EARTH OR ROCK DRILLING; MINING

E21 EARTH OR ROCK DRILLING; MINING

Note(s)
In this class, the following term is used with the meaning indicated:
– “drilling” covers boring and vice versa.

E21B EARTH OR ROCK 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 [5]

Note(s) [7, 2006.01]
(1) This subclass covers:
– primarily equipment for drilling of earth or rock in their natural formation;
– similar equipment for drilling of man-made structures in situ, e.g. of road surfaces or concrete structures.
(2) This subclass does not cover:
– hand-held drilling machines, e.g. for domestic use;
– drilling equipment for manufacturing operations, i.e. where an article is worked, e.g. for further processing;
which are covered by relevant subclasses of section B, e.g. B23B;
– compositions for drilling of boreholes or wells or for treating boreholes or wells, which compositions are covered by group C09K 8/00, e.g. compositions for enhanced recovery methods for obtaining hydrocarbons C09K 8/58.

Subclass indexes
METHODS OR APPARATUS FOR DRILLING .................................................. 1/00-7/00
DRILLING TOOLS; ACCESSORIES THEREFOR ........................................ 10/00, 11/00; 12/00
OTHER EQUIPMENT OR DETAILS FOR DRILLING; WELL EQUIPMENT OR MAINTENANCE Derricks; drilling rods or the like ................ 15/00; 17/00, 19/00

Methods or apparatus for drilling

1/00 Percussion drilling (drives used in the borehole E21B 4/00) [1, 3, 2006.01]
1/02 . Surface drives for drop hammers, e.g. with a cable [1, 7, 2006.01]
1/04 . Devices for reversing the movement of the rod or cable at the surface [1, 2006.01]
1/12 . with a reciprocating impulse member (E21B 1/02, E21B 1/38 take precedence) [7, 2006.01]
1/14 . driven by a rotating mechanism [7, 2006.01]
1/16 . with spring-mounted reciprocating masses, e.g. with air cushion [7, 2006.01]
1/18 . . . with elastic joining of the drive to the push-rod by double buffer springs [7, 2006.01]
1/20 . . . formed as centrifugal hammers [7, 2006.01]
1/22 . . . driven by electromagnets [7, 2006.01]
1/24 . . . the impulse member being a piston driven directly by fluid pressure [7, 2006.01]
1/26 . . . by liquid pressure [7, 2006.01]
1/28 . . . working with pulses [7, 2006.01]
1/30 . . . by air, steam or gas pressure [7, 2006.01]
1/32 . . . working with pulses [7, 2006.01]
1/34 . . . . . . . . . . the impulse member being a piston of an internal-combustion engine [7, 2006.01]
1/36 . Tool-carrier piston type, i.e. in which the tool is connected to an impulse member [7, 2006.01]
1/38 . Hammer piston type, i.e. in which the tool bit or anvil is hit by an impulse member [7, 2006.01]
3/00 Rotary drilling (drives used in the borehole E21B 4/00; rotary drilling machines in general B23B) [1, 3, 2006.01]
3/02 . Surface drives for rotary drilling [1, 2006.01]
3/025 . . with a to-and-fro rotation of the tool [7, 2006.01]
3/03 . . with an intermittent unidirectional rotation of the tool [7, 2006.01]
3/035 . . with slipping or elastic transmission [7, 2006.01]
3/04 . . Rotary tables [1, 2006.01]
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) [1, 3, 2006.01]
4/00 Drives for drilling, used in the borehole [3, 2006.01]
4/02 . Fluid rotary type drives (hydraulic turbines for drilling wells F03B 13/02) [3, 2006.01]
4/04 . Electric drives (E21B 4/12 takes precedence) [3, 2006.01]
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) [3, 2006.01]
4/08 . continuous undirectional rotary motion of shaft or drilling pipe effecting consecutive impacts [3, 2006.01]
4/10 . impact being obtained by gravity only, e.g. with lost-motion connection [3, 2006.01]
4/12 . Electrically operated hammers [3, 2006.01]
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 [3, 2006.01]
4/18 . Anchoring or feeding in the borehole [3, 7, 2006.01]
4/20 . combined with surface drive (E21B 4/10 takes precedence) [3, 2006.01]

