

E21 EARTH OR ROCK DRILLING; MINING

E21D SHAFTS; TUNNELS; GALLERIES; LARGE UNDERGROUND CHAMBERS (soil-conditioning or soil-stabilising materials C09K 17/00; cutting machines for mining or quarrying E21C; safety devices, transport, rescue, ventilation or drainage E21F) [2,6]

- (1) This subclass covers methods or apparatus for making or lining tunnels, galleries or large underground chambers, using underground mining methods only, i.e. not involving disturbance of the ground surface. [6]
- (2) This subclass does not cover underground spaces made by foundation engineering, i.e. involving disturbance of the ground surface, which are covered by subclass E02D. [6]

MAKING SHAFTS; LININGS THEREFOR 1/00, 3/00,
7/00, 8/00; 5/00

MAKING TUNNELS OR GALLERIES;
LININGS THEREFOR 9/00; 11/00

MAKING UNDERGROUND CHAMBERS;
LININGS THEREFOR 13/00; 11/00

WORKING-FACE SUPPORTS OR COVERS 15/00, 17/00,
19/00, 21/00

SUPPORTS FOR STEP-BY-STEP
MOVEMENT 23/00

SETTING ANCHORING BOLTS 20/00

Shafts

- 1/00 Sinking shafts**
- 1/02 . by hand
 - 1/03 . mechanically (E21D 1/08 takes precedence)
 - 1/04 . . with grabs
 - 1/06 . . with shaft-boring cutters (drilling machines E21B)
 - 1/08 . while moving the lining downwards
 - 1/10 . Preparation of the ground
 - 1/12 . . by freezing
 - 1/14 . . . Freezing apparatus
 - 1/16 . . by petrification (grouting anchoring-bolts E21D 20/02)
- 3/00 Raising shafts, i.e. working upwards from the bottom**
- 5/00 Lining shafts; Linings therefor** (E21D 11/00 takes precedence) [3]
- 5/01 . using prefabricated lining lowered into a hole filled with liquid or viscous mass
 - 5/012 . Use of fluid-tight or anti-friction material on outside of, or between, lining layers
 - 5/016 . Bearer curbs
 - 5/02 . with wood (E21D 5/01, E21D 5/012, E21D 5/016 take precedence)
 - 5/04 . with brick, concrete, stone, or similar building materials (E21D 5/01, E21D 5/012, E21D 5/016 take precedence)
 - 5/06 . with iron or steel (E21D 5/01, E21D 5/012, E21D 5/016 take precedence)
 - 5/08 . . in the form of profiled parts
 - 5/10 . . in the form of tubing
 - 5/11 . with combinations of different materials, e.g. wood, metal, concrete (E21D 5/01, E21D 5/012, E21D 5/016 take precedence)
 - 5/12 . Accessories for making shaft linings, e.g. suspended cradles, shutterings
- 7/00 Shaft equipment, e.g. timbering within the shaft**
- 7/02 . Arrangement of guides for cages in shafts; Connection of guides for cages to shaft walls (guideways or guides for elevators B66B 7/02)
- 8/00 Shafts not provided for in groups E21D 1/00 E21D 7/00 [8]**

Tunnels; Galleries; Large underground chambers; Linings

therefor (galleries protecting against falling rocks or avalanches E01F 7/04; pressure galleries, galleries specially adapted to house pressure water conduits E02B 9/06; sewers E03F) [3,6]

