said method is distinguished in that the three main parts of the apparatus, namely 1) the mounting device with transition section, 2) the inner pipe with the valve and 3) the borer, are brought down to an installation frame at the site for hot tapping, in that the pipe line is prepared and lifted up in an accessible position with the installation frame, whereby the three main parts of the apparatus dependent on dimensions, weight and water depths are brought down assembled by use of guidelines and/or guideposts, or are brought down separately or partly assembled for subsequent assembling, preferably by withdrawing the clamps at the mechanical couplings, for example by use of a ROV (remotely operated vehicle), in that clamping on the pipeline, pretensioning, pressure equalizing and pressure testing before penetrating, penetration, partly borer withdrawal, valve closing, complete borer withdrawal and connection to another pipeline or blanking is undertaken with a ROT (Remotely Operated Tool) integrated in the PRS, with transfer of hydraulic and electric power and control signals via a ROV, and with monitoring and further assistance as required by one or more ROV's or from a surface vessel.

The invention does also comprise use of the apparatus according to the invention, for setting up a connection point in a pipeline containing fluid under pressure.

Drawings

Figure 1 illustrates the apparatus according to the invention.

Figure 2 illustrates further details of the apparatus according to the invention.

Detailed description

With reference to Figure 1 the apparatus according to the invention for penetrating the pipewall and setting up a connection point in a pipeline 1 containing fluid under pressure, is illustrated, in that the apparatus comprises a mounting device 2 for stable and correctly aligned mounting on the pipeline, a transition section 3 from the mounting device to a pretensioning device 4, a seal 5 for sealing against the pipeline surface, a volume 6 for holding the pipeline pressure, a valve 7 and a borer 8. Optionally additional mechanical connections, valves and devices are provided. As mentioned the apparatus is distinguished in that the volume 6 is formed by an inner pipe 9 that fits into and is longitudinally movable in the transition section 3, where the inner pipe in one end towards the pipeline is equipped with seal 5 and further away from the pipeline is equipped with one or more first reaction points 10 for affixing the pretensioning device 4, the valve 7, and further in the other end with a first mechanical coupling 11 for connecting the borer 8, where the inner pipe 9 via the one or more first reaction points 10 and the pretensioning device 4 is connected to one or more second reaction points 12 on the transition section.

On Figure 1 it is also illustrated a second mechanical coupling 13, and further the hinges are indicated on the mounting device 2. The dimensions and the embodiment as illustrated are only for illustration, and can be varied provided that the distinguishing features of the invention are maintained.

With reference to Figure 2 further details are illustrated in form of a section where the inner pipe 9 is pretensioned against the pipeline 1. A double arrow indicates that the inner pipe 9 is longitudinally movable in the transition section 3. The seal 5 has been deformed a distance into the surface of the pipeline 1, whereby sealing of the volume 6 in the inner pipe 9 has been achieved. The seal 5 is in the form of a knife edge at the end of the inner pipe. The mounting device 2 and the transition section 3 are in Figure 2 assembled into one unit. Coating resulting in low friction between the transition section 3 and the inner pipe 9 can be provided. The dimensions and the embodiment as shown are only for illustration, and can be varied provided that the distinguishing features of the invention are maintained.

A particularly preferable apparatus according to the invention is distinguished in that the inner pipe 9 in one end towards the pipeline is provided with saddle formed seal 5 and further away from the pipeline in distance beyond the transition section the one or more first reaction points in form of a first flange 10 for connecting the pretensioning device 4, a second mechanical coupling 13, the valve 7, and further in the other end the first mechanical coupling 11 for connecting the borer 8, wherein the inner pipe via the first flange 10 and a pretensioning device 4 is connected to the one or more second reaction points in form of a second flange 12 on the transition section, and the mounting device 2 is without specific sealing elements having function to seal against the pipeline pressure.

On Figure 1 the second mechanical coupling 13 is illustrated, which gives possibility for closing on the pipeline side of valve 7, whereby possible valve leakage is avoided when the branch line is disconnected, and it is provided possibility for changing the valve 7 without disconnecting the hot tap.

