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

WARNINGS

1. 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 43/27	covered by	
E21B 47/001-E21B 47/009	covered by	
E21B 47/013-E21B 47/017	covered by	
E21B 47/0224-E21B 47/0236	covered by	
E21B 47/047-E21B 47/053	covered by	
E21B 47/07	covered by	
E21B 47/085	covered by	
E21B 47/092-E21B 47/098	covered by	
E21B 47/103-E21B 47/117	covered by	
E21B 47/125-E21B 47/135	covered by	
E21B 47/20-E21B 47/24	covered by	
E21B 47/26	covered by	

2. In this subclass non-limiting references (in the sense of paragraph 39 of the Guide to the IPC) may still be displayed in the scheme.

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 7/021)}

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
4/20 . combined with surface drive (E21B 4/10 takes precedence)

6/00 Drives for combined percussion and rotary drilling (drives used in the borehole E21B 4/00)
6/02 . the rotation being continuous
6/04 . . Separate drives for percussion and rotation
6/06 . the rotation being intermittent, e.g. obtained by ratchet device
6/08 . . Separate drives for percussion and rotation

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. baskets, buckets E21B 27/00; tunnelling E21D)}
7/005 . . {with helical conveying means (E21B 7/201 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 31/1075; gun or shaped-charge perforators E21B 43/116; fracturing by explosives E21B 43/263, 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 therefor 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 therefor 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
7/1245 . . . {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
7/136 . . 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 . Driving 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; {pushing means outside of the borehole E21B 19/08;} 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)}

7/205 . . {without earth removal (E21B 7/30 takes precedence)}

NOTE

Special methods or apparatus for drilling without earth removal E21B 7/26

7/206 . . . {using down-hole drives (down-hole drives per se E21B 4/00)}

7/208 . . {using down-hole drives (down-hole drives per se E21B 4/00; E21B 7/203 and E21B 7/206 take precedence)}

7/24 . Drilling using vibrating or oscillating means, e.g. out-of-balance masses (percussion drilling E21B 1/00)

7/26 . Drilling without earth removal, e.g. with self-propelled burrowing devices ({E21B 7/205 and} E21B 7/30 take precedence; down-hole drives E21B 4/00, {e.g. self-propelled fluid-operated hammers E21B 4/145})

7/265 . . {Combined with earth removal}

7/28 . Enlarging drilled holes, e.g. by counterboring (drill bits for enlarging the borehole E21B 10/26)

7/30 . . without earth removal

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 resisting 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 resisting 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 discs 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 axles (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}

10/25 . . . characterised by sealing details

10/26 . Drill bits with leading portion, i.e. drill bits with a pilot cutter; Drill bits for enlarging the borehole, e.g. reamers (percussion drill bits with leading portion E21B 10/40; augers with leading portion E21B 10/44)

10/28 . . with non-expansible roller cutters

10/30 . . . Longitudinal axis roller reamers, e.g. reamer stabilisers

10/32 . . with expansible cutting tools

10/322 . . . {cutter shifted by fluid pressure (E21B 10/345 takes precedence)}

10/325 . . . {the cutter being shifted by a spring mechanism}

10/327 . . . {the cutter being pivoted about a longitudinal axis (E21B 10/34 takes precedence)}

10/34 . . . of roller-cutter type

10/345 . . . . {cutter shifted by fluid pressure}

10/36 . Percussion drill bits (characterised by wear resisting parts E21B 10/46 {; with helical conveying portion E21B 10/445})

10/38 . . characterised by conduits or nozzles for drilling fluids

10/40 . . with leading portion

10/42 . Rotary drag type drill bits with teeth, blades or like cutting elements, e.g. fork-type bits, fish tail bits (characterised by wear resisting parts E21B 10/54, by conduits or nozzles for drilling fluid E21B 10/60, by detachable or adjustable parts E21B 10/62)

2010/425 . . {characterised by teeth or cutter arrangement}

10/43 . . characterised by the arrangement of teeth or other cutting elements

10/44 . Bits with helical conveying portion, e.g. screw type bits; Augers with leading portion or with detachable parts ({Rotary drag type drill bits E21B 10/42}; drilling rods with helical structure E21B 17/22)

10/445 . . {percussion type, e.g. for masonry (percussion drill bits in general E21B 10/36)}

10/46 . characterised by wear resisting parts, e.g. diamond inserts {(drill bits with self-renewable cutting edge E21B 10/006)}

10/48 . . the bit being of core type {(saw cylinders having their cutting rim equipped with abrasive particles for drilling stone or glass B28D 1/041)}