- 9/00 Tunnels or galleries, with or without linings; Methods or apparatus for making thereof** (linings per se E21D 11/00); **Layout of tunnels or galleries** [3]
- 9/01 . Methods or apparatus for enlarging or restoring the cross-section of tunnels, e.g. by restoring the floor to its original level [7]
 - 9/02 . Driving inclined tunnels or galleries [3]
 - 9/04 . Driving tunnels or galleries through loose materials; Apparatus therefor not otherwise provided for
 - 9/06 . Making by using a driving shield [2]
 - 9/08 . . with additional boring or cutting means [2]
 - 9/087 . . . with a rotary drilling-head cutting simultaneously the whole cross-section, i.e. full-face machines [7]
 - 9/093 . . Control of the driving shield [7]
 - 9/10 . Making by using boring or cutting machines (E21D 9/08 takes precedence; similar machines for mining E21C 27/20; mining picks E21C 35/18) [3]
 - 9/11 . . with a rotary drilling-head cutting simultaneously the whole cross-section, i.e. full-face machines [7]
 - 9/12 . Devices for removing or hauling away excavated material or spoil; Working or loading platforms (underground transport E21F 13/00) [2]
 - 9/13 . . using hydraulic or pneumatic conveying means [7]
 - 9/14 . Layout of tunnels or galleries; Constructional features of tunnels or galleries, not otherwise provided for, e.g. portals, day-light attenuation at tunnel openings [3]
- 11/00 Lining tunnels, galleries or other underground cavities, e.g. large underground chambers; Linings therefor; Making such linings in situ, e.g. by assembling** (E21D 15/00 E21D 23/00 take precedence; specially for shafts E21D 5/00; lining pressure water galleries, linings therefor E02B 9/06) [2]
- 11/02 . Lining predominantly with wood [2]
 - 11/03 . . using timber-setting machines
 - 11/04 . Lining with building materials (E21D 11/02, E21D 11/14 take precedence) [2]

E21D

- 11/05 . . . using compressible insertions
- 11/06 . . . with bricks
- 11/07 using brick-laying machines
- 11/08 . . . with preformed concrete slabs
- 11/10 . . . with concrete cast in situ; Shuttering or other equipment adapted therefor
- 11/12 . . . Temporary supports for use during building; Accessories
- 11/14 . Lining predominantly with metal [2]
- 11/15 . . . 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]
- 11/18 . . . Arch members
- 11/20 Special cross-sections, e.g. corrugated
- 11/22 Clamps or other yieldable means for interconnecting adjacent arch members either rigidly, or allowing arch member parts to slide when subjected to excessive pressure
- 11/24 Knuckle joints or links between arch members
- 11/26 Shoes for connecting arch members to longitudinal struts
- 11/28 . . . Longitudinal struts
- 11/30 . . . Bases for lower arch members (for props E21D 15/54)
- 11/34 . . . Joints between vertical props and horizontal top bars (end caps forming part of the props E21D 15/54)
- 11/36 . . . Linings or supports specially shaped for tunnels or galleries of irregular cross-section [2,3]
- 11/38 . Waterproofing (in general E02D 31/00); Heat insulating; Soundproofing; Electric insulating (for building constructions in general E04B 1/62) [2]
- 11/40 . Devices or apparatus specially adapted for handling or placing units of linings for tunnels or galleries [2]
- 13/00 Large underground chambers; Methods or apparatus for making them** (lining E21D 11/00) [6]
- 13/02 . Methods
- 13/04 . Special equipment; Accessories

Working-face supports

- 15/00 Props** (in the building art E04G 25/00); **Chocks**
- 15/02 . Non-telescopic props
- 15/04 . . . with wooden prop parts joined by double conical connectors
- 15/06 . . . with parts joined by a lock, with or without slight axial adjustability
- 15/08 with toggle joint connection
- 15/10 with dog-clutch or pin-and-hole connection
- 15/12 with locking devices located near head or foot
- 15/14 . Telescopic props (general means for fixing telescopic parts together F16B)
- 15/15 . . . Means counteracting entry of dirt; Built-in cleaning devices
- 15/16 . . . with parts held together by positive means, with or without relative sliding movement when the prop is subject to excessive pressure
- 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
- 15/20 with pawl, pin, cross-piece, or the like engaging with ratchet teeth, notches, holes, or the like spaced apart at intervals