Drilling tools
10/00 Drill bits (specially adapted for deflecting the direction of boring E21B 7/08; with means for collecting substances E21B 27/00) [3, 2006.01]
10/02 . Core bits (characterised by wear resisting parts E21B 10/46; obtaining undisturbed cores E21B 25/00) [3, 2006.01]
10/04 . with core destroying means [3, 2006.01]
10/06 . . Roller core bits [3, 2006.01]
10/08 . . Roller bits (roller core bits E21B 10/06; with leading portion E21B 10/26; characterised by wear resisting parts E21B 10/46) [3, 2006.01]
10/10 . . with roller axle supported at both ends (with disc cutters E21B 10/12) [3, 2006.01]
10/12 . . with disc cutters [3, 2006.01]
10/14 . . combined with non-rolling cutters other than of leading-portion type [3, 2006.01]
10/16 . . characterised by tooth form or arrangement [3, 2006.01]
10/18 . . characterised by conduits or nozzles for drilling fluids (drilling fluid supply to the bearings E21B 10/23) [3, 2006.01]
10/20 . . characterised by detachable or adjustable parts, e.g. legs or axes (cross axle roller bits E21B 10/10) [3, 2006.01]
10/22 . . characterised by bearing, lubrication or sealing details [3, 2006.01]
10/23 . . with drilling fluid supply to the bearings [2006.01]
10/24 . . characterised by lubricating details (E21B 10/23 takes precedence) [3, 2006.01]
10/25 . . characterised by sealing details [2006.01]
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) [3, 2006.01]
10/28 . . with non-expansible roller cutters [3, 2006.01]
10/30 . . Longitudinal axis roller reamers, e.g. reamer stabilisers [3, 2006.01]
10/32 . . with expandable cutting tools [3, 2006.01]
10/34 . . of roller-cutter type [3, 2006.01]
10/36 . Percussion drill bits (characterised by wear resisting parts E21B 10/46) [3, 2006.01]
10/38 . . characterised by conduits or nozzles for drilling fluids [3, 2006.01]
10/40 . . with leading portion [3, 2006.01]
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 10/46, by conduits or nozzles for drilling fluid E21B 10/60, by detachable parts E21B 10/62) [3, 2006.01]
10/43 . characterised by the arrangement of teeth or other cutting elements [2006.01]
10/44 . Bits with helical conveying portion, e.g. screw type bits; Augers with leading portion or with detachable parts (E21B 10/42 takes precedence; drilling rods with helical structure E21B 17/22) [3, 2006.01]
10/46 . characterised by wear resisting parts, e.g. diamond inserts [3, 2006.01]
10/48 . the bit being of core type [3, 2006.01]
10/50 . the bit being of roller type [3, 2006.01]
10/52 . . with chisel- or button-type inserts [3, 2006.01]
10/54 . the bit being of the rotary drag type, e.g. fork-type bits [3, 2006.01]
10/55 . . . with preformed cutting elements (inserts per se E21B 10/56; E21B 10/58) [2006.01]
10/56 . Button-type inserts (E21B 10/52 takes precedence) [3, 2006.01]
10/57 . . . with preformed cutting elements mounted on a distinct support, e.g. polycrystalline inserts [2006.01]
10/53 . . . characterised by support details, e.g. the substrate construction or the interface between the substrate and the cutting element [2006.01]
10/58 . . Chisel-type inserts (E21B 10/52, E21B 10/54 take precedence) [3, 2006.01]
10/60 . characterised by conduits or nozzles for drilling fluids (for roller bits E21B 10/18; for percussion drill bits E21B 10/38) [3, 2006.01]
10/61 . . characterised by nozzle structure [2006.01]
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 augers E21B 10/44) [3, 2006.01]
10/67 . . with plural detachable cutting elements [2006.01]
10/63 . . . independently detachable [2006.01]
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) [3, 2006.01]
10/66 . . the cutting element being movable through the drilling pipe and laterally shiftable [3, 2006.01]
11/00 Other drilling tools [1, 2006.01]
11/02 . Boring rams (percussion drives used in the borehole E21B 4/06; percussion drill bits E21B 10/36) [1, 2006.01]
11/04 . Boring grabs [1, 2006.01]
11/06 . with driven cutting chains or similarly-driven tools [1, 2006.01]
12/00 Accessories for drilling tools [3, 2006.01]
12/02 . Wear indicators [3, 2006.01]
12/04 . Drill bit protectors [3, 2006.01]
12/06 . Mechanical cleaning devices [3, 2006.01]

Other equipment or details for drilling: Well equipment or well maintenance
15/00 Supports for the drilling machine, e.g. derricks or masts [1, 7, 2006.01]
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) [1, 3, 2006.01]
15/04 . specially adapted for directional drilling, e.g. slant hole rigs [3, 2006.01]
17/00 Drilling rods or pipes; Flexible drill strings; Kellies; Drill collars; Sucker rods; Casings; Tubings (rod couplings in general F16D; tubes or tube couplings in general F16L) [1, 2006.01]
17/01 . Risers (riser connectors E21B 33/038) [3, 2006.01]
17/02 . Couplings; Joints [1, 2006.01]
17/03 . . between drilling rod or pipe and drill motor, e.g. between drilling rod and hammer [7, 2006.01]
17/04 . . between rod and bit, or between rod and rod [1, 2006.01]
17/042 . . threaded [1, 2006.01]
17/043 . . . with locking means [1, 2006.01]
17/046 . . . with ribs, pins, or jaws, and complementary grooves or the like, e.g. bayonet catches [1, 2006.01]
17/05 . . . Swivel joints [1, 2006.01]
17/06 . . . Releasing-joints, e.g. safety joints [1, 2006.01]
17/07 . . . Telescopings for varying drill string lengths; Shock absorbers (heave compensators in the derrick E21B 19/09; releasing-jars E21B 31/107) [3, 2006.01]
17/08 . . . Casing joints [1, 2006.01]
17/10 . Wear protectors; Centralising devices (drives used in the borehole with anchoring means E21B 4/18; guiding or centralising devices outside the borehole E21B 19/24) [1, 2006.01]
17/12 . . Devices for placing or drawing out wear protectors [1, 2006.01]
17/14 . Casing shoes [1, 2006.01]
17/16 . Drill collars [3, 2006.01]
17/18 . Pipes provided with plural fluid passages (circulation of drilling fluid by means of such pipes E21B 21/12) [3, 2006.01]
17/20 . Flexible or articulated drilling pipes [3, 2006.01]
17/22 . Rods or pipes with helical structure (drill bits with helical conveying portion E21B 10/44) [3, 2006.01]
19/00 Handling rods, casings, tubes or the like outside the borehole, e.g. in the derrick; Apparatus for feeding the rods or cables (surface drives E21B 1/02, E21B 3/02) [1, 2006.01]
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 3/36) [1, 2006.01]
19/04 . . Hooks [1, 2006.01]
19/06 . . Elevators, i.e. rod- or tube-gripping devices [1, 2006.01]
19/07 . . . Slip-type elevators (slips in rotary tables E21B 19/10) [1, 2006.01]
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 [1, 3, 7, 2006.01]
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) [1, 2, 7, 2006.01]

