CPC  COOPERATIVE PATENT CLASSIFICATION

E  FIXED CONSTRUCTIONS

EARTH DRILLING; MINING

E21  EARTH DRILLING; MINING

E21B  EARTH DRILLING, e.g. DEEP DRILLING (mining, quarrying E21C; making shafts, driving galleries or tunnels E21D); OBTAINING OIL, GAS, WATER, SOLUBLE OR MELTABLE MATERIALS OR A SLURRY OF MINERALS FROM WELLS

WARNING

The following IPC groups are not in the CPC scheme. The subject matter for these IPC groups is classified in the following CPC groups:

- E21B 1/12 - E21B 1/38 covered by E21B 1/00
- E21B 7/08 covered by E21B 7/06
- E21B 11/04 covered by E21B 27/00
- E21B 23/12 covered by E21B 23/002
- E21B 31/08 covered by E21B 27/00
- E21B 43/22 covered by C09K 8/58
- E21B 47/001 - E21B 47/009 covered by E21B 1/00
- E21B 47/013 - E21B 47/017 covered by E21B 1/00
- E21B 47/0224 - E21B 47/0236 covered by E21B 1/00
- E21B 47/047 - E21B 47/053 covered by E21B 1/00
- E21B 47/070 covered by E21B 1/00
- E21B 47/085 covered by E21B 1/00
- E21B 47/092 - E21B 47/098 covered by E21B 1/00
- E21B 47/103 - E21B 47/117 covered by E21B 1/00
- E21B 47/125 - E21B 47/135 covered by E21B 1/00
- E21B 47/20 - E21B 47/24 covered by E21B 1/00
- E21B 47/26 covered by E21B 1/00

Methods or apparatus for drilling

1/00  Percussion drilling (drives used in the borehole E21B 4/00; rotary drilling machines in general B23B)

1/02  .  .  Surface drives for percussion drilling

1/04  .  .  Devices for reversing the movement of the rod or cable at the surface (not used, see E21B 1/02)

3/00  Rotary drilling (drives used in the borehole E21B 4/00; rotary drilling machines in general B23B)

3/02  .  .  Surface drives for rotary drilling

3/025  .  .  with a to-and-fro rotation of the tool

3/03  .  .  with an intermittent unidirectional rotation of the tool

3/035  .  .  with slipping or elastic transmission

3/04  .  .  Rotary tables (portable drilling rigs with rotary tables E21B 7/02)

3/045  .  .  .  movably mounted on the drilling structure or platform (derricks adapted to be moved on their substructure E21B 15/003; specially adapted for underwater drilling, E21B 15/02)

2003/05  .  .  .  [with a to-and-fro rotation of the drill pipe or casing]

3/06  .  .  .  Adaptation of rotary draw works to drive rotary tables (connecting or disconnecting couplings or joints E21B 19/16; rope, cable, or chain winding mechanisms, capstans B66D)

4/00  Drives used in the borehole

4/003  .  [Bearing, sealing, lubricating details (for roller bits E21B 10/22; bearings in general F16C; sealing in general F16J; lubricating in general F16N)]

4/006  .  .  {Mechanical motion converting means, e.g. reduction gearings (E21B 4/10 takes precedence; gearings in general F16H)}

4/02  .  .  Fluid rotary type drives (hydraulic turbines for drilling wells F03B 13/02)

4/04  .  .  Electric drives (E21B 4/12 takes precedence)

4/06  .  .  Down-hole impacting means, e.g. hammers (percussion drill bits E21B 10/36; boring rams E21B 11/02; releasing-jars E21B 31/107)

4/08  .  .  .  impact being obtained by gravity only, e.g. with lost-motion connection

4/10  .  .  .  continuous unidirectional rotary motion of shaft or drilling pipe effecting consecutive impacts

4/12  .  .  .  Electrically operated hammers

4/14  .  .  .  Fluid operated hammers

4/145  .  .  .  [of the self propelled-type, e.g. with a reverse mode to retract the device from the hole]

4/16  .  .  .  Plural down-hole drives, e.g. for combined percussion and rotary drilling (E21B 4/10 takes precedence); Drives for multi-bit drilling units

4/18  .  .  .  Anchoring or feeding in the borehole
Methods or apparatus for drilling

E21B

7/00 Special methods or apparatus for drilling

7/001 . . (Drilling a non circular hole (excavating trenches E02F 5/02; cutting machines for slitting E21C 25/00))

7/002 . . (Drilling with diversely driven shafts extending into the borehole (simultaneously drilling and casing E21B 7/20; plural down-hole drives E21B 4/16; E21B 7/001 takes precedence))

7/003 . . (Drilling with mechanical conveying means (bailers, e.g. buckets, buckets E21B 27/00; tunnelling E21D))

7/005 . . . (with helical conveying means (E21B 7/20) takes precedence; augers E21B 10/44; drilling rods or pipes with helical structure E21B 17/22)

7/006 . . . . (combined with a bucket-type container (bailers with helical conveying means E21B 27/04))

7/007 . . (Drilling by use of explosives (underwater drilling using explosives E21B 7/1245; setting-tools actuated by explosives E21B 23/04, E21B 23/065; cutting or destroying objects in boreholes by explosives E21B 29/02; freeing objects using explosives E21B 31/075; gun or shaped-charge perforators E21B 43/116; fracturing by explosives E21B 43/29, E21B 43/248; taking samples using explosives E21B 49/04))

7/008 . . . (Drilling ice or a formation covered by ice)

7/02 Portable drilling rigs, truck-or skid-mounted, with their own drive (portable drilling rigs for use on underwater floors E21B 7/124)

7/021 . . . (With a rotary table, i.e. a fixed rotary drive for a relatively advancing tool (rotary tables E21B 3/04))

7/022 . . . (Control of the drilling operation: Hydraulic or pneumatic means for activation or operation (control circuits for drilling masts E21B 15/045))

7/023 . . . (the mast being foldable or telescopically retractable)

7/024 . . . . (having means for adapting to inclined terrain; having means for stabilizing the vehicle while drilling)

7/025 . . . (Rock drills, i.e. jumbo drills)

7/026 . . . (having auxiliary platforms, e.g. for observation purposes)

7/027 . . . (Drills for drilling shallow holes, e.g. for taking soil samples or for drilling postholes)

7/028 . . . . (the drilling apparatus being detachable from the vehicle, e.g. hand portable drills)

7/04 Directional drilling (derricks or masts specially adapted thereto E21B 15/04)

7/043 . . . (for underwater installations)

7/046 . . . (horizontal drilling (drilling with mechanical conveying means E21B 7/003))

7/06 . . . Deflecting the direction of boreholes (directional window cutting E21B 29/06; deflecting the direction of fishing tools E21B 31/14)