In principle any type of seal can be utilized at the end of the inner pipe, so far as the seal under pretensioning can hold the pipeline pressure. However, it is preferred that the seal 5 is chosen amongst the group of knife edged formed seal of high strength steel or nickel alloy, metal seal in the form of knife edge or gasket of low strength steel, seals of graphite and/or PTFE with metal and/or polymer elements providing spring action and a hindrance to extrusion, or elastomer seal, in that the seal either is integrated in or permanently fastened at the end of the inner pipe 9 or is disconnectably connected to the inner pipe 9. Preferably the seal 5 is a saddle seal of metal in form of one or more knife edges designed to cut into the pipeline a predetermined distance during the pretensioning.

If the seal is disconnectable it can be placed loosely into the transition section for subsequent connection to the inner pipe. A such embodiment, however, results in an additional mechanical connection and thereby an additional source of leakage, and will therefore not be preferable. With very large dimension it may, however, be preferable to have the seal for example as a saddle formed ring loosely suspended in the transition section, which saddle formed sealing ring by moving the inner pipe in the transition section first will connect with the inner pipe and then will be pretensioned against the pipeline.

The inner axially movable pipe with seal will normally have to be provided with seal adapted to a specific pipe geometry.

In principle the pretensioning can be of any type that will give correct pretension that can be made permanent. It is preferred that the pretensioning device 4 is chosen from the group of hydraulic, mechanical, mechanical/hydraulic and electrohydraulic pretensioning devices. Most preferable the pretensioning device 4 is hydraulic/mechanical with half nut or reaction nut as indicated on Figure 1, since this

according to experience gives best control of the pretensioning, which can be made permanent by redrawing nuts or half nuts, and which is available in commercial embodiments that can be operated remotely. (Hydra-Tights, England; Headley Purvis or Hi-Torque). Half nuts will normally be utilized for remote operation.

The actual pretensioning can take place between reaction points in form of flanges, jacking or lifting points, or alternatively by screwing of a sleeve or collet, with clamps, or by other methods known by skilled persons. Preferably flanges and hydraulic tensioning of bolts are utilized, since this is the simplest embodiment which gives good control of the forces and can also be performed diverless.

The mounting device 2 can be adapted for use on a specific pipe geometry or an interval of pipe geometries. The mounting device is dimensioned to hold the apparatus under pretension in stable position, and is as mentioned without seals having function to seal against the pipeline pressure. However, it is possible to use mounting devices with seals, for example the introductory mentioned clamps with integrated elastomeric seals, whereby said seal will not have any sealing function against the pipeline pressure. If the operator has available usable clamps with the seals, in a version that can be operated remotely, it will normally be preferable to use the existing clamp instead of building a new clamp, in that the embodiment which involves the lowest amount of labor and cost will be most preferable.

The one or the mechanical couplings 11, 13 can in principle be chosen amongst all types of coupling with sufficient mechanical stability and which can hold the pipeline pressure. Preferably the mechanical couplings 11, 13 are chosen from the group of friction based couplings (typical Framo Engineering, PD), grip type couplings (typical Merlin), wrought couplings (typical Snams Hydra-lok and Nouvo Pignone, Cameron's Camforge or Big Inch Marine's Flexiforge), balls/forged-type couplings (typical Hydratight's Morgrip), flange couplings (either bolted flanges, clamp based couplings or collet type couplings), or machine couplings. Reference is made to DnV "recommended practice RP-F104", "Mechanical Pipeline Couplings", 1999. Most preferable are clamp based couplings or collet type couplings, because of simple connection, possibility for remote operation and commercial availability. (Kværner, Oslo, Norway; ABB, Asker, Norway). It is expected that even more preferable and preferred couplings will be available in the market in the future.

It is not obligatory with hot tap in 90° against the pipeline 1, whereby the hot tap is termed a T-hot tap. The angle refers to the angle between the longitudinal axis of the pipeline 1 and the inner pipe 9. If good ability for pigging is important, it can be preferable with a Y-hot tap, whereby the angle against the pipeline is different from 90°.

In order to achieve the technical effect of the invention, there is no specific requirements as to cross-section geometry of the inner pipe or requirements as to the

geometry of the seal, else that a sealing against the pipeline surface by stable axial movement or pretensioning of the inner pipe must be achievable. Accordingly, the inner pipe can for example be square, with the proviso that the transition section is adapted internally for stable axial movement of the inner pipe and the seal at the end is adapted to the pipeline surface or surface against which sealing is to be provided. With a square or rectangular inner pipe and transition section the sealing can for example have the geometry of two lines on the pipe surface parallel with the longitudinal axis of the pipe and two arc sections on the pipe surface. However, it is most preferable to use pipe geometry and saddle formed seal in order to minimize the sealing length, the sealing area, the required force for pretensioning, the dimensions on the mounting device and the preparations.