21/00 Arrangements for handling drilling fluids or cuttings outside the borehole, e.g. mud boxes (arrangements for treating drilling fluids E21B 21/06) [7, 2006.01]

21/01 Means engaging the bore entrance, e.g. hoods for collecting dust [7, 2006.01]

21/02 Swivel joints in hose lines [1, 2006.01]

21/03 Arrangements for treating drilling fluids outside the borehole (treating steps see the relevant subclasses) [3, 2006.01]

21/07 for treating dust-laden gaseous fluids [7, 2006.01]

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) [3, 2006.01]

21/10 Valves arrangements in drilling-fluid circulation systems (valves in general F16K) [3, 2006.01]

21/12 using drilling pipes with plural fluid passages, e.g. closed circulation systems (pipes with plural fluid passages E21B 17/18) [3, 2006.01]

21/14 using liquids and gases, e.g. foams [3, 2006.01]

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) [7, 2006.01]

21/18 Preventing exhaust air from the drill motor from blowing-off towards the working face [7, 2006.01]

23/00 Apparatus for displacing, setting, locking, releasing or removing tools, packers or the like in boreholes or wells (setting of casings, screens, or liners E21B 43/10) [1, 2006.01]

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) [6, 2006.01]

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) [1, 3, 2006.01]

23/03 for setting the tools into, or removing the tools from, laterally offset landing nipples or pockets [3, 2006.01]

23/04 operated by fluid means, e.g. actuated by explosion (E21B 23/06, E21B 23/08 take precedence) [1, 3, 2006.01]

23/06 for setting packers [1, 2006.01]

23/08 Introducing or running tools by fluid pressure, e.g. through-the-flow-line tool systems (special provisions on heads therefor E21B 33/068; cementing plugs E21B 33/16; scrapers operated by fluid pressure E21B 37/04) [3, 2006.01]

23/10 Tools specially adapted therefor [3, 2006.01]

23/12 Tool diverters [3, 2006.01]

23/14 for displacing a cable or a cable-operated tool, e.g. for logging or perforating operations in deviated wells (by fluid pressure E21B 23/08; provision on well heads for introducing or removing cable-operated tools E21B 33/072, E21B 33/076) [6, 2006.01]

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) [1, 2006.01]

25/02 the core receiver being insertable into, or removable from, the borehole without withdrawing the drilling pipe (retrievable drill bits E21B 10/64) [3, 2006.01]

25/04 the core receiver having a core forming cutting edge or element, e.g. punch type core barrels [3, 2006.01]

25/06 the core receiver having a flexible liner or inflatable retaining means [3, 2006.01]

25/08 Coating, freezing, consolidating cores (E21B 25/06 takes precedence); Recovering uncontaminated cores or cores at formation pressure [3, 2006.01]

25/10 Formed core retaining or severing means (E21B 25/06, E21B 25/08 take precedence) [3, 2006.01]

25/12 of the sliding wedge type [3, 2006.01]

25/14 mounted on pivot transverse to core axis [3, 2006.01]

25/16 for obtaining oriented cores [3, 2006.01]

25/18 the core receiver being specially adapted for operation under water [3, 2006.01]

27/00 Containers for collecting or depositing substances in boreholes or wells, e.g. bailers for collecting mud or sand; Drill bits with means for collecting substances, e.g. valve drill bits [1, 6, 2006.01]

27/02 Dump bailers, i.e. containers for depositing substances, e.g. cement or acids [6, 2006.01]

27/04 where the collecting or depositing means include helical conveying means [2006.01]
28/00 Vibration generating arrangements for boreholes or wells, e.g. for stimulating production (for drilling E21B 7/24; for transmitting measuring-signals E21B 47/14; for geophysical measurements G01V 1/02) [6, 2006.01]

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 [1, 2006.01]

29/02 by explosives or by thermal or chemical means (destroying objects in boreholes or wells by explosives E21B 31/16) [1, 2006.01]

29/04 Cutting of wire lines or the like (E21B 29/02 takes precedence) [3, 2006.01]

29/06 Cutting windows, e.g. directional window cutters for whipstock operations (E21B 29/08 takes precedence; whipstocks E21B 7/08) [3, 2006.01]

29/08 Cutting or deforming pipes to control fluid flow (blow-out preventers E21B 33/06) [3, 2006.01]

29/10 Reconditioning of well casings, e.g. straightening [3, 2006.01]

31/00 Fishing for or freeing objects in boreholes or wells (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) [1, 2006.01]

31/03 Freeing by flushing [3, 2006.01]

31/06 using magnetic means [1, 3, 2006.01]

31/08 using junk baskets or the like [1, 3, 2006.01]

31/10 using impact means for releasing stuck parts, e.g. jars (telescoping joints E21B 17/07) [3, 2006.01]

31/113 hydraulically operated [3, 2006.01]

31/12 Grapping tools, e.g. tongs or grabs [1, 2006.01]

31/14 with means deflecting the direction of the tool, e.g. by use of knuckle joints (apparatus for deflecting the boring E21B 7/08) [3, 2006.01]

31/16 combined with cutting or destroying means (cutting or destroying means per se E21B 29/00) [3, 2006.01]

31/18 gripping externally, e.g. overshot [3, 2006.01]

31/20 gripping internally, e.g. fishing spears [3, 2006.01]

33/00 Sealing or packing boreholes or wells [1, 2006.01]

33/02 Surface sealing or packing [1, 2006.01]

33/03 Well heads; Setting-up thereof (valve arrangements therefor E21B 34/02) [1, 2006.01]

33/035 specially adapted for underwater installations (E21B 33/043, E21B 33/064, E21B 33/076 take precedence) [1, 3, 2006.01]

33/037 Protective housings therefor [3, 2006.01]

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) [3, 2006.01]