10/485 . . . {with inserts in form of chisels, blades or the like}

10/50 . . the bit being of roller type

10/52 . . . with chisel or button type inserts

10/54 . . the bit being of the rotary drag type, e.g. fork-type bits

2010/545 . . . {with blades having performed cutting elements mounted on a distinct support, e.g. polycrystalline inserts}

10/55 . . . with preformed cutting elements {with blades having preformed cutting elements mounted on a distinct support, e.g. polycrystalline inserts}

10/56 . . Button type inserts (E21B 10/52 takes precedence)

2010/561 . . . {Inserts with performed cutting elements mounted on a distinct support, e.g. polycrystalline inserts}

2010/562 . . . . {having a non planar or non circular cutting face}
2010/563 . . . . {having a cutting face with different segments, e.g. mosaic-type inserts}
2010/564 . . . . {characterised by support details}
2010/565 . . . . . {Interface between the substrate and the cutting element}
2010/566 . . . . {with chip breaking arrangements}
10/567 . . . with preformed cutting elements mounted on a distinct support, e.g. polycrystalline inserts
10/5673 . . . . {having a non planar or non circular cutting face}
10/5676 . . . . {having a cutting face with different segments, e.g. mosaic-type inserts}
10/573 . . . . characterised by support details
10/5735 . . . . . {Interface between the substrate and the cutting element}
10/58 . . Chisel type inserts ({E21B 10/485,} E21B 10/52, E21B 10/54 take precedence)
10/60 . characterised by conduits or nozzles for drilling fluids (for roller bits E21B 10/18; for percussion drill bits E21B 10/38 {; mining picks with arrangement of fluid-spraying nozzles E21C 35/187})
10/602 . . {the bit being a rotary drag type bit with blades}
10/605 . . {the bit being a core-bit}
2010/607 . . {characterised by the nozzle structure}
10/61 . . characterised by the nozzle structure
10/62 . characterised by parts, e.g. cutting elements, which are detachable or adjustable (E21B 10/64 takes precedence; for roller bits E21B 10/20; {for rotary drag type drill bits E21B 10/42}; for augers E21B 10/44)
2010/622 . . {with plural separable cutter elements}
2010/624 . . . {independently attachable}
10/627 . . with plural detachable cutting elements
10/633 . . . independently detachable
10/64 . characterised by the whole or part thereof being insertable into or removable from the borehole without withdrawing the drilling pipe (retrievable core receivers E21B 25/02)
10/66 . . the cutting element movable through the drilling pipe and laterally shiftable

11/00 **Other drilling tools {**(boring grabs E21B 27/00)**}**
11/005 . {Hand operated drilling tools}
11/02 . Boring rams (percussion drives used in the borehole E21B 4/06; percussion drill bits E21B 10/36)
11/06 . with driven cutting chains or similarly driven tools

12/00 **Accessories for drilling tools {**(connecting and disconnecting drill bit and drilling pipe E21B 19/18; sharpening stone drill bits B24B 3/33)**}**
12/02 . Wear indicators
12/04 . Drill bit protectors
12/06 . Mechanical cleaning devices

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}
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; Kellies; 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
17/085 . . . {Riser connections (connectors for wellhead E21B 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 1/02, E21B 3/02)

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 1/00; crown blocks or pulley blocks B66D; cable guides B66D 1/36)
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 3/04; slip-type elevators E21B 19/07; casing heads with slips E21B 33/0422)}
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 1/0442})
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}

19/168 . . {using a spinner with rollers or a belt adapted to engage a well pipe}
19/18 . Connecting or disconnecting drill bit and drilling pipe
19/20 . Combined feeding from rack and connecting, e.g. automatically
19/22 . Handling reeled pipe or rod units, e.g. flexible drilling pipes {(lifting or hauling appliances using two or more cooperating endless chains B66D 3/003)}
19/24 . Guiding or centralising devices for drilling rods or pipes

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)
21/001 . {specially adapted for underwater drilling}
21/002 . {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)}
21/003 . {Means for stopping loss of drilling fluid (plastering the borehole wall E21B 33/138)}
2021/005 . {using 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})
21/012 . . {using exhaust air from the drilling motor for blowing off the dust at the borehole entrance}
21/015 . . Means engaging the bore entrance, e.g. hoods for collecting dust
21/02 . 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}
21/062 . . {by mixing components}
21/063 . . {by separating components}
21/065 . . . {Separating solids from drilling fluids}
21/066 . . . . {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}
21/12 . using drilling pipes with plural fluid passages, e.g. closed circulation systems (pipes with plural fluid passages E21B 17/18)
21/14 . using liquids and gases, e.g. foams
21/16 . using gaseous fluids (E21B 21/14 takes precedence; arrangements for handling drilling fluids outside the borehole E21B 21/01; arrangements for treating drilling fluids E21B 21/06)
21/18 . Preventing exhaust air from the drill motor from blowing-off towards the working face