- 15/22 with member, pin, cross-piece, or the like ruptured, sheared through, or permanently deformed upon excessive pressure
- 15/24 . . . with axial screw-and-nut, rack-and-worm, or like mechanism
- 15/26 with screw, worm, or the like not self-locking but normally prevented from rotation by friction members which slip upon excessive pressure
- 15/28 . . . with parts held relatively to each other by friction or gripping, e.g. using wedges
- 15/30 by means expanded or contracted by pressure applied through the medium of a fluid or quasi-fluid, e.g. rubber
- 15/32 by a deformable collar
- 15/34 by axially-moving balls, rollers, or the like
- 15/36 by a tiltable collar surrounding one or both parts
- 15/38 with longitudinally-divided upper or lower prop parts, e.g. interfitting laminations
- 15/40 Collar or other support gripped to one or both parts by toggle-action, cam, or other member pivoted or similarly mounted
- 15/42 with special parts to influence the friction
- 15/43 Details of wedges (friction linings or pads E21D 15/42)
- 15/44 . . . Hydraulic, pneumatic, or hydraulic-pneumatic props
- 15/45 having closed fluid system, e.g. with built-in pumps or accumulators
- 15/46 . . . with load-measuring devices; with alarm devices
- 15/48 . Chocks or the like
- 15/50 . Component parts or details of props (E21D 15/43, E21D 15/58, E21D 15/60 take precedence)
- 15/502 . . . Prop bodies characterised by their shape, e.g. of specified cross-section
- 15/51 . . . specially adapted to hydraulic, pneumatic, or hydraulic-pneumatic props, e.g. arrangements of relief valves
- 15/52 . . . Extensible units located above or below standard props
- 15/54 . . . Details of the ends of props (for permitting step-by-step movement E21D 23/06)
- 15/55 of prop heads
- 15/56 . . . Details of locks of telescopic props
- 15/58 . Devices for setting props
- 15/582 . . . for mechanical props
- 15/59 . . . for hydraulic, pneumatic, or hydraulic-pneumatic props
- 15/60 . Devices for withdrawing props or chocks
- 17/00 Caps for supporting mine roofs**
- 17/01 . characterised by the shape of the cap, e.g. of specified cross-section
- 17/02 . Cantilever extension or similar protecting devices
- 17/022 . . . Auxiliary devices for temporary support of roof-supporting beams whilst assembling
- 17/03 . . . Brackets for roof-supporting bars
- 17/04 . . . for use in longwall working
- 17/05 hydraulically extensible
- 17/054 hydraulically pivotable
- 17/06 . . . for use in drifting galleries
- 17/08 . . . Cap joints for obtaining a coal-face free of pit-props
- 17/082 of sliding type

- 17/086 . . . of articulated type
- 17/10 . Details of mine caps for engaging the tops of pit-props, with or without retaining-plates; Retaining-plates
- 19/00 Provisional protective covers for working space** (E21D 9/06, E21D 23/00 take precedence) [3]
 - 19/02 . for use in longwall working
 - 19/04 . for use in drifting galleries
 - 19/06 . Arrangements for applying the covers [6]
- 20/00 Setting anchoring-bolts** (anchoring bolts for shafts, tunnels or galleries E21D 21/00; means for anchoring structural elements or bulkheads specially adapted to foundation engineering E02D 5/74; dowels or other devices fastened in walls or the like by inserting them in holes made therein for that purpose F16B 13/00) [5]
 - 20/02 . with provisions for grouting
- 21/00 Anchoring-bolts for roof, floor, or shaft-lining protection** (dowels or other devices fastened in walls or the like by inserting them in holes made therein for that purpose F16B 13/00) [5]
 - 21/02 . having means for indicating tension (screwed connections specially modified for indicating tensile load F16B 31/02)
- 23/00 Mine roof supports for step-by-step movement, e.g. in combination with provisions for shifting of conveyers, mining machines, or guides therefor** (shifting of mine conveyers at the working face, per se E21F 13/08)
 - 23/03 . having protective means, e.g. shields, for preventing or impeding entry of loose material into the working space or support [4]
 - 23/04 . Structural features of the supporting construction, e.g. linking members between adjacent frames or sets of props; Means for counteracting lateral sliding on inclined floor (E21D 23/14 takes precedence)
 - 23/06 . . Special mine caps or special tops of pit-props for permitting step-by-step movement
 - 23/08 . Advancing mechanisms (E21D 23/16 takes precedence)
 - 23/10 . . with advancing devices separate from the supporting construction
 - 23/12 . Control, e.g. using remote control (E21D 23/16 takes precedence)
 - 23/14 . . Effecting automatic sequential movement of supports, e.g. one behind the other
 - 23/16 . Hydraulic or pneumatic features, e.g. circuits, arrangement or adaptation of valves, setting or retracting devices
 - 23/18 . . of advancing mechanisms
 - 23/20 . . . for sequential movement, e.g. one behind the other
 - 23/22 . . . incorporated in mine caps
 - 23/24 . . . the advancing mechanisms being separate from the supporting construction
 - 23/26 . . Hydraulic or pneumatic control