33/04 Casing heads; Suspending casings or tubings in well heads (setting of casings in wells E21B 43/10) [1, 2006.01]

33/043 specially adapted for underwater well heads (E21B 33/047 takes precedence) [3, 2006.01]

33/047 for plural tubing strings [3, 2006.01]

33/05 Cementing-heads, e.g. having provision for introducing cementing plugs [1, 2006.01]

33/06 Blow-out preventers [1, 3, 2006.01]

33/064 specially adapted for underwater well heads (connectors therefor E21B 33/038) [3, 2006.01]

33/068 having provision for introducing objects or fluids into, or removing objects from, wells (cementing-heads E21B 33/05) [3, 2006.01]

33/072 for cable-operated tools (E21B 33/076 takes precedence) [3, 2006.01]

33/076 specially adapted for underwater installations [3, 2006.01]

33/08 Wipers; Oil savers [1, 2006.01]

33/10 in the borehole [1, 2006.01]

33/12 Packers; Plugs (used for cementing E21B 33/134, E21B 33/16) [1, 2006.01]

33/122 Multiple-string packers [1, 2006.01]

33/124 Units with longitudinally-spaced plugs for isolating the intermediate space [1, 2006.01]

33/126 with fluid-pressure-operated elastic cup or skirt (E21B 33/122, E21B 33/124 take precedence) [1, 2006.01]

33/127 with inflatable sleeve (E21B 33/122, E21B 33/124 take precedence) [1, 2006.01]

33/128 with a member expanded radially by axial pressure (E21B 33/122, E21B 33/124 take precedence) [1, 2006.01]

33/129 with mechanical slips for hooking into the casing (E21B 33/122, E21B 33/124 take precedence) [1, 2006.01]

33/1295 actuated by fluid pressure [6, 2006.01]

33/13 Methods or devices for cementing, for plugging holes, crevices, or the like (dump bailers E21B 27/02; chemical compositions therefor C09K 8/00) [1, 2006.01]

33/134 Bridging plugs [1, 2006.01]

33/136 Baskets, e.g. of umbrella type [1, 2006.01]

33/138 Plastering the borehole wall; Injecting into the formation [1, 2006.01]

33/14 for cementing casings into boreholes [1, 2006.01]

33/16 using plugs for isolating cement charge; Plugs therefor [1, 2006.01]

33/179 Operable by control fluid supplied from outside the borehole (control means being outside the borehole E21B 34/16) [3, 2006.01]

33/18 Operated by movement of casings or tubings [3, 2006.01]

33/19 Operated by movement of tools, e.g. sleeve valves operated by pistons or wire line tools [3, 2006.01]

33/16 Control means therefor being outside the borehole [3, 2006.01]

34/00 Valve arrangements for boreholes or wells (in drilling fluid circulation systems E21B 21/10; blow-out preventers E21B 33/06; oil flow regulating apparatus E21B 43/12; valves in general F16K) [3, 2006.01]

34/02 in well heads [3, 2006.01]

34/04 in underwater well heads [3, 2006.01]

34/06 in wells [3, 2006.01]

34/08 responsive to flow or pressure of the fluid obtained (E21B 34/10 takes precedence) [3, 2006.01]

34/10 Operated by control fluid supplied from outside the borehole (control means being outside the borehole E21B 34/16) [3, 2006.01]

34/12 Operated by movement of casings or tubings [3, 2006.01]

34/14 Operated by movement of tools, e.g. sleeve valves operated by pistons or wire line tools [3, 2006.01]

34/16 Control means therefor being outside the borehole [3, 2006.01]
Obtaining fluids from wells [3]

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) [1, 2006.01]

36/00 Heating, cooling, or 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) [3, 2006.01]

36/02 . using burners [3, 2006.01]
36/04 . using electrical heaters [3, 2006.01]

37/00 Methods or apparatus for cleaning boreholes or wells (E21B 21/00 takes precedence; cleaning pipes in general B08B 9/02) [1, 2006.01]
37/02 . Scrapers specially adapted therefor [1, 2006.01]
37/04 . operated by fluid pressure, e.g. free-piston scrapers (operating other tools by fluid pressure E21B 23/08) [3, 2006.01]
37/06 . using chemical means for preventing or limiting the deposition of paraffins or like substances (chemical compositions therefor C09K 8/52) [3, 2006.01]
37/08 . cleaning in situ of down-hole filters, screens, or gravel packs (E21B 37/06 takes precedence) [3, 2006.01]
37/10 . Well swabs [3, 2006.01]

40/00 Tubing catchers, automatically arresting the fall of oil-well tubing [1, 2006.01]

41/00 Equipment or details not covered by groups E21B 15/00-E21B 40/00 [1, 2006.01]
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) [3, 6, 2006.01]
41/04 . Manipulators for underwater operations, e.g. temporarily connected to well heads (manipulators in general B25F) [3, 2006.01]
41/06 . Work chambers for underwater operations, e.g. temporarily connected to well heads (in general B63C 11/00) [3, 2006.01]
41/08 . Underwater guide bases, e.g. drilling templates; Levelling thereof [7, 2006.01]
41/10 . Guide posts, e.g. releasable; Attaching guide lines to underwater guide bases [7, 2006.01]

Obtaining fluids from wells [3]

