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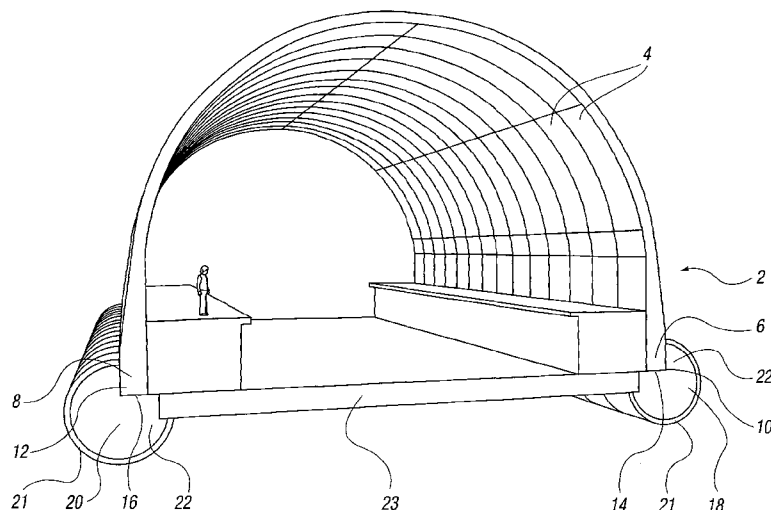


FIG. 1b

(57) Abstract: The invention relates to a method and apparatus for the formation of underground structures. The method includes the provision of the formation of at least two spaced support structures which are provided to include a slide track thereon to receive and allow the sliding movement therealong of a roof structure which is moved into position once the support structures are formed to form the underground structure. The support structures can include piled foundations and include a series of units in which the slide tracks are formed. Further articles can be provided to allow the excretion of lubricant to allow the movement of the structure units into position to be improved. Said articles can also be used subsequently to receive a filler material to allow any spaces between the structure and surrounding soil or rock to be filled.



INTERNATIONAL SEARCH REPORT

International application No

PCT/GB2011/001657

A. CLASSIFICATION OF SUBJECT MATTER

INV. E02D29/055

ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

E02D

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

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

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 99/19603 A1 (THOMSON JAMES CRAWFORD [CH]) 22 April 1999 (1999-04-22) the whole document -----	1-23

 Further documents are listed in the continuation of Box C.

 See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

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INTERNATIONAL SEARCH REPORT

International application No.
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Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

see additional sheet(s)

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-23

A method of forming an underground structure, said method comprising the steps of excavating soil and/or rock to a sufficient extent to allow the formation one or more units in position to form at least two, spaced apart, linear support structures, forming and/or exposing linear slide tracks within or on said structures and advancing one or more roof structures into the excavation with respective opposing ends of each of the roof structures in contact with at least one of the tracks and wherein material lying under the one or more roof structures is then excavated to the required depth of the underground structure.
With dependent claims 2-23.

2. claims: 24-26

A method of forming an underground construction, said method comprising the steps of: installing support structures including any of abutments or access tunnel or box, if an access tunnel or box is provided installing piling under the same to form abutments and piers, providing slide tracks on each support structure, jacking roof structure units along the support structures with a shield in front of the leading roof structure unit, supporting and sliding the end portions of the roof structure units along the tracks and, as the excavation and shield is advanced, jacking further roof structure units from a launch point at an end of the structure and exposing the slide tracks by removing part of the linear structure.
With dependent claims 25-26.

3. claims: 27, 28

A structure formed underground, said structure including at least first and second substantially linear support structures, said support structures including a series of units, said support structures spaced apart and each having a track formed therein, said tracks respectively receiving an end portion of at least one roof structure such that said at least one roof structure spans across the space between said support structures and is supported by the same to allow an excavated area thereunder to be defined to a sufficient depth once fully excavated to allow the passage of persons and/or transport means.
With dependent claims 28.

4. claims: 29-39

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Apparatus for the formation of a tunnel structure in an excavation, said apparatus comprising a plurality of support structure units, supporting a roof structure therebetween, said units formed and located such that when the same are in position, the tunnel structure is created and wherein, there is provided, in position between the external face of the tunnel structure and the surrounding soil or rock, at least one article in which a material is provided to aid the formation of the tunnel structure and/or the stability of the soil or rock around said tunnel structure.

5. claim: 40

Apparatus for forming a tunnel structure, said apparatus including a plurality of support structure units advanced and positioned in series so as to form the structure, wherein said units include at, or adjacent to, at least part of the external surface, a plurality of elongate tubes, said tubes provided to receive lubricant and/or grouting material therein.

6. claims: 41-45

A method of forming a tunnel structure, said method comprising excavating soil or rock to form a path along which the tunnel structure is to be formed, inserting, as the excavation takes place, a series of units, to form support structure and/or a roof structure, and wherein, as the units are inserted, at least one article is also inserted and positioned at the interface between the external face of the units and the surrounding soil or rock, said article provided to receive lubricant and/or grouting material.

With dependent claims 42-45.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9919603	A1	22-04-1999	
		AT 216026 T	15-04-2002
		AU 9357998 A	03-05-1999
		CA 2304533 A1	22-04-1999
		DE 69804834 D1	16-05-2002
		DE 69804834 T2	28-11-2002
		EP 1021640 A1	26-07-2000
		HK 1026467 A1	26-07-2002
		JP 4317322 B2	19-08-2009
		JP 2001520340 A	30-10-2001
		US 6406220 B1	18-06-2002
		WO 9919603 A1	22-04-1999