7/061 . . . (the tool shaft advancing relative to a guide, e.g. a curved tube or a whipstock)

7/062 . . . (the tool shaft rotating inside a non-rotating guide travelling with the shaft (E21B 7/067 and E21B 7/068 take precedence))

7/064 . . . . (specially adapted drill bits therefor)

7/065 . . . . [using oriented fluid jets]

7/067 . . . . . (with means for locking sections of a pipe or of a guide for a shaft in angular relation, e.g. adjustable bent sub)

7/068 . . . . (drilled by a down-hole drilling motor (down-hole drives per se E21B 4/00, E21B 7/067 takes precedence))

7/10 . . Correction of deflected boreholes

7/12 Underwater drilling (derricks or masts specially adapted thereto E21B 15/02; telescoping joints E21B 17/07; using heave compensators E21B 19/09)

7/122 . . . (with submersible vertically movable guide)

7/124 . . . (with underwater tool drive prime mover, e.g. portable drilling rigs for use on underwater floors)

7/125 . . . . (using explosive means (anchors driven in by explosive charges B63B 21/28))

7/128 . . . from floating support with independent underwater anchored guide base (guide line systems E21B 41/10)

7/132 . . . from underwater buoyant support

7/134 . . . . from non-buoyant support (E21B 7/124 takes precedence)

7/14 Drilling by use of heat, e.g. flame drilling (by use of explosives E21B 7/007)

7/143 . . . . (underwater)

7/146 . . . (Thermal lances)

7/15 . . of electrically generated heat

7/16 . . Applying separate balls or pellets by the pressure of the drill, so-called shot-drilling

7/18 Drilling by liquid or gas jets, with or without entrained pellets (E21B 7/14 takes precedence ( obtaining a slurry of minerals E21B 43/29); hydraulic monitors E21C 45/00)

7/185 . . . (underwater)

7/20 Drilling or forcing casings or pipes into boreholes, e.g. sinking; Simultaneously drilling and casing boreholes (surface means for applying to-and-fro rotation movements to the casing E21B 3/025; placing piles E02D 7/00; sinking shafts while moving the lining downwards E21D 1/08; making galleries by forcing prefabricated elements through the ground E21D 9/005)

7/201 . . . (with helical conveying means (drilling with helical conveying means E21B 7/005; augers E21B 10/44; drilling rods or pipes with helical structure E21B 17/22)

7/203 . . . . . (using down-hole drives (down-hole drives per se E21B 4/00))
Methods or apparatus for drilling

Drilling tools

10/00 Drill bits (specially adapted for deflecting the direction of boring E21B 7/064; with means for collecting substances E21B 27/00)

10/003 . . . [with cutting edges facing in opposite axial directions]

10/006 . . . [providing a cutting edge which is self-renewable during drilling]

10/02 Core bits (characterised by wear resistant parts E21B 10/46; obtaining undisturbed cores E21B 25/00)

10/04 . . . with core destroying means

10/06 . . . Roller core bits

10/08 . . . Roller bits (roller core bits E21B 10/06; with leading portion E21B 10/26; characterised by wear resistant parts E21B 10/46)

10/083 . . . [with longitudinal axis, e.g. wobbling or nutating roller bit (longitudinal axis roller reamers E21B 10/30)]

10/086 . . . [with excentric movement]

10/10 . . . with roller axle supported at both ends (with disc-cutters E21B 10/12)

10/12 . . . with disc cutters

10/14 . . . combined with non-rolling cutters other than of leading-portion type

10/16 . . . characterised by tooth form or arrangement

10/18 . . . characterised by conduits or nozzles for drilling fluids (drilling fluid supply to the bearings E21B 10/23)

10/20 . . . characterised by detachable or adjustable parts, e.g. legs or axes (cross axle roller bits E21B 10/10)

10/22 . . . characterised by bearing, lubrication or sealing details

2010/225 . . . [sealing details]

10/23 . . . [with drilling fluid supply to the bearings]

10/24 . . . characterised by lubricating details

2010/243 . . . [with drilling fluid supply to the bearing]

10/246 . . . [with pumping means for feeding lubricant]
Drilling tools

15/02 . . . specially adapted for underwater drilling (E21B 15/04 takes precedence; floating drilling platforms B63B 35/44; drilling platforms on legs E02B 17/00; [with skidding means E21B 15/003])

15/04 . . . specially adapted for directional drilling, e.g. slant hole rigs ([with skidding means E21B 15/003])

15/045 . . . [Hydraulic, pneumatic or electric circuits for their positioning]

17/00 Drilling rods or pipes; Flexible drill strings; Kellys; Drill collars; Sucker rods [; Cables]; Casings; Tubings (rod couplings in general F16D; tubes or tube couplings in general F16L)

17/003 . . . [with electrically conducting or insulating means (E21B 17/028 and E21B 17/023 take precedence)]

17/006 . . . [Accessories for drilling pipes, e.g. cleaners (wear protectors E21B 17/10; handling drilling pipes E21B 19/00; thread protectors B65D 59/00)]

17/01 . . . Risers ([connections between riser sections E21B 17/085; supporting a riser from a drilling or production platform E21B 19/004; riser connectors on well heads E21B 33/038]

17/012 . . . [with buoyancy elements (E21B 17/015 takes precedence)]

17/015 . . . [Non-vertical risers, e.g. articulated or catenary-type]

17/017 . . . [Bend restrictors for limiting stress on risers]

17/02 . . . Couplings; joints ([expandable couplings or joints E21B 43/106]

17/021 . . . [Devices for subsurface connecting or disconnecting by rotation (connecting or disconnecting pipe couplings or joints E21B 19/16; fishing tools for frozen rods, casings, ropes, bits or the like E21B 31/00])

17/023 . . . [Arrangements for connecting cables or wirelines to downhole devices]

17/025 . . . . [Side entry subs]

17/026 . . . . [Arrangements for fixing cables or wirelines to the outside of downhole devices (protectors and centralisers for cables and control lines E21B 17/1035)]

17/028 . . . . [Electrical or electro-magnetic connections]

17/03 . . . between drilling rod or pipe and drill motor, e.g. between drilling rod and hammer

17/04 . . . between rod [or the like] and bit or between rod and rod [or the like]

17/042 . . . threaded (readily releasing joints E21B 17/06)

17/0423 . . . . [with plural threaded sections, e.g. with two-step threads]

17/0426 . . . . [with a threaded cylindrical portion, e.g. for percussion rods]

17/043 . . . . with locking means

17/046 . . . . with ribs, pins or jaws, and complementary grooves or the like, e.g. bayonet catches