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) [1, 2006.01]
43/01 . specially adapted for obtaining from underwater installations (underwater well heads E21B 33/035) [1, 2006.01]
43/03 . Connecting a production flow line to an underwater well head [3, 2006.01]
43/07 . 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) [3, 2006.01]
43/02 . Subsoil filtering (E21B 43/11 takes precedence; chemical compositions for consolidating loose sand or the like around wells C09K 8/56) [1, 2006.01]
43/04 . Gravelling of wells [1, 2006.01]
43/08 . Screens or liners [1, 2006.01]
43/10 . Setting of casings, screens or liners 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) [1, 2006.01]
43/11 . Perforators; Permeators [1, 2006.01]
43/12 . Perforators with extendable perforating members, e.g. actuated by fluid means [1, 2006.01]
43/14 . Perforators using direct fluid action, e.g. abrasive jets [1, 2006.01]
43/16 . Gun or shaped-charge perforators [1, 2006.01]
43/17 . Perforators using direct fluid action, e.g. abrasive jets [1, 2006.01]
43/18 . Repressuring or vacuum methods [1, 2006.01]
43/20 . Displacing by water [1, 2006.01]
43/22 . Use of chemicals or bacterial activity (E21B 43/27 takes precedence; chemical or bacterial compositions therefor C09K 8/58; chemical features in extracting oils from oil sands or shales C10G) [1, 2006.01]
43/24 . using heat, e.g. steam injection (heating, cooling or insulating wells E21B 36/00) [1, 2006.01]
43/27 . using heat, e.g. steam injection (heating, cooling or insulating wells E21B 36/00) [1, 2006.01]
43/28 . using heat, e.g. steam injection (heating, cooling or insulating wells E21B 36/00) [1, 2006.01]
43/29 . Combustion in situ [3, 2006.01]
43/30 . in association with fracturing processes [3, 2006.01]
43/34 . using explosives [5, 2006.01]
43/35 . Methods for stimulating production (dump bailers E21B 27/02; vibration generating arrangements E21B 28/00; chemical compositions therefor C09K 8/60) [1, 2006.01]
43/36 . by forming crevices or fractures [1, 2006.01]
43/37 . using explosives [3, 2006.01]
43/38 . reinforcing fractures by propping [3, 2006.01]
43/39 . by use of eroding chemicals, e.g. acids [1, 2006.01]
43/40 . Dissolving minerals other than hydrocarbons, e.g. by an alkaline or acid leaching agent (E21B 43/241 takes precedence) [1, 5, 2006.01]
43/44 . Melting minerals, e.g. sulfur (E21B 43/24 takes precedence; heating, cooling or insulating arrangements for wells E21B 36/00) [5, 2006.01]
43/45 . Obtaining a slurry of minerals, e.g. by using nozzles [5, 2006.01]
Automatic control

Surveying or testing

Survey of boreholes or wells (monitoring pressure or flow of drilling fluid E21B 21/08) [1, 2006.01, 2012.01]

Surveying or testing

Determining well or borehole volumes (determining depth E21B 47/04; diameter E21B 47/08) [2012.01]

Monitoring or checking of cementation quality or liquid level (E21B 47/053 takes precedence) [3, 2006.01, 2012.01]

Survey of boreholes or wells (production satellite stations E21B 43/017) [3, 2006.01]

Monitoring of walking-beam pump systems [2012.01]
E21B – E21C

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) [1, 2006.01]

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) [1, 2006.01]

49/60 . . obtaining fluid samples or testing fluids, in boreholes or wells [3, 2006.01]

49/04 . . using explosives in boreholes; using projectiles penetrating the wall [1, 3, 2006.01]

49/06 . . using side-wall drilling tools or scrapers [1, 2006.01]

E21C MINING OR QUARRYING

Subclass indexes

CUTTING; SLITTING; DISLODGING

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METHODS OF MINING OR QUARRYING;

OPEN-PIT MINING .................................................. 41/00, 45/00;

47/00, 49/00

OBTAINING MINERALS FROM UNDERWATER ........................................ 50/00

WINNING MATERIALS FROM EXTRATERRESTRIAL SOURCES .................... 51/00

25/52 . Machines incorporating two or more of the slitting means according to groups E21C 25/02, E21C 25/06, E21C 25/16, E21C 25/20 and E21C 25/22 [1, 2006.01] |

25/54 . Slitting by unguided cutter cables or cutter chains or by unguided tools drawn along the working face by cables or the like (dislodging by planing means E21C 27/32; propulsion by haulage cables E21C 29/14) [1, 2006.01] |

25/56 . Slitting by cutter cables or cutter chains or by tools drawn along the working face by cables or the like, in each case guided parallel to the face, e.g. by a conveyor or by a guide parallel to a conveyor (pressing the conveyor equipped with tools toward the working face E21C 35/14) [1, 2006.01] |

25/58 . Machines slitting by drilling hole on hole [1, 2006.01] |

25/60 . Slitting by jets of water or other liquid (picks with arrangement of fluid-spraying nozzles E21C 35/187; distribution of spraying fluids in rotating cutter-heads E21C 35/23) [1, 6, 2006.01] |

25/62 . Machines for making slits approximately perpendicular to the seams either level with, or above or below the level of, the machine [1, 2006.01] |

25/64 . Slitting machines guided solely by hand and either carried by hand or mounted on supports (hand-held power-operated tools E21C 37/22) [1, 2006.01] |

25/66 . Machines for making slits with additional arrangements for drilling [1, 2006.01] |

25/68 . Machines for making slits combined with equipment for removing, e.g. by loading, material won by other means (slitting machines combined with planing means E21C 27/18; removing chippings E21C 35/20) [1, 2006.01] |

27/00 Machines which completely free the mineral from the seam [1, 2006.01] |

27/01 . specially adapted for removing overhanging coal [1, 2006.01] |

27/02 . solely by slitting (rods, drums, for same E21C 25/10; saws, discs, wheels E21C 25/18; chains, chain guides, for same E21C 25/28) [1, 2006.01] |

27/04 . by a single chain guided on a frame with or without auxiliary slitting means [1, 2006.01]
Propulsion of machines for slitting or completely freeing the mineral from the seam [1, 2006.01]