The apparatus can be modified for utilization on other objects than pipes, for example on pressure tanks. In such locations it can be necessary to modify the mounting device. The valve can be chosen amongst all types of valves that allow passage of the borer. Preferably a gate valve or a ball valve is chosen because the full pipe opening will thereby be available for the borer. The apparatus can comprise more than one valve, however, only one valve is required, which therefore is preferred.

The borer 8 can be chosen amongst several current types of saws and cutters. A leading supplier is T.D. Williamson, Tulsa, Oklahoma, USA. The borer has preferably devices for measuring the rotations per minute, position of the bore, the flow, the pressure on the cutting side and number of revolutions undertaken. It will in general, and in particular at large differential pressures, be required or preferable with a device integrated in the borer to fill the borer and the volume 6 with nitrogen, inert gas, oil, water or another non-explosive fluid to equalizing pressure against the pipeline pressure before the boring is commenced. Thereby both pressure equalization is achieved against the pipeline pressure as well as a pressure test of the pretensioned seal. A device for pressure equalization and pressure testing has to be provided for in the inner pipe 9 or with connection thereto if a borer is chosen without said device. The pressure equalization continues until a maximum allowable differential pressure between the pipeline 1 and the volume 6 is achieved, and the pressure test is undertaken by maintaining a predetermined test pressure in a period of time, in accordance with normal practice by skilled personnel who are considered able to find appropriate conditions for every occasion. It can be preferable to use incompressible fluids, which means liquids such as glycol, methanol, oil or water, to ease the pressure build-up and provide for possible use of seawater during operations subsea.

The setting up of a connection point will normally require considerable preparations and supplementary work, however, of less extent and easier character than when using prior art, as the preferable effects of the invention allow. Pipelines are often buried and shall after setting up of a connection point normally be left buried, in

a protected position. The preparations and supplementary work are in general considered to be within ordinary skill and are not a part of the invention, and will therefore not be further described. A further description with respect to the diverless method for hot tapping is on the contrary considered required for such operation.

Preferably a vessel with dynamic positioning on the sea surface or one or more heave compensated cranes are used for the diverless method. Further, the vessel is provided with at least one ROV of the work-class on board, with associated support functions. The preparations and supplementary work are preferably undertaken by use of the Pipeline Repair System (PRS), operated by Statoil, Kårstø, Norway. PRS comprises machines for remote breaking up and burying, lifting of the pipeline to position (installation frame), machines for remote removal of concrete, other coatings and optionally grinding/honing on the pipe surface (CRM). After setting up the hot tap the pipeline is buried if desirable and optionally protected with a protection structure against fishing trawls etc. In occasion with large dimensions, large depths or strong currents it can be preferable to use a dedicated support frame that is placed over the connection point on the sea bed, with devices preferably pre-installed in the support frame. The support frame preferably comprises a winch device where the apparatus is suspended operatable with ROV or from the vessel, in addition to handling wires.

It is considered obvious for skilled personnel to combine all features mentioned in the description and the claims or illustrated on the drawings, in ways and numbers that are not specifically described, without deviating from the spirit of the invention and the scope of the invention as these are interpreted by skilled personnel based upon the present associated patent claims interpreted with support from the description and the drawings.

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Claims

1. Apparatus for penetrating the pipewall and setting up a connection point in a pipeline (1) containing fluid under pressure, which apparatus comprises a mounting device (2) for stable and correctly aligned mounting on the pipeline, a transition section (3) from the mounting device to a pretensioning device (4), a seal (5) for sealing against the pipeline surface, a volume (6) for holding the pipeline pressure, a valve (7) and a borer (8), and optionally additional mechanical connections, valves or devices,

characterized in that the volume (6) is formed by an inner pipe (9) that fits into and is longitudinally movable in the transition section (3),

where the inner pipe in one end towards the pipeline is equipped with seal (5) and further away from the pipeline is equipped with one or more first reaction points (10) for affixing the pretensioning device (4), the valve (7), and further at the other end with a first mechanical coupling (11) for connecting the borer (8),

where the inner pipe (9) via the one or more first reaction points (10) and the pretensioning device (4) is connected to one or more second reaction points (12) on the transition section.