17/05 . . . . Swivel joints

17/06 . . . . Releasing-joints, e.g. safety joints

17/07 . . . . Telescoping joints for varying drill string lengths; Shock absorbers (heave compensators in the derrick E21B 19/09; releasing-jars E21B 31/107; [shock-absorbers in general F16F])

17/073 . . . . [with axial rotation]

17/076 . . . . [between rod or pipe and drill bit]

17/08 . . . . Casing joints

Other equipment or details for drilling; Well equipment or well maintenance

15/00 Derricks; Masts; [Other supports (drill rigs with movable understructures E21B 7/02)]

15/003 . . . [adapted to be moved on their substructure, e.g. with skidding means; adapted to drill a plurality of wells (slant-hole rigs E21B 15/04)]

15/006 . . . [Means for anchoring the drilling machine to the ground]
Other equipment or details for drilling; Well equipment or well maintenance

17/085 . . . [Riser connections (connectors for wellhead B21B 33/038)]
17/10 . Wear protectors; Centralising devices; [e.g. stabilisers] (drives used in the borehole with anchoring means E21B 4/18; guiding or centralising devices outside the borehole E21B 19/24)
17/1007 . . . (for the internal surface of a pipe; e.g. wear bushings for underwater well-heads)
17/1014 . . . [Flexible or expansible centering means, e.g. with pistons pressing against the wall of the well (E21B 17/1042 takes precedence)]
17/1021 . . . [with articulated arms or arcuate springs (measuring the diameter E21B 47/08)]
17/1028 . . . [with arcuate springs only, e.g. baskets with outwardly bowed strips for cementing operations]
17/1035 . . . (for plural rods, pipes or lines, e.g. for control lines)
17/1042 . . . [Elastomer protector or centering means]
17/105 . . . [split type]
17/1057 . . . (Centralising devices with rollers or with a relatively rotating sleeve (E21B 17/1014 takes precedence))
17/1064 . . . [Pipes or rods with a relatively rotating sleeve]
17/1071 . . . [specially adapted for pump rods, e.g. sucker rods]
17/1078 . . . (Stabilisers or centralisers for casing, tubing or drill pipes (devices for off-center positioning E21B 17/10; E21B 17/1007 - E21B 17/1064 take precedence))
17/1085 . . . [Wear protectors; Blast joints; Hard facing (wear protection included in centralising devices, see relevant subgroups)]
17/1092 . . . [Gauge section of drill bits]
17/12 . . . [Devices for placing or drawing out wear protectors]
17/14 . . . [Casing shoes (for the protection of the bottom of the casing)]
17/16 . . . [Drill collars]
17/18 . . . [Pipes provided with plural fluid passages (E21B 17/203 takes precedence; circulation of drilling fluid by means of such pipes E21B 21/12; general F16L 39/00)]
17/20 . . . [Flexible or articulated drilling pipes; e.g. flexible or articulated rods, pipes or cables (risers E21B 17/01; swivel joints E21B 17/05)]
17/203 . . . [with plural fluid passages]
17/206 . . . [with conductors, e.g. electrical, optical (hoses with electrically conducting means in general F16L 11/127)]
17/22 . . . [Rods or pipes with helical structure (drill bits with helical conveying portion E21B 10/44)]
19/00 Handling rods, casings, tubes or the like outside the borehole, e.g. in the derrick (surface drives E21B 1A/02, E21B 3A/02)
19/002 . . . [specially adapted for underwater drilling (E21B 19/09, E21B 19/143 take precedence; risers with buoyancy elements E21B 17/012, E21B 17/015)]
19/004 . . . [supporting a riser from a drilling or production platform]
19/006 . . . [including heave compensators]

19/008 . . . [Winding units, specially adapted for drilling operations (capstans, winches B66D; cathead actuated pipe wrenches or spinners E21B 19/162)]
19/02 . . . Rod or cable suspensions (load-engaging elements for hoisting or lowering purposes in general B66C 100; crown blocks or pulley blocks B66D; cable guides B66D 136)
19/04 . . . [Hooks]
19/06 . . . [Elevators, i.e. rod or tube gripping devices]
19/07 . . . [Slip-type elevators (slips E21B 19/10)]
19/08 . . . [Apparatus for feeding the rods or cables (E21B 19/22 takes precedence; automatic feed E21B 44/02; hoisting drums B66D); Apparatus for increasing or decreasing the pressure on the drilling tool; Apparatus for counterbalancing the weight of the rods]
19/081 . . . [Screw-and-nut feed mechanisms]
19/083 . . . [Cam, rack or like feed mechanisms]
19/084 . . . [with flexible drawing means; e.g. cables]
19/086 . . . [with a fluid-actuated cylinder (E21B 19/084, E21B 19/087, E21B 19/09 take precedence)]
19/087 . . . [by means of a swinging arm]
19/089 . . . [with a spring or an additional weight]
19/09 . . . [specially adapted for drilling underwater formations from a floating support using heave compensators supporting the drill string (drilling-pipe telescoping joints E21B 17/07; heave compensators for supporting a riser E21B 19/006)]
19/10 . . . [Slips; Spiders; Catching devices (rotary tables with master bushing or kelly bushing E21B 3D; slip-type elevators E21B 19/07; casing heads with slips E21B 3D/02)]
19/12 . . . [Rope clamps (rope clamps in general F16G 11/00; rod, casings or tube clamps not secured to elevators)]
19/14 . . . [Racks, ramps, troughs or bins, for holding the lengths of rod singly or connected; Handling between storage place and borehole (E21B 19/20; E21B 19/22 take precedence; storing elongated articles in general B65G 10/442)]
19/143 . . . [specially adapted for underwater drilling]
19/146 . . . [Carousel systems, i.e. rotating rack systems]
19/15 . . . [Racking of rods in horizontal position; Handling between horizontal and vertical position]
19/155 . . . [Handling between horizontal and vertical position]
19/16 . . . [Connecting or disconnecting pipe couplings or joints (E21B 19/20 takes precedence; pipe wrenches or the like B25B)]
19/161 . . . [using a wrench or a spinner adapted to engage a circular section of pipe (E21B 19/168 takes precedence)]
19/162 . . . [cathead actuated]
19/163 . . . [piston-cylinder actuated]
19/164 . . . [motor actuated (E21B 19/162 and E21B 19/163 take precedence)]
19/165 . . . [Control or monitoring arrangements therefor]
19/166 . . . [Arrangements of torque limiters or torque indicators]
19/167 . . . [using a wrench adapted to engage a non circular section of pipe, e.g. a section with flats or splines]
Other equipment or details for drilling; Well equipment or well maintenance

21/00 Methods or apparatus for flushing boreholes, e.g. by use of exhaust air from motor (freeing objects stuck in boreholes by flushing E21B 31/03; well drilling compositions C09K 8/02)