29/00 . . . with a slew ing frame [1, 2006.01]
29/02 . . . by means on the machine exerting a thrust against fixed supports [1, 2006.01]
29/04 . . . by cable or chains [1, 2006.01]
29/06 . . . anchored at one or both ends to the mine working face [1, 2006.01]
29/08 . . . Anchoring arrangements (for anchoring of conveyors only E21F 13/00) [1, 2006.01]
29/10 . . . Cable or chain co-operating with a winch or the like on the machine [1, 2006.01]
29/12 . . . Machines propelled by thrust or pull against a part alternately anchored to, and released from, a cable or chain [1, 2006.01]
29/14 . . . by haulage cable or chain pulling the machine along the working face [1, 2006.01]
29/16 . . . Winches or other means for pulling cable or chain (winches in general B66D) [1, 2006.01]
29/18 . . . Coupling and uncoupling machine to cable or chain [1, 2006.01]
29/20 . . . with safety devices operating in the event of breakage of the cable or chain [1, 2006.01]
29/22 . . . by wheels, endless tracks, or the like [1, 2006.01]
29/24 . . . Trucks carrying the machine while working [1, 2006.01]
29/26 . . . with means for adjustably positioning the machine on the truck [1, 2006.01]
29/28 . . . . adjusting the height of the whole machine [1, 2006.01]

31/00 Driving means incorporated in machines for slitting or completely freeing the mineral from the seam [1, 2006.01]
31/02 . . . for cutting or breaking-down devices [1, 2006.01]
31/04 . . . imparting both a rotary and reciprocating motion [1, 2006.01]
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31/08 . . . for adjusting parts of the machines [1, 2006.01]
31/10 . . . for slewing parts of the machines [1, 2006.01]
31/12 . . . Component parts [1, 2006.01]

33/00 Trucks or other devices for transporting machines for slitting or completely freeing the mineral from the seam [1, 2006.01]
33/02 . . . with equipment for loading or unloading the machine on to, or from, the truck [1, 2006.01]

35/00 Details of, or accessories for, machines for slitting or completely freeing the mineral from the seam, not provided for in groups E21C 25/00-E21C 33/00, E21C 37/00 or E21C 39/00 [1, 2006.01]
35/02 . . . Locking equipment for slewable parts [1, 2006.01]
35/04 . . . Safety devices (operating in the event of breakage of a haulage cable or chain E21C 29/20) [1, 2006.01]
35/06 . . . Equipment for positioning the whole machine in relation to its sub-structure [1, 2006.01]
35/08 . . . Guiding the machine [1, 2006.01]
35/10 . . . by feelers contacting the working face [1, 2006.01]
35/12 . . . along a conveyor for the cut material [1, 2006.01]
35/14 . . . Equipment for pressing the conveyor towards the working face [1, 2006.01]
35/16 . . . by making use of the timbering, filling, or other supports [1, 2006.01]
35/18 . . . Mining picks; Holders therefor (planing knives E21C 35/18) [1, 2006.01]
35/19 . . . Means for fixing picks or holders [6, 2006.01]
35/19/3 . using bolts as main fixing elements [6, 2006.01]
35/19/7 . using sleeves, rings or the like, as main fixing elements [6, 2006.01]
35/20 . . . General features of equipment for removal of chippings, e.g. for loading on conveyor [1, 2006.01]
35/22 . . . Equipment for preventing the formation of, or for removal of, dust (picks with arrangement of fluid-spraying nozzles E21C 35/187; methods or apparatus for flushing boreholes E21B 21/00) [1, 2006.01]
35/23 . . . Distribution of spraying-fluids in rotating cutters heads [6, 2006.01]
35/24 . . . Remote control specially adapted for machines for slitting or completely freeing the mineral (control in general G05) [1, 2006.01]
E21C – E21D

37/00 Other methods or devices for dislodging with or without loading (breaking-down by means inserted in slits E21C 27/14) [1, 2006.01]
37/02 . by wedges [1, 2006.01]
37/04 . by devices with parts pressed mechanically against the wall of a borehole [1, 2006.01]
37/06 . by making use of hydraulic or pneumatic pressure in a borehole [1, 2006.01]
37/08 . Devices with pistons, plungers, or the like pressed locally against the wall of the borehole [1, 2006.01]
37/10 . Devices with expanding elastic casings [1, 2006.01]
37/12 . by injecting into the borehole a liquid, either initially at high pressure or subsequently subjected to high pressure, e.g. by pulses, by explosive cartridges acting on the liquid (slitting by jets of water E21C 25/60; blasting by explosives F42D) [1, 2006.01]
37/14 . by compressed air; by gas blast; by gasifying liquids [1, 2006.01]
37/16 . by fire-setting or by similar methods based on a heat effect (drilling by use of heat E21B 7/14) [1, 2006.01]
37/18 . by electricity [1, 2006.01]
37/20 . by ultrasonics [1, 2006.01]
37/22 . Hand tools or hand-held power-operated tools specially adapted for dislodging minerals (slitting machines guided solely by hand E21C 25/64) [1, 2006.01]
37/24 . Pick hammers (pneumatic hammers in general B25D; percussion drilling E21B 1/00) [1, 2006.01]
37/26 . Chisels or other cutting tools not mentioned before [1, 2006.01]
39/00 Devices for testing in situ the hardness or other properties of minerals, e.g. for giving information as to the selection of suitable mining tools [1, 2006.01]