23/00 Apparatus for displacing, setting, locking, releasing, or removing tools, packers or the like in the boreholes or wells (setting of casings, screens or liners E21B 43/10)
23/002 . {Tool diverters, e.g. for through-the-flow line tool systems or for wire-line tools (E21B 23/03 takes precedence; for drilling E21B 7/06)}
23/004 . {Indexing systems for guiding relative movement between telescoping parts of downhole tools}
23/006 . . {"J-slot" systems, i.e. lug and slot indexing mechanisms}
2023/008 . {Self propelling system or apparatus, e.g. for moving tools within the horizontal portion of a borehole}
23/01 . for anchoring the tools or the like (E21B 23/02 - E21B 23/06 take precedence; anchoring of drives in the borehole E21B 4/18; {packers E21B 33/12})
23/02 . for locking the tools or the like in landing nipples or in recesses between adjacent sections of tubing (E21B 23/03 - E21B 23/06 take precedence)
23/03 . for setting the tools into, or removing the tools from, laterally offset landing nipples or pockets
23/04 . operated by fluid means, e.g. actuated by explosion (E21B 23/06, E21B 23/08 take precedence)
23/06 . for setting packers
23/065 . . {setting tool actuated by explosion or gas generating means}
23/08 . Introducing or running tools by fluid pressure, e.g. through-the-flow-line tool systems ({tool diverters E21B 23/002}; special provisions on heads therefor E21B 33/068; cementing plugs E21B 33/16; scrapers operated by fluid pressure E21B 37/04)
23/10 . . Tools specially adapted therefor
23/14 . for displacing a cable or cable-operated tool, e.g. for logging or perforating operations in deviated wells ({side entry sub E21B 17/025; control line protectors E21B 17/1035}; by fluid pressure E21B 23/08; provision on well heads for introducing or removing cable-operated tools E21B 33/072, E21B 33/076)

25/00 Apparatus for obtaining or removing undisturbed cores, e.g. core barrels, core extractors (core bits E21B 10/02; using explosives or projectiles in boreholes E21B 49/04; side-wall sampling or coring E21B 49/06)
25/005 . {Above ground means for handling the core, e.g. for extracting the core from the core barrel}
25/02 . the core receiver being insertable into, or removable from, the borehole without withdrawing the drilling pipe (retrievable drill bits E21B 10/64)
25/04 . . the core receiver having a core forming cutting edge or element, e.g. punch type core barrels

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 uncontaminated 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-expansible 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 whipstock operations ({E21B 29/005 and} E21B 29/08 take precedence {; whipstocks E21B 7/061})

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

29/12 . 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 47/09)

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 se 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

2033/005 . {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 C23F)}

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)}

33/043 . . . . specially adapted for underwater well heads ({E21B 33/0407,} E21B 33/047 take precedence)
33/047 . . . . for plural tubing strings
33/05 . . . . Cementing-heads, e.g. having provision for introducing cementing plugs
33/06 . . . 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 34/00)}
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 33/0355})
33/068 . . . having provision for introducing objects or fluids into, or removing objects from, wells (cementing heads E21B 33/05; {wipers, oil savers E21B 33/08})
33/072 . . . . for cable-operated tools (E21B 33/076 takes precedence)
33/076 . . . . specially adapted for underwater installations
33/08 . . 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 33/1277 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
33/1243 . . . . {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 27/02; {methods or apparatus for grouting offshore structures E02B 17/0008} chemical compositions therefor C09K 8/00)
33/134 . . . Bridging plugs {(packers E21B 33/12)}
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 round 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 F16K)

2034/002 . {Ball valves}
2034/005 . {Flapper valves}
2034/007 . {Sleeve valves}
34/02 . 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}