21/01 . [specially adapted for underwater drilling]

21/02 . [Down-hole drilling fluid separation systems (containers comprising collecting means with a strainer E21B 27/005; subsoil filtering E21B 43/02; down-hole production separators E21B 43/38)]

21/03 . [Means for stopping loss of drilling fluid (plastering the borehole wall E21B 33/138)]

2021/005 . . (gaseous fluids)

2021/006 . . [Underbalanced techniques, i.e. where borehole fluid pressure is below formation pressure]

2021/007 . . [Arrangements for handling drilling fluids or cuttings outside the borehole, e.g. mud boxes]

2021/008 . . . (Means engaging the bore entrance, e.g. hoods for collecting dust)

21/01 . Arrangements for handling drilling fluids or cuttings outside the borehole, e.g. mud boxes ([swivel joints in hose-lines E21B 21/02]; arrangements for treating drilling fluids E21B 21/06; waste disposal systems E21B 41/005)

21/02 . . [using exhaust air from the drilling motor for blowing off the dust at the borehole entrance]

21/03 . . . [Means engaging the bore entrance, e.g. hoods for collecting dust]

21/04 . Swivel joints in hose-lines (hose connections in general F16L 31/00; F16L 33/00)

21/06 . Arrangements for treating drilling fluids outside the borehole (treating steps per se, see the relevant subclasses)

2021/061 . . . [for treating dust-loaded gaseous fluids]

21/02 . . . [by mixing components]

21/03 . . . [by separating components]

21/04 . . . . [Separating solids from drilling fluids]

21/06 . . . . . . . [with further treatment of the solids, e.g. for disposal]

21/067 . . . [Separating gases from drilling fluids]

21/068 . . . . [using chemical treatment]

21/07 . . . for treating dust-laden gaseous fluids

21/08 . Controlling or monitoring pressure or flow of drilling fluid, e.g. automatic filling of boreholes, automatic control of bottom pressure (valve arrangements therefor E21B 21/10)

21/10 . Valves arrangements in drilling fluid circulation systems (valves in general F16K)

21/103 . . . [Down-hole by-pass valve arrangements, i.e. between the inside of the drill string and the annulus]

21/106 . . . [Valve arrangements outside the borehole, e.g. kelly valves]
Other equipment or details for drilling; Well equipment or well maintenance

25/06  the core receiver having a flexible liner or inflatable retaining means
25/08  Coating, freezing, consolidating cores (E21B 25/06 takes precedence); Recovering unconsolidated cores or cores at formation pressure
25/10  Formed core retaining or severing means (E21B 25/06, E21B 25/08 take precedence)
25/12  . of the sliding wedge type
25/14  . mounted on pivot transverse to core axis
25/16  . for obtaining oriented cores
25/18  the core receiver being specially adapted for operation under water

27/00  Containers for collecting or depositing substances in boreholes or wells, e.g. bailers, (baskets or buckets) for collecting mud or sand; Drill bits with means for collecting substances, e.g. valve drill bits
27/005  (Collecting means with a strainer)
27/02  Dump bailers, i.e. containers for depositing substances, e.g. cement or acids
27/04  where the collecting or depositing means including helical conveying means ((drilling with helical conveying means combined with bucket-type container E21B 7/006))

28/00  Vibration generating arrangements for boreholes or wells, e.g. for stimulating production (for drilling E21B 7/24; for fishing for or freeing objects E21B 31/005; for transmitting measuring-signals E21B 47/14; for geophysical measurements G01V 1/02)

WARNING
Group E21B 28/00 is not complete. See also E21B 43/003

29/00  Cutting or destroying pipes, packers, plugs, or wire lines, located in boreholes or wells, e.g. cutting of damaged pipes, of windows (perforators E21B 43/11); Deforming of pipes in boreholes or wells; Reconditioning of well casings while in the ground (by enlarging drilled holes or counterboring E21B 7/28)
29/002  (Cutting, e.g. milling, a pipe with a cutter rotating along the circumference of the pipe)
29/005  (with a radially-expandable cutter rotating inside the pipe, e.g. for cutting an annular window)
29/007  (with a radially-retracting cutter rotating outside the pipe)
29/02  by explosives or by thermal or chemical means ((freeing stuck objects by explosives E21B 31/002); destroying objects in boreholes or wells by explosives E21B 31/16)
29/04  Cutting of wire lines or the like (E21B 29/02 takes precedence)
29/06  Cutting windows, e.g. directional window cutters for whiststock operations (E21B 29/006 and E21B 29/008 take precedence; whiststocks E21B 7/001))
29/08  Cutting or deforming pipes to control fluid flow (shear type blow-out preventers E21B 33/063)
29/10  Reconditioning of well casings, e.g. straightening specially adapted for underwater installations (E21B 29/08 takes precedence)

31/00  Fishing for or freeing objects in boreholes or wells ((using junk baskets or the like E21B 27/00); provisions on well heads for introducing or removing objects E21B 33/068; locating or determining the position of objects in boreholes or wells E21B 47/00)
31/002  (Destroying the objects to be fished, e.g. by explosive means (cutting by explosives E21B 29/02)
31/005  [using vibrating or oscillating means (vibration generating arrangements for boreholes or wells E21B 28/00)
31/007  [fishing tools with means for attaching comprising fusing or sticking]
31/03  Freeing by flushing ([ Controlling differential pipe sticking]
31/06  . using magnetic means
31/107  . using impact means for releasing stuck parts, e.g. jars (telescoping joints E21B 17/07)
31/1075  . (using explosives)
31/113  . hydraulically-operated
31/1135  . [Jars with a hydraulic impedance mechanism, i.e. a restriction, for initially delaying escape of a restraining fluid]
31/12  . Grappling tools, e.g. tongs or grabs
31/125  . [specially adapted for parted wire line or ropes]
31/14  . with means deflecting the direction of the tool, e.g. by use of knuckle joints (apparatus for deflecting the boring E21B 7/06)
31/16  . combined with cutting or destroying means (cutting or destroying means per see E21B 29/00)
31/18  . gripping externally, e.g. overshot
31/20  . gripping internally, e.g. fishing spears