Methods of mining or quarrying: Open-pit mining: Layouts therefor

41/00 Methods of underground or surface mining (E21C 45/00 takes precedence); Layouts therefor (for peat E21C 49/00) [1, 5, 2006.01]
41/16 . Methods of underground mining (winning machines therefor E21C 25/00-E21C 39/00); Layouts therefor [5, 2006.01]
41/18 . for brown or hard coal [5, 2006.01]
41/20 . for rock salt or potash salt [5, 2006.01]
41/22 . for ores, e.g. mining placers [5, 2006.01]
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41/26 . Methods of surface mining (machines for obtaining, or the removal of, materials in open-pit mines E21C 47/00); Layouts therefor [5, 2006.01]
41/28 . for brown or hard coal [5, 2006.01]
41/30 . for ores, e.g. mining placers [5, 2006.01]
41/32 . Reclamation of surface-mined areas (machines or methods for treating or working soil for agricultural purposes A01B 77/00, A01B 79/00; machines for back-filling E02F 5/22) [5, 2006.01]
45/00 Methods of hydraulic mining; Hydraulic monitors (E21C 25/60 takes precedence) [1, 5, 2006.01]
45/02 . Means for generating pulsating fluid jets [5, 2006.01]
45/04 . by use of highly pressurised liquid [5, 2006.01]
45/06 . by use of compressed gases [5, 2006.01]
45/08 . Automatic or remote control of hydraulic monitors [5, 2006.01]
47/00 Machines for obtaining, or the removal of, materials in open-pit mines (obtaining peat E21C 49/00) [1, 2006.01]
47/02 . for coal, brown coal, or the like (dredgers or soil-shifting machines in general E02F) [1, 3, 2006.01]
47/04 . Conveyor bridges used in co-operation with the winning apparatus [1, 3, 2006.01]
47/06 . Cableway conveyors used in co-operation with the winning apparatus (underground hauling E21F 13/00) [1, 2006.01]
47/08 . Devices for cutting-out partings, e.g. layers of sand between seams of coal [1, 2006.01]
47/10 . for quarrying stone, sand, gravel, or clay [1, 2006.01]
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49/02 . by excavating [1, 2006.01]
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50/00 Obtaining minerals from underwater, not otherwise provided for (suction dredgers or component parts thereof E02F 3/88; equipment for conveying or separating excavated material E02F 7/00; dippers G01N 1/12) [5, 2006.01]
50/02 . dependent on the ship movements (vessels or floating structures adapted for special purposes B63B 15/00) [5, 2006.01]
51/00 Apparatus for, or methods of, winning materials from extraterrestrial sources (cosmonautics B64G) [2, 2006.01]
### Shafts

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<td>. Plate linings; Laggings, i.e. linings designed for holding back formation material or for transmitting the load to main supporting members (insulation E21D 11/38) [2, 2006.01]</td>
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<td>11/18</td>
<td>. . Arch members [1, 2006.01]</td>
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<td>11/20</td>
<td>. . . Special cross-sections, e.g. corrugated [1, 2006.01]</td>
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<td>11/22</td>
<td>. . . Clamps or other yieldable means for interconnecting adjacent arch members either rigidly, or allowing arch member parts to slide when subjected to excessive pressure [1, 2006.01]</td>
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<td>11/24</td>
<td>. . . Knuckle joints or links between arch members [1, 2006.01]</td>
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Working-face supports

15/00 Props (in the building art E04G 25/00); Chocks [1, 2006.01]
15/02 Non-telescopic props [1, 2006.01]
15/04 with wooden prop parts joined by double conical connectors [1, 2006.01]
15/06 with parts joined by a lock, with or without slight axial adjustability [1, 2006.01]
15/08 with toggle joint connection [1, 2006.01]
15/10 with dog-clutch or pin-and-hole connection [1, 2006.01]
15/12 with locking devices located near head or foot [1, 2006.01]
15/14 Telescopic props (general means for fixing telescopic parts together F16B) [1, 2006.01]
15/15 Means countering entry of dirt; Built-in cleaning devices [1, 2006.01]
15/16 with parts held together by positive means, with or without relative sliding movement when the prop is subject to excessive pressure [1, 2006.01]
15/18 with one part resting on a supporting medium, e.g. rubber, sand, bitumen, lead, located in the other part, with or without expulsion or displacement of the medium upon excessive pressure [1, 2006.01]
15/20 with pawl, pin, cross-piece, or the like engaging with ratchet teeth, notches, holes, or the like spaced apart at intervals [1, 2006.01]
15/22 with member, pin, cross-piece, or the like ruptured, sheared through, or permanently deformed upon excessive pressure [1, 2006.01]
15/24 with axial screw-and-nut, rack-and-worm, or like mechanism [1, 2006.01]
15/26 with screw, worm, or the like not self-locking but normally prevented from rotation by frictional members which slip upon excessive pressure [1, 2006.01]
15/28 with parts held relatively to each other by friction or gripping, e.g. using wedges [1, 2006.01]
15/30 by means expanded or contracted by pressure applied through the medium of a fluid or quasi-fluid, e.g. rubber [1, 2006.01]
15/32 by a deformable collar [1, 2006.01]
15/34 by axially-moving balls, rollers, or the like [1, 2006.01]
15/36 by a tiltable collar surrounding one or both parts [1, 2006.01]
15/38 with longitudinally-divided upper or lower prop parts, e.g. interfitting laminations [1, 2006.01]
15/40 Collar or other support gripped to one or both parts by toggle-action, cam, or other member pivoted or similarly mounted [1, 2006.01]
15/42 with special parts to influence the friction [1, 2006.01]
15/43 Details of wedges (friction linings or pads E21D 15/42) [1, 2006.01]
15/44 Hydraulic, pneumatic, or hydraulic-pneumatic props [1, 2006.01]
15/45 having closed fluid system, e.g. with built-in pumps or accumulators [1, 2006.01]
15/46 with load-measuring devices; with alarm devices [1, 2006.01]
15/48 Chocks or the like [1, 2006.01]
15/50 Component parts or details of props (E21D 15/43, E21D 15/58, E21D 15/60 take precedence) [1, 2006.01]
15/52 Extensible units located above or below standard props [1, 2006.01]
15/54 Details of the ends of props (for permitting step-by-step movement E21D 23/06) [1, 2006.01]
15/55 of prop heads [1, 2006.01]
15/56 Details of locks of telescopic props [1, 2006.01]
15/58 Brackets for roof-supporting bars [1, 2006.01]
15/58/2 for mechanical props [1, 2006.01]
15/59 for hydraulic, pneumatic, or hydraulic-pneumatic props [1, 2006.01]
15/60 Devices for withdrawing props or chocks [1, 2006.01]
17/00 Caps for supporting mine roofs [1, 2006.01]
17/01 characterised by the shape of the cap, e.g. of specified cross-section [1, 2006.01]
17/02 Cantilever extension or similar protecting devices [1, 2006.01]
17/02/2 Auxiliary devices for temporary support of roof-supporting beams whilst assembling [1, 2006.01]
17/03 Brackets for roof-supporting bars [1, 2006.01]
17/04 for use in longwall working [1, 2006.01]
17/05 hydraulically extensible [1, 2006.01]
17/05/4 hydraulically pivotable [1, 2006.01]
17/06 for use in drifting galleries [1, 2006.01]
17/08 Cap joints for obtaining a coal-face free of pitprops [1, 2006.01]
17/08/2 of sliding type [1, 2006.01]
17/08/6 of articulated type [1, 2006.01]
17/10 Details of mine caps for engaging the tops of pitprops, with or without retaining-plates; Retaining-plates [1, 2006.01]
19/00 Provisional protective covers for working space (E21D 9/06, E21D 23/00 take precedence) [1, 3, 2006.01]
19/02 for use in longwall working [1, 2006.01]
19/04 for use in drifting galleries [1, 2006.01]
19/06 Arrangements for applying the covers [6, 2006.01]
### E21D – E21F