2. Apparatus according to claim 1, characterized in that the inner pipe (9) in one end towards the pipeline is equipped with saddle formed seal (5), and further away from the pipeline in distance outside the transition section the one or more first reaction point in form of a first flange (10) for affixing the pretensioning device (4), a first mechanical coupling (13), the valve (7), and further in the other end the first mechanical coupling (11) for connecting the borer (8),

where the inner pipe (9) via the first flange (19) and the pretensioning device (4) is connected to the one or more second reaction points in form of a second flange (12) on the transition section,

and the mounting device (2) is without specific sealing elements having function to seal against the pipeline pressure.

3. Apparatus according to claim 1 or 2, characterized in that the seal (5) is chosen from the group consisting of knife edge formed seal of high strength steel or nickel alloy, metal seal in form of knife edge or sealing ring of low strength steel, seals of graphite and/or PTFE with spring acting and extrusion sealing metal and/or polymer elements, or elastomeric seal, in that the seal

either is integrated in or permanent fastened to the end of the inner pipe (9) or is disconnectable connected to the inner pipe (9).

4. Apparatus according to anyone of the above claims, characterized in that the seal (5) is a saddle seal of metal in form of one or more knife edges designed to cut a predetermined distance into the surface of the pipeline during pretensioning.

5. Apparatus according to anyone of the previous claims, characterized in that the pretensioning device (4) is chosen amongst the group of hydraulic, mechanical, mechanical/hydraulic or electrohydraulic pretensioning devices, and preferably is hydraulic/mechanical with half nut or reaction nut.

6. Apparatus according to anyone of the above claims, characterized in that the mechanical couplings (11, 13) preferably is chosen amongst clamp based couplings or collet type couplings.

7. Apparatus according to anyone of the above claims, characterized in that the apparatus can have an angle towards the pipeline (1) containing fluid under pressure different from 90°, whereby the apparatus forms a piggable Y-hot tap.

8. Method for penetrating the pipewall and setting up a connection point in a pipeline (1) containing fluid under pressure, whereby the apparatus according to anyone of the above claims is utilized, characterized in that

the mounting device (2) first is mounted stable and correctly aligned on the pipeline,

the inner pipe (9) is put into the transition section (3),

mechanical connection is set up between the one or more first reaction points (10) on the inner part and the one or more second reaction points (12) on the transition section,

the pretensioning device (4) is mounted between said reaction points and is used for pretensioning the seal (5) against the pipe surface with a predetermined force, where after if present, the second mechanical coupling (13) is established, with subsequent mounting of the valve (7),

the borer is mounted on the first mechanical coupling (11), pressure equalization to the pipeline pressure and pressure testing in the volume (6) and borer (8) which is to hold the pipeline pressure is undertaken,

and the borer is used to penetrate the pipewall,

where after the borer is withdrawn sufficiently for the valve (7) to be closed, where after the borer is removed and the first chemical coupling (11) is connected to a second pipeline that is a branch to the main pipeline (1) or is blanked for subsequent connection.

9. Method for penetrating the pipewall and setting up a connection point in a pipeline (1) containing fluid under pressure, which pipeline is deployed in water hardly accessible or inaccessible for divers, whereby the apparatus according to anyone of claims 1 to 7 is utilized by remote operation, and the Pipeline Repair System (PRS) (operated by Statoil) and additional support functions, characterized in that the three main parts of the apparatus, namely 1) the mounting device with transition section, 2) inner pipe with valve and 3) borer, is deployed to an installation frame on the site for hot tapping, in that the pipeline is prepared and raised up to an accessible position with the installation frame, whereby the three main parts of the apparatus, dependent on dimensions, weight and water depths are deployed assembled by use of guidelines and/or guideposts, or are deployed separately or partly assembled for subsequent assembling, preferably by withdrawing the clamps at the mechanical couplings, for example by use of a ROV (remotely operated vehicle), in that the mounting of the pipeline, the pretensioning, the pressure equalization and pressure testing before boring, the boring, partly borer withdrawal, closing of the valve, full borer withdrawal and connection to a second pipeline or blanking is undertaken with a ROT (Remotely Operated Tool) integrated in PRS, with transfer of hydraulical and electrical power and control signals via a ROV and with monitoring and further assistance as required from one or more ROV's and from a surface vessel.
10. Use of the apparatus according to anyone of the claims 1 to 7, for setting up a connection point in a pipeline containing fluid under pressure.