33/00  Sealing or packing boreholes or wells
33/005  [Sealings characterised by their shape]
33/02  Surface sealing or packing
33/03  . Well heads; Setting-up thereof (valve arrangements therefor E21B 34/02)
33/035  . specially adapted for underwater installations (E21B 33/043, E21B 33/064, E21B 33/076 take precedence)
33/0355  . . [Control systems, e.g. hydraulic, pneumatic, electric, acoustic, for submerged well heads]
33/037  . . Protective housings therefor
33/0375  . . . [Corrosion protection means (in general C23E)]
33/038  . . . Connectors used on well heads, e.g. for connecting blow-out preventer and riser (connecting a production flow-line to an underwater well head E21B 43/013)
33/0385  . . . [electrical connectors (underwater electrical connections in general H01R 13/523)]
33/04  . Casing heads; Suspending casings or tubings in well heads (setting of casings in wells E21B 43/10)
33/0407  . . [with a suspended electrical cable]
33/0415  . . [rotating or floating support for tubing or casing hanger]
33/0422  . . [a suspended tubing or casing being gripped by a slip or an internally serrated member (slips in rotary table E21B 19/10)]
Other equipment or details for drilling; Well equipment or well maintenance

33/043 . . . . specially adapted for underwater well heads ([E21B 33/047;] E21B 33/047 take precedence)
33/047 . . . . for plural tubing strings
33/050 . . . . Cementing-heads, e.g. having provision for introducing cementing plugs
33/066 . . . . Blow-out preventers (i.e. apparatus closing around a drill pipe, e.g. annular blow-out preventers (rotating blow-out preventers E21B 33/085; valves E21B 33/040)
33/061 . . . . [Ram-type blow-out preventers, e.g. with pivoting rams]
33/062 . . . . (with sliding rams)
33/063 . . . . {for shearing drill pipes (cutting of wireline E21B 29/04; cutting pipes E21B 29/08)}
33/064 . . . . specially adapted for underwater well heads (connectors therefor E21B 33/038; control systems for submerged well-heads E21B 33/025)
33/068 . . . . having provision for introducing objects or fluids into, or removing objects from, wells (cementing heads E21B 33/045; wipers, oil savers E21B 33/040)
33/072 . . . . for cable-operated tools (E21B 33/076 takes precedence)
33/076 . . . . specially adapted for underwater installations
33/088 . . . . Wipers; Oil savers
33/085 . . . . [Rotatable packing means, e.g. rotating blow-out preventers]
33/10 . . . . in the borehole (sealing the junction between main bore and laterals E21B 41/0042)
2033/105 . . . . [characterised by sealing the junction between a lateral and a main bore]
33/12 . . . . Packers; Plugs (locking packers or plugs in landing nipples E21B 23/02); used for cementing E21B 33/134, E21B 33/16)
33/1204 . . . . [permanent; drillable]
33/1208 . . . . [characterised by the construction of the sealing or packing means (E21B 33/127 takes precedence)]
33/1212 . . . . (including a metal-to-metal seal element)
33/1216 . . . . [Anti-extrusion means, e.g. means to prevent cold flow of rubber packing]
33/122 . . . . Multiple string packers
33/124 . . . . Units with longitudinally-spaced plugs for isolating the intermediate space
33/1234 . . . . [with inflatable sleeves]
33/1246 . . . . [inflated by down-hole pumping means operated by a pipe string]
33/126 . . . . with fluid-pressure-operated elastic cup or skirt (E21B 33/122; E21B 33/124 take precedence)
33/1265 . . . . [with mechanical slips]
33/127 . . . . with inflatable sleeve (E21B 33/122, E21B 33/124 take precedence)
33/1272 . . . . [inflated by down-hole pumping means operated by a pipe string]
33/1275 . . . . [inflated by down-hole pumping means operated by a down-hole drive]
33/1277 . . . . [characterised by the construction or fixation of the sleeve]
33/128 . . . . with a member expanded radially by axial pressure (E21B 33/122, E21B 33/124; E21B 33/129 take precedence; characterised by the construction of the sealing means E21B 33/1208)
33/1285 . . . . [by fluid pressure]
33/129 . . . . with mechanical slips for hooking into the casing (E21B 33/122, E21B 33/124 take precedence)
33/1291 . . . . [anchor set by wedge or cam in combination with frictional effect, using so-called drag-blocks (E21B 33/1295 takes precedence)]
33/1292 . . . . [with means for anchoring against downward and upward movement]
33/1293 . . . . [with means for anchoring against downward and upward movement (E21B 33/1291, E21B 33/1295 take precedence)]
33/1294 . . . . [characterised by a valve, e.g. a by-pass valve]
33/1295 . . . . actuated by fluid pressure
33/12955 . . . . [using drag blocks frictionally engaging the inner wall of the well]
33/13 . . . . Methods or devices for cementing, for plugging holes, crevices, or the like (dump bailers E21B 22/02; methods or apparatus for grouting offshore structures E02B 17/0008; chemical compositions therefor C09K 8/00)
33/134 . . . . Bridging plugs [packers E21B 33/123]
33/136 . . . . Baskets, e.g. of umbrella type
33/138 . . . . Plastering the borehole wall; Injecting into the formations [(packers E21B 33/12; consolidation of loose sand or the like around the wells without excessively decreasing the permeability thereof E21B 43/025, compositions therefor C09K 8/56)]
33/14 . . . . for cementing casings into boreholes [(using special cement compositions C09K 8/42; control of cementation quality or level E21B 47/0005)]
33/143 . . . . [for underwater installations]
33/146 . . . . [Stage cementing, i.e. discharging cement from casing at different levels]
33/16 . . . . using plugs for isolating cement charge; Plugs therefor [(spacer compositions C09K 8/424; stage cementing E21B 33/146)]
34/00 Valve arrangements for boreholes or wells (in drilling fluid circulation systems E21B 21/10; tool diverters E21B 23/002; blow-out preventers E21B 33/06; oil flow regulating apparatus E21B 43/12; valves in general E16K)
2034/002 . . . . [Ball valves]
2034/005 . . . . [Flapper valves]
2034/007 . . . . [Sleeve valves]
33/02 . . . . in well heads
34/04 . . . . in underwater well heads
34/045 . . . . [adapted to be lowered on a tubular string into position within a blow-out preventer stack, e.g. so-called test trees]
34/06 . . . . in wells
34/063 . . . . [Valve or closure with destructible element, e.g. frangible disc (E21B 34/103 takes precedence)]
34/066 . . . . [electrically actuated]
Other equipment or details for drilling; Well equipment or well maintenance

E21B

37/06 . using chemical means for preventing, limiting [or eliminating] the deposition of paraffins or like substances (chemical compositions therefor C09K 8/52)

37/08 . cleaning in situ of down-hole filters, screens, [e.g. casing perforations] or gravel packs (E21B 37/06 takes precedence)

37/10 . Well swabs [(pistons in general E16B)]

40/00 Tubing catchers, automatically arresting the fall of oil-well tubing [(preventing small objects from falling into the borehole E21B 41/0021)]