**SAFETY DEVICES, TRANSPORT, FILLING-UP, RESCUE, VENTILATION, OR DRAINAGE IN OR OF MINES OR TUNNELS [2]**

**Subclass indexes**

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#### Ventilation of mines or tunnels

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<th>Means or methods for preventing, binding, depositing or removing dust; Preventing explosions or fires (dams E21F 17/103; applying liquids or other fluent materials to surfaces in general B05; flue-gas indicators G01N) [1, 6, 2006.01]</th>
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<td>Impregnating walls, or the like, with liquids for binding dust [1, 2006.01]</td>
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7/00 Methods or devices for drawing-off gases with or without subsequent use of the gas for any purpose [1, 2006.01]

9/00 Devices preventing sparking of machines or apparatus (preventing sparking of electric machines or apparatus H01K, H02K) [1, 2006.01]

11/00 Rescue devices or other safety devices, e.g. safety chambers or escape ways (breathing aids for curative purposes A61H 31/00; respiratory apparatus A62B 7/00; breathing apparatus for accidentally buried persons A62B 33/00) [1, 2006.01]

13/00 Transport specially adapted to underground conditions (mine cars B61D; transport in general, loading B65G) [1, 2006.01]

13/02 . in galleries [1, 2006.01]
13/04 . in gravity inclines; in staple or inclined shafts [1, 2006.01]
13/06 . at or adjacent to the working face [1, 2006.01]
13/08 . Shifting conveyors or other transport devices from one location at the working face to another (guiding mining machines along conveyors for the cut mineral E21C 35/12; in combination with mine roof supports for step-by-step movement E21D 23/00) [1, 2006.01]
13/10 . Anchorings for conveyors [2, 2006.01]

15/00 Methods or devices for placing filling-up materials in underground workings (dams E21F 17/103) [1, 6, 2006.01]

15/02 . Supporting means, e.g. shuttering, for filling-up materials [1, 2006.01]
15/04 . . Stowing mats; Goaf wire netting; Partition walls [1, 2006.01]
15/06 . Filling-up mechanically [1, 2006.01]

15/08 . Filling-up hydraulically or pneumatically (hydraulic or pneumatic transport devices B65G; pipes, pipe couplings F16L) [1, 2006.01]

15/10 . . Hydraulic or pneumatic filling-up machines [1, 2006.01]

16/00 Drainage (keeping dry foundation sites or other areas in the ground E02D 19/00) [2, 2006.01]

16/02 . of tunnels [2, 2006.01]

17/00 Methods or devices for use in mines or tunnels, not covered elsewhere (mine lighting F21, H05B) [1, 2, 2006.01]

17/02 . Suspension devices for tubes or the like, e.g. for ventilating ducts (supporting pipes, cables or protective tubing in general F16L 3/00-F16L 7/00) [1, 2006.01]

17/04 . Distributing means for power supply [1, 2, 2006.01]

17/06 . . Distributing electric power; Cable networks; Conduits for cables (circuit arrangements for supplying or distributing electric power in general H02J) [1, 2006.01]

17/08 . . Distributing hydraulic power; Pipe networks for hydraulic liquid (pipe-line systems in general F17D) [1, 2006.01]

17/10 . . Distributing pneumatic power; Pipe networks for compressed air (pipe-line systems in general F17D) [1, 2006.01]

17/103 . Dams, e.g. for ventilation [6, 2006.01]

17/107 . . inflatable [6, 2006.01]

17/12 . . Dam doors [1, 2006.01]

17/16 . Modification of mine passages or chambers for storage purposes, especially for liquids or gases (storing fluids in natural or artificial cavities or chambers in the earth B65G 5/00) [1, 2006.01]

17/18 . Special adaptations of signalling or alarm devices (for elevators, escalators or moving walkways B66B; gas-sensitive devices per se G01N) [1, 2006.01]