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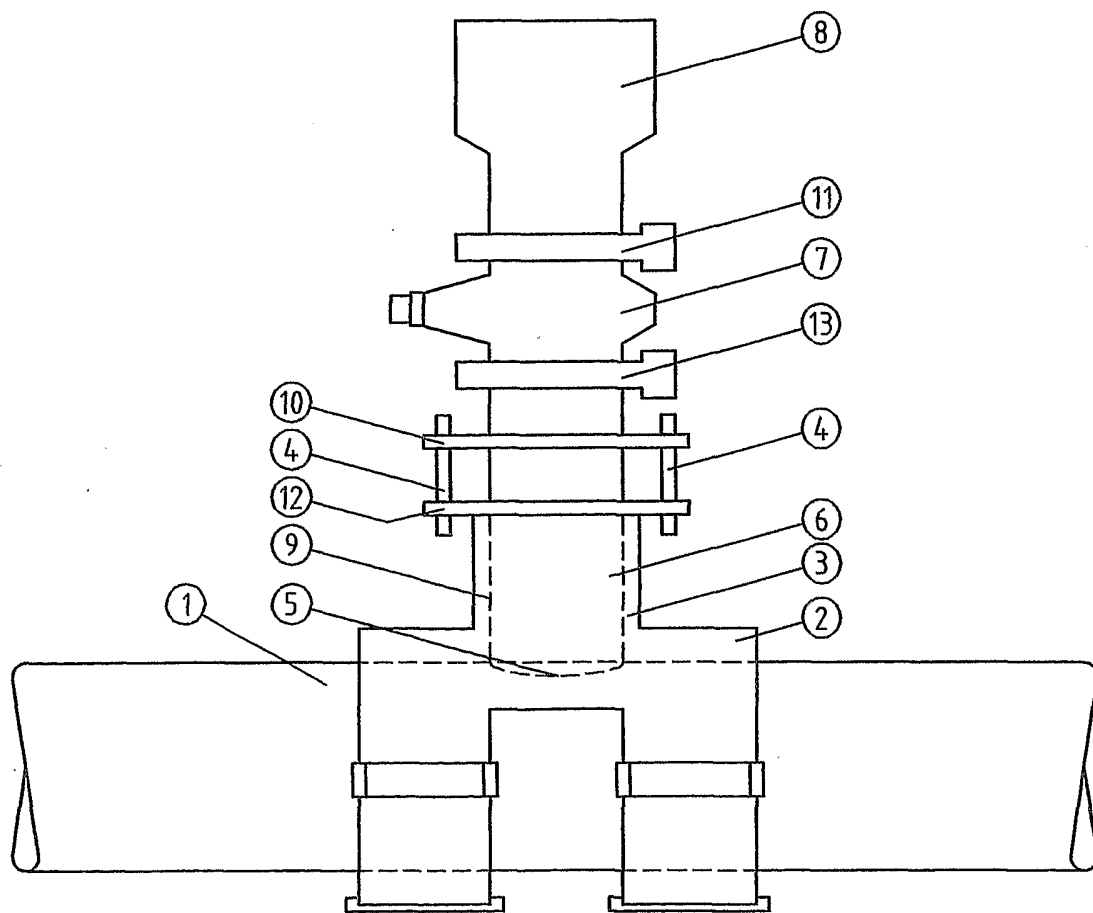