41/00 Equipment or details not covered by groups E21B 15/00 - E21B 40/00

41/007 . [for underwater installations (E21B 41/005, E21B 41/04, E21B 41/06, E21B 41/08, E21B 41/10 take precedence)]

41/0014 . [Underwater well locating or reentry systems]

41/0021 . [Safety devices, e.g. for preventing small objects from falling into the borehole]

204100/028 . [Fuzzy logic, artificial intelligence, neural networks, or the like]

41/0035 . [Apparatus or methods for multilateral well technology, e.g. for the completion of or workover on wells with one or more lateral branches (whipstocks E21B 7/06); tool diverters E21B 23/002; cutting casing windows E21B 29/06; specific well pattern E21B 43/30)]

41/0042 . [characterised by sealing the junction between a lateral and a main bore]

41/005 . [Waste disposal systems (treatment of drilling fluid outside the borehole E21B 21/06; collecting oil or the like from a submerged leakage E21B 43/0122)]

41/0057 . [Disposal of a fluid by injection into a subterranean formation]

41/0064 . [Carbon dioxide sequestration (storing fluids in porous layers B65G 5/005)]

41/0071 . [Adaptation of flares, e.g. arrangements of flares in offshore installations (flares of waste gases or noxious gases F23G 7/08)]

41/0078 . [Nozzles used in boreholes (drilling by liquid or gas jets E21B 7/18; drill bits with nozzles E21B 10/60); perforators using direct fluid action E21B 43/114; obtaining a slurry of minerals using nozzles E21B 43/29; nozzles in general B05B)]

41/0085 . [Adaptations of electric power generating means for use in boreholes (generation of electric power per se H02)]

41/0092 . [Methods relating to program engineering, design or optimisation]

41/02 . in situ inhibition of corrosion in boreholes or wells (dump bailers E21B 27/02; chemical compositions therefor C09K 8/54; inhibiting corrosion in general C23F)

41/04 . Manipulators for underwater operations, e.g. temporarily connected to well heads (manipulators in general B25J)

41/06 . Work chambers for underwater operations, e.g. temporarily connected to well heads (in general B66C 11/00)
41/08 . Underground guide bases, e.g. drilling templates; Levelling therefor

**WARNING**

This group was introduced in January 2000. Patent documents are continuously being reclassified to this group from groups E21B 7/12, E21B 33/035, E21B 43/017

41/10 . Guide posts, e.g. releasable; Attaching guide lines to underwater guide bases

### Obtaining fluids from wells

43/00 Methods or apparatus for obtaining oil, gas, water, soluble or meltable materials or a slurry of minerals from wells (applicable only to water E03B; obtaining oil-bearing deposits or soluble or meltable materials by mining techniques E21C 41/00; pumps F04)

43/003 . (Vibrating earth formations (vibration generating arrangements for boreholes or wells E21B 28/00))

43/006 . (Production of coal-bed methane (E21B 43/243 takes precedence; methods or devices for drawing-off gases for safety purposes in mines E21F 7/00))

43/01 . specially adapted for obtaining from underwater installations (underwater well heads E21B 33/035)

43/0107 . . . (Connecting of flow lines to offshore structures (E21B 43/013 takes precedence))

2043/0115 . . . (Drilling for or production of natural gas hydrate reservoirs; Drilling through or monitoring of formations containing gas hydrates)

43/0122 . . . (Collecting oil or the like from a submerged leakage (cleaning or keeping clear the surface of open water from oil or the like E02B 15/04))

43/013 . Connecting a production flow line to an underwater well head

43/0135 . . . . . . {using a pulling cable}

43/017 . . . Production satellite stations, i.e. underwater installations comprising a plurality of satellite well heads connected to a central station (underwater separating arrangements E21B 43/36)

43/02 . . . Subsoil filtering (E21B 43/11 takes precedence, chemical compositions therefor or the like around wells C09K 8/56)

43/025 . . . (Consolidation of loose sand or the like round the wells without excessively decreasing the permeability thereof (sealing borehole walls E21B 33/138))

43/04 . . . Gravelling of wells

43/045 . . . . . . {Crossover tools}

43/08 . . . Screens or liners (expandable screens or liners E21B 43/108; obtaining drinking water; filters E03B 3/18)

43/082 . . . . . . {Screens comprising porous materials, e.g. prepacked screens}

43/084 . . . . . . {Screens comprising woven materials, e.g. mesh or cloth}

43/086 . . . . . . {Screens with preformed openings, e.g. slotted liners (comprising porous materials E21B 43/082)}

43/088 . . . . . . {Wire screens (comprising porous materials E21B 43/082; comprising woven materials E21B 43/084)}

43/10 . . . Setting of casings, screens, liners (or the like) in wells (driving or forcing casings into boreholes, simultaneously drilling and casing boreholes E21B 7/20; setting of tools, packers or the like E21B 23/00; suspending casings in well heads E21B 33/04)

43/101 . . . . (for underwater installations)

43/103 . . . . . . ([of expandable casings, screens, liners, or the like]

43/105 . . . . . . . . (Expanding tools specially adapted therefor)

43/106 . . . . . . . . . . [Couplings or joints therefor]

43/108 . . . . . . . . . . . [Expandable screens or liners]

43/11 . . . Perforators; Permeators

43/112 . . . . . . . . . . . Perforators with extendable perforating members, e.g. actuated by fluid means

43/114 . . . . . . . . . . . Perforators using direct fluid action (on the wall to be perforated), e.g. abrasive jets

43/116 . . . . . . . . . . . Gun or shaped charge perforators ((projectiles with shaped or hollow charge E42B 12/10)

43/117 . . . . . . . . . . . . Shaped charge perforators (E21B 43/118 takes precedence)

43/118 . . . . . . . . . . . . . characterised by lowering in vertical position and subsequent tilting to operating position

43/1185 . . . . . . . . . . . Ignition systems

43/11852 . . . . . . . . . . . . . [hydraulically actuated]

43/11855 . . . . . . . . . . . . . (mechanically actuated, e.g. by movement of a wireline or a drop-bar (E21B 43/11852 takes precedence))

43/11857 . . . . . . . . . . . [firing indication systems]

43/119 . . . . . . . . . . . Details, e.g. for locating perforating place or direction

43/1195 . . . . . . . . . . . . . [Replacement of drilling mud; decrease of undesirable shock waves]

43/12 . . . Methods or apparatus for controlling the flow of the obtained fluid to or in wells (E21B 43/25 takes precedence; valve arrangements E21B 34/00)

43/121 . . . . . . . . . . . (Lifting well fluids (survey of down-hole pump systems E21B 47/0007))

43/122 . . . . . . . . . . . [Gas lift]

43/123 . . . . . . . . . . . [Gas lift valves]

43/124 . . . . . . . . . . . . [Adaptation of jet-pump systems]