34/08 . . responsive to flow or pressure of the fluid obtained (E21B 34/10 takes precedence)
34/085 . . . {with time-delay systems, e.g. hydraulic impedance mechanisms}
34/10 . . operated by control fluid supplied from above ground ({by a dropped ball or piston E21B 34/14;} above-ground control means E21B 34/16)
34/101 . . . {with means for equalizing fluid pressure above and below the valve}
34/102 . . . {with means for locking the closing element in open or closed position (E21B 34/105 and E21B 34/108 take precedence)}
34/103 . . . . {with a shear pin}
34/105 . . . {retrievable, e.g. wire line retrievable, i.e. with an element which can be landed into a landing-nipple provided with a passage for control fluid}
34/106 . . . . {the retrievable element being a secondary control fluid actuated valve landed into the bore of a first inoperative control fluid actuated valve}
34/107 . . . . {the retrievable element being an operating or controlling means retrievable separately from the closure member, e.g. pilot valve landed into a side pocket (E21B 34/106 takes precedence)}
34/108 . . . {with time delay systems, e.g. hydraulic impedance mechanisms}
34/12 . . operated by movement of casings or tubings
34/125 . . . {with time delay systems, e.g. hydraulic impedance mechanisms}
34/14 . . operated by movement of tools, e.g. sleeve valves operated by pistons or wire line tools {(E21B 34/066 takes precedence)}
34/16 . Above-ground control means therefor {(control systems for submerged well heads E21B 33/0355)}

35/00 Methods or apparatus for preventing or extinguishing fires (cutting or deforming pipes to control fluid flow E21B 29/08; controlling flow of fluid to or in wells E21B 43/12; fire fighting in general A62C, A62D)

36/00 Heating, cooling, insulating arrangements for boreholes or wells, e.g. for use in permafrost zones (drilling by use of heat E21B 7/14; secondary recovery methods using heat E21B 43/24)
36/001 . {Cooling arrangements}
36/003 . {Insulating arrangements}
36/005 . {Heater surrounding production tube}
36/006 . {Combined heating and pumping means}
36/008 . {using chemical heat generating means}
36/02 . using burners
36/025 . . {the burners being above ground or outside the bore hole}
36/04 . using electrical heaters

37/00 Methods or apparatus for cleaning boreholes or wells (E21B 21/00 takes precedence; {bailers E21B 27/00;} cleaning pipes in general B08B 9/02)
37/02 . Scrapers specially adapted therefor
37/04 . . operated by fluid pressure, e.g. free-piston scrapers (operating other tools by fluid pressure E21B 23/08)
37/045 . . . {Free-piston scrapers}
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 F16J)}

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
41/0007 . {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}
2041/0028 . {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 7/061; 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 B63C 11/00)

41/08 . Underwater 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 for consolidating loose sand 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 F42B 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 43/26; 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 CO_2 or carbonated water (in combination with organic material C09K 8/594)}

43/166 . . {Injecting a gaseous medium; Injecting a gaseous medium and a liquid medium (CO_2 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 . . Repressuring 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 19/20; 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 G01V)
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)}

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)

47/022 . . of the borehole {, e.g. using geomagnetism}

47/02208 . . . {using seismic or acoustic means}

47/02216 . . . {using at least one source of electromagnetic energy and at least one detector therefor}

47/02224 . . . . {at least one of the sources or one of the detectors being located above ground}

47/02232 . . . {using a pendulum}

47/024 . . of devices in the borehole (E21B 47/022 takes precedence)

47/026 . . 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 telerecorders for level of liquids} G01F; {measuring depth in general G01B 7/26})

47/042 . . {Measuring or locating liquid level (E21B 47/044 takes precedence)}

47/044 . . {using radioactive markers}

47/06 . Measuring temperature or pressure (measuring temperature in general G01K; measuring pressure in general G01L {telerecorders for pressure G01L; telerecorders for temperature G01K})

47/065 . . {Measuring temperature}

47/08 . Measuring the diameter (measuring diameter in general G01B)

47/082 . . {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)

47/0905 . . {by detecting magnetic anomalies (investigating materials by investigating magnetic variables G01N 27/72)}

47/091 . . {by detecting an acoustic anomaly, e.g. a mud-pressure pulse}

47/0915 . . {using impression packers, e.g. to detect recesses or perforations}

47/10 . Locating fluid leaks, intrusions or movements {(using impression packers E21B 47/0915; flow measurement in general G01F; examining density and leaking in general G01M)}

47/1005 . . {using thermal measurements (measurement temperature E21B 47/065)}

47/101 . . {using acoustic energy}

47/1015 . . {using tracers: using radioactivity}

47/102 . . {using electrical indications: using light radiations}

47/1025 . . {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)

47/121 . . {using earth as an electrical conductor (E21B 47/122 takes precedence; in general H04B 13/02; electric prospecting G01V 3/00)}

47/122 . . {by electromagnetic energy, e.g. radio frequency (in general H04B; magnetic prospecting G01V 3/00)}

47/123 . . . {using light waves (optical transmission in general H04B 10/00; light guides, e.g. optical fibres G02B 6/00)}

47/124 . . {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}

47/182 . . . . {by continuous mud waves with modulation of the waves}

47/185 . . . . {by negative mud pulses using a pressure relieve valve between drill pipe and annulus}

47/187 . . . . {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)}

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