Fig. 1

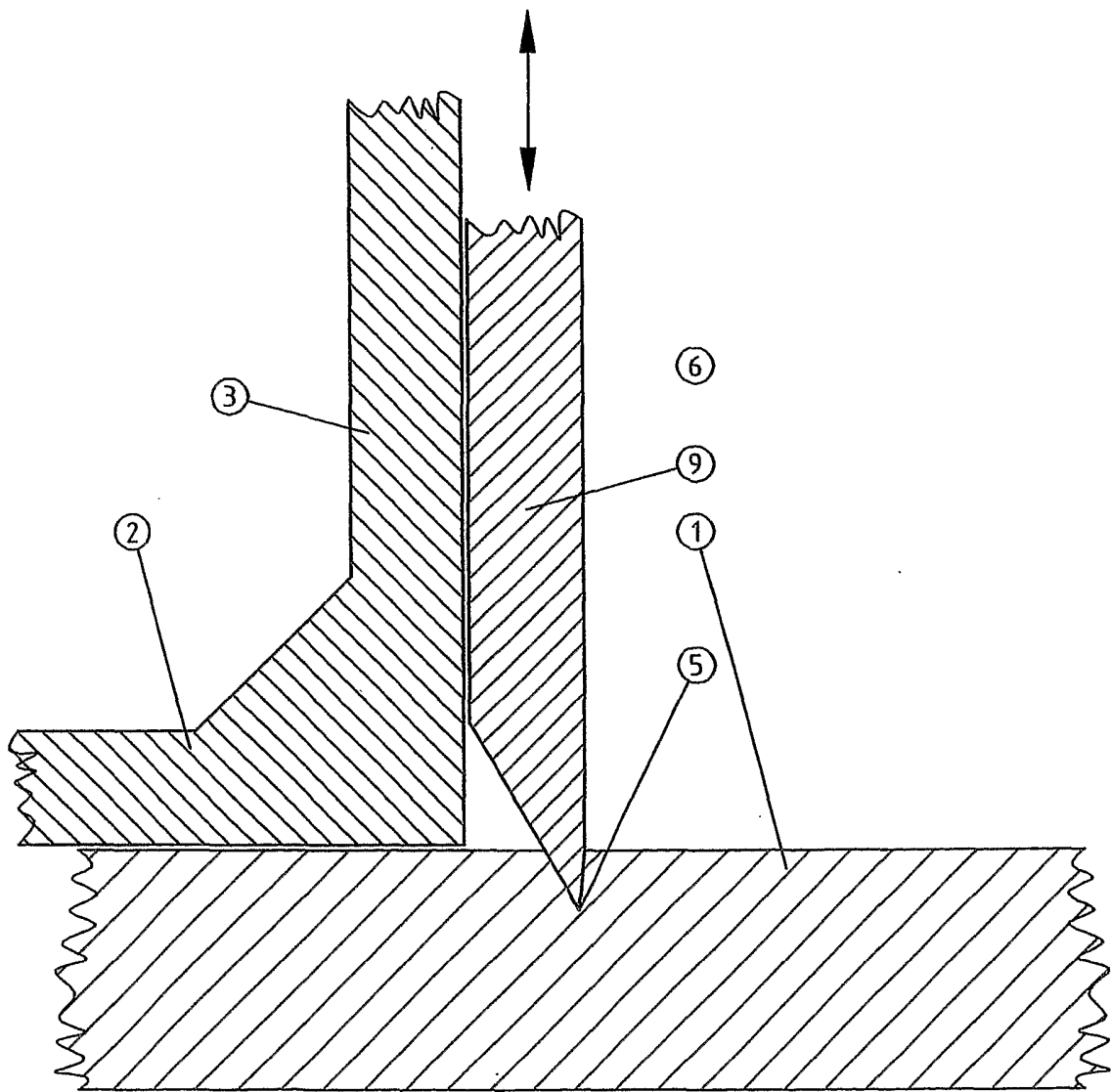


Fig. 2.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 02/00221

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: F16L 41/04 // F16L 41/08

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: F16L

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

SE,DK,FI,NO classes as above

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

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	DATABASE WPI Week 198217 Derwent Publications Ltd., London, GB; Class Q67, AN1982-E9171E & SU 844899 B (SLAVY METAL CUT RES), 10 July 1981 (1981-07-10) abstract, details 4,5,9,11,12 --	1-10
Y	SE 353785 B (F BOCCEDA), 12 February 1973 (12.02.73), figures 1,4,6,7, details 2,2a,3,3a,4,7, 8,8a,13,17,19 --	1-10
Y	SE 500024 C2 (L. TIGERHOLM), 21 March 1994 (21.03.94), page 1, line 1 - line 3, details 5,7, 11 --	1-10

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Date of the actual completion of the international search

25 Sept 2002

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 02/00221

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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02/09/02

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