2043/125 . . . . . . . . . . . (Adaptation of walking-beam pump systems)

43/126 . . . . . . . . . . . . . [Adaptations of down-hole pump systems powered by drives outside the borehole, e.g. by a rotary or oscillating drive (powered by fluid E21B 43/129)]

43/127 . . . . . . . . . . . . . [Adaptations of walking-beam pump systems]

43/128 . . . . . . . . . . . . . [Adaptation of pump systems with down-hole electric drives]

43/129 . . . . . . . . . . . . . [Adaptations of down-hole pump systems powered by fluid supplied from outside the borehole (gas-lift E21B 43/122; jet pumps E21B 43/124)]

43/14 . . . . . . . . . . . Obtaining from a multiple-zone well

43/16 . . . . . . . . . . . Enhanced recovery methods for obtaining hydrocarbons (fracturing E21B 43/20; obtaining slurry E21B 43/29; reclamation of contaminated soil in situ B09C; chemical compositions therefor C09K 8/58)

43/162 . . . . . . . . . . . [Injecting fluid from longitudinally spaced locations in injection well]

43/164 . . . . . . . . . . . (Injecting CO2 or carbonated water (in combination with organic material C09K 8/594))
Obtaining fluids from wells

43/166 . . . [Injecting a gaseous medium; Injecting a gaseous medium and a liquid medium (CO₂ injection E21B 43/164; steam injection E21B 43/24)]

43/168 . . . [Injecting a gaseous medium]

43/17 . . . Interconnecting two or more wells by fracturing or otherwise attacking the formation ([E21B 43/2405]; E21B 43/247 take precedence)

43/18 . . . Repressing or vacuum methods

43/20 . . . Displacing by water

43/24 . . . using heat, e.g. steam injection (heating, cooling or insulating wells E21B 36/00 (; in combination with organic material C09K 8/592))

43/2401 . . . [by means of electricity]

43/2403 . . . [by means of nuclear energy (nuclear reactors G21)]

43/2405 . . . [in association with fracturing or crevice forming processes (E21B 43/247 takes precedence)]

43/2406 . . . [Steam assisted gravity drainage [SAGD]]

43/2408 . . . [SAGD in combination with other methods]

**WARNING**
Not complete pending a reorganisation. See also E21B 43/24 and subgroups

43/241 . . . combined with solution mining of non-hydrocarbon minerals, e.g. solvent pyrolysis of oil shale

43/243 . . . Combustion in situ

43/247 . . . . . . in association with fracturing processes (or crevice forming processes)

43/248 . . . . . . . using explosives

43/25 . . . Methods for stimulating production (dump bailers E21B 27/02; vibration generating arrangements E21B 28/00 (; by vibrating earth formations E21B 43/003); chemical compositions therefor C09K 8/60)

43/255 . . . [including the injection of a gaseous medium as treatment fluid into the formation]

43/26 . . . by forming crevices or fractures ([chemical compositions therefor C09K 8/62])

43/261 . . . [Separate steps of (1) cementing, plugging or consolidating and (2) fracturing or attacking the formation]

43/263 . . . using explosives ([combustion in situ using explosives E21B 43/248])

43/2635 . . . . . . [by means of nuclear energy (peaceful applications of nuclear explosive devices in general G21J 3/00)]

43/267 . . . reinforcing fractures by propping ([chemical compositions therefor C09K 8/80])

43/28 . . . Dissolving minerals other than hydrocarbons, e.g. by an alkaline or acid leaching agent (E21B 43/241 takes precedence (; using steerable or laterally extendable nozzles E21B 43/292))

43/281 . . . [using heat (heating, cooling or insulating wells E21B 36/00)]

43/283 . . . [in association with a fracturing process]

43/285 . . . Melting minerals, e.g. sulfur (E21B 43/24 takes precedence; heating, cooling or insulating arrangements for wells E21B 36/00)

43/29 . . . Obtaining a slurry of minerals, e.g. by using nozzles

43/292 . . . [using steerable or laterally extendable nozzles]

43/295 . . . Gasification of minerals, e.g. for producing mixtures of combustible gases (E21B 43/243 takes precedence)

43/30 . . . Specific pattern of wells, e.g. optimizing the spacing of wells (production satellite stations E21B 43/017)

43/305 . . . [comprising at least one inclined or horizontal well]

43/32 . . . Preventing gas- or water- coning phenomena, i.e. the formation of a conical column of gas or water around wells

43/34 . . . Arrangements for separating materials produced by the well (separating apparatus per se, see the relevant subclasses)

43/36 . . . Underwater separating arrangements (E21B 43/38 takes precedence)

43/38 . . . . . . in the well

43/385 . . . . . . [by reinjecting the separated materials into an earth formation in the same well]

43/40 . . . Separation associated with re-injection of separated materials ([E21B 43/385 takes precedence])

**Automatic control, surveying or testing**

44/00 Automatic control systems specially adapted for drilling operations, i.e. self-operating systems which function to carry out or modify a drilling operation without intervention of a human operator, e.g. computer-controlled drilling systems (for non-automatic drilling control, see the operation controlled; automatic feeding from rack and connecting of drilling pipes E21B 19/29; controlling pressure or flow of drilling fluid E21B 21/08; control systems in general G05); Systems specially adapted for monitoring a plurality of drilling variables or conditions (means for transmitting measuring-signals from the well to the surface E21B 47/12)

44/005 . . . [Below-ground automatic control systems]

44/02 . . . Automatic control of the tool feed ([E21B 44/005]. E21B 44/10 take precedence)

44/04 . . . in response to the torque of the drive [: Measuring drilling torque (E21B 44/06 takes precedence; measuring stresses in a well bore pipe E21B 47/0006)]

44/06 . . . in response to the flow or pressure of the motive fluid of the drive

44/08 . . . in response to the amplitude of the movement of the percussion tool, e.g. jump or recoil

44/10 . . . Arrangements for automatic stopping when the tool is lifted from the working face ([informative reference: arrangements for automatic stopping for portable percussive tools B25D 9/265])

45/00 Measuring the drilling time or rate of penetration

47/00 Survey of boreholes or wells (monitoring pressure or flow of drilling fluid E21B 21/08; geophysical logging G01Y)

47/0001 . . . [for underwater installations]

47/0002 . . . [Survey of boreholes or wells by visual inspection (photographing internal surfaces, e.g. of pipes G03B 37/005; closed circuit television systems H04N 7/18)]

47/0003 . . . [Determining well or borehole volumes (determining depth E21B 47/04, diameter E21B 47/08; measuring volumes in general G01F)]
Automatic control, surveying or testing

47/0005 . [control of cementation quality or level (measuring temperature E21B 47/065)]
47/0006 . [Measuring stresses in a well bore pipe string or casing (for locating stuck pipe E21B 47/09)]
47/0007 . [Survey of down-hole pump systems]
47/0008 . [Survey of walking-beam pump systems, e.g. for the detection of so called "pumped-off" conditions]
47/01 . Devices for supporting measuring instruments on a drill pipe, rod or wireline (setting or locking tools in boreholes or wells E21B 23/00); ([flexible centering means per se E21B 17/1014]) Protecting measuring instruments in boreholes against heat, shock, pressure or the like

NOTE

Devices for both supporting and protecting measuring instruments are only classified in E21B 47/011

47/011 . [Protecting measuring instruments (cooling or insulating arrangements for boreholes or wells E21B 36/00)]
47/02 . Determining slope or direction (clinometers or direction meters G01C)
47/02 . . . of the borehole, { e.g. using geomagnetism}
47/02 . . . of the borehole, { e.g. using seismic or acoustic means}
47/02 . . . [using at least one source of electromagnetic energy and at least one detector therefor]
47/02 . . . . . [at least one of the sources or one of the detectors being located above ground]
47/02 . . . . . [using a pendulum]
47/02 . . . of devices in the borehole (E21B 47/022 takes precedence)
47/02 . . . . . of penetrated ground layers (apparatus for obtaining oriented cores E21B 25/16; formation testing E21B 49/00)
47/04 . Measuring depth or liquid level (measuring liquid level in general [and telerrecorders for level of liquids] G01E; [measuring depth in general G01B 7/26])
47/04 . . . [Measuring or locating liquid level (E21B 47/044 takes precedence)]
47/04 . . . . . [using radioactive markers]
47/06 . Measuring temperature or pressure (measuring temperature in general G01K; measuring pressure in general G01L, (telerrecorders for pressure G01L; telerrecorders for temperature G01K))
47/06 . . . . . [Measuring temperature]
47/08 . Measuring the diameter (measuring diameter in general G01B)
47/08 . . . . . [using radiant means, e.g. acoustic, radioactive, electromagnetic]
47/09 . Locating or determining the position of objects in boreholes or wells, [e.g. the position of an extending arm]; Identifying the free or blocked portions of pipes (measuring depth E21B 47/04; measuring diameter E21B 47/08)
47/09 . . . . . [by detecting magnetic anomalies (investigating materials by investigating magnetic variables G01N 27/72)]
47/09 . . . . . [by detecting an acoustic anomaly, e.g. a mud-pressure pulse]
47/09 . . . . . [using impression packers, e.g. to detect recesses or perforations]
47/10 . Locating fluid leaks, intrusions or movements (using impression packers E21B 47/09/15; flow measurement in general G01F; examining density and leaking in general G01M)
47/10 . . . . . [using thermal measurements (measuring temperature E21B 47/065)]
47/10 . . . . . [using acoustic energy]
47/10 . . . . . [using tracers: using radioactivity]
47/10 . . . . . [using electrical indications: using light radiations]
47/10 . . . . . . [Detecting leaks, e.g. of tubing, by pressure testing (investigating fluid-tightness of structures by using fluid or vacuum G01M 3/02)]
47/12 . Means for transmitting measuring-signals [or control signals] from the well to the surface {or from the surface to the well}, e.g. for logging while drilling (remote signalling in general G08)
47/12 . . . . . [using earth as an electrical conductor (E21B 47/122 takes precedence; in general H04B 13/02; electric prospecting G01V 3/00)]
47/12 . . . . . [by electromagnetic energy, e.g. radio frequency (in general H04B; magnetic prospecting G01V 3/00)]
47/12 . . . . . . [using light waves (optical transmission in general H04B 10/00; light guides, e.g. optical fibres G02B 6/00)]
47/12 . . . . . . . [Storing data down-hole, e.g. in a memory or on a record carrier (recording in connection with measuring in general G01D; information storage in general G11)]
47/14 . . . . . [using acoustic waves]
47/16 . . . . . through the drill string or casing, { e.g. by torsional acoustic waves}
47/18 . . . . . through the well fluid, { e.g. mud pressure pulse telemetry]
47/18 . . . . . . . [by negative mud pulses using a pressure relieve valve between drill pipe and annulus]
47/18 . . . . . . . . [by positive mud pulses using a flow restricting valve within the drill pipe]

49/00 . Testing the nature of borehole walls; Formation testing; Methods or apparatus for obtaining samples of soil or well fluids, specially adapted to earth drilling or wells (sampling in general G01N 1/00)
49/001 . . . . . [specially adapted for underwater installations]
49/003 . . . . . [by analysing drilling variables or conditions (E21B 49/005 takes precedence; systems specially adapted for monitoring a plurality of drilling variables or conditions E21B 44/00)]
49/005 . . . . . [Testing the nature of borehole walls or the formation by using drilling mud or cutting data (investigating chemical or physical properties of materials per se G01N)]
49/006 . . . . . [Measuring wall stresses in the borehole (investigation of mechanical properties of foundation soil E02D 1/022)]
49/008 . . . . . [by injection test; by analysing pressure variations in an injection or production test, e.g. for estimating the skin factor (measuring pressure E21B 47/06; obtaining fluid samples or testing fluids E21B 49/08)]
Automatic control, surveying or testing

49/02 . by mechanically taking samples of the soil
(apparatus for obtaining undisturbed cores
E21B 25/00; investigation of foundation soil in situ
E02D 1/00)

49/025 . . [of underwater soil, e.g. with grab devices
(underwater coring E21B 25/18)]

49/04 . . using explosives in boreholes; using projectiles
penetrating the wall [(drilling by use of
explosives E21B 7/007; gun or shaped charge
perforators E21B 43/116)]

49/06 . . with side-wall drilling tools {pressing} or
scrapers

49/08 . Obtaining fluid samples or testing fluids, in
boreholes or wells [(packers E21B 33/12; valves
E21B 34/00; analysing pressure variations in an
injection or production test E21B 49/008)]

49/081 . . [with down-hole means for trapping a fluid
sample (E21B 49/10 takes precedence)]

49/082 . . . [Wire-line fluid samplers (E21B 49/083 takes
precedence)]

49/083 . . . [Samplers adapted to be lowered into or
retrieved from a landing nipple, e.g. for testing
a well without removing the drill string]

49/084 . . . [with means for conveying samples through pipe
to surface]

2049/085 . . . [Determining specific physical fluid parameters]

49/086 . . . [Withdrawing samples at the surface]

49/087 . . . [Well testing, e.g. testing for reservoir
productivity or formation parameters]

49/088 . . . [combined with sampling]

49/10 . . . using side-wall fluid samplers or testers