Drilling very deep Boreholes with Plasma Drilling Technology

Short Presentation

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What is meant by Plasma Drilling Technology?

In the future, plasma drilling technology will be used to drill very deep holes where the soil (rock, clay, sand, etc.) in the bottom of the borehole is melted by a plasma flame and the addition of liquid nitrogen. The plasma flame at the drill head reaches a temperature of 3,000°C. The molten magma is cooled down on its way out of the borehole by injecting liquid nitrogen on the side of the drill head and converted into fine dust (fly-ash). The expansion that occurs during the transition of the liquid nitrogen into the gaseous state, causes the fine dust (fly-ash) to be blown out of the borehole under very high pressure and, in addition, the wall of the borehole is cooled from the drill head by these nitrogen injections; which leads to amorphous crystallization of the molten borehole wall and thus to a glazed wall. The amorphous ("fast" cooling of a melt) crystallization of the borehole walls eliminates the need to support the borehole with telescopic steel tubes. The drilling speed is more than 10 times faster than with conventional rotary drilling.

Issued Process Patents

Issued Process-Patents in Europa, USA, Japan, China

Europe Patent No. EP2825715 B1
USA Patent No. US9631433 B2
Japan Patent No. J6066133 B2
China Patent No. 201380024380.6

Content
It is described how the plasma drill head is working with different gases, that between the plasma drill head and the bottom of the hole a storage room is generated and that the generated magma particle are guides to the side of the plasma drill head. When the magma particles are passing the plasma drill head a stream of cold nitrogen is forming the plasma particles into ash particles which are guided into the ring space between drill string and borehole wall. Furthermore it is mentioned that the plasma head has a heat protection shield and how the electrical drill string is designed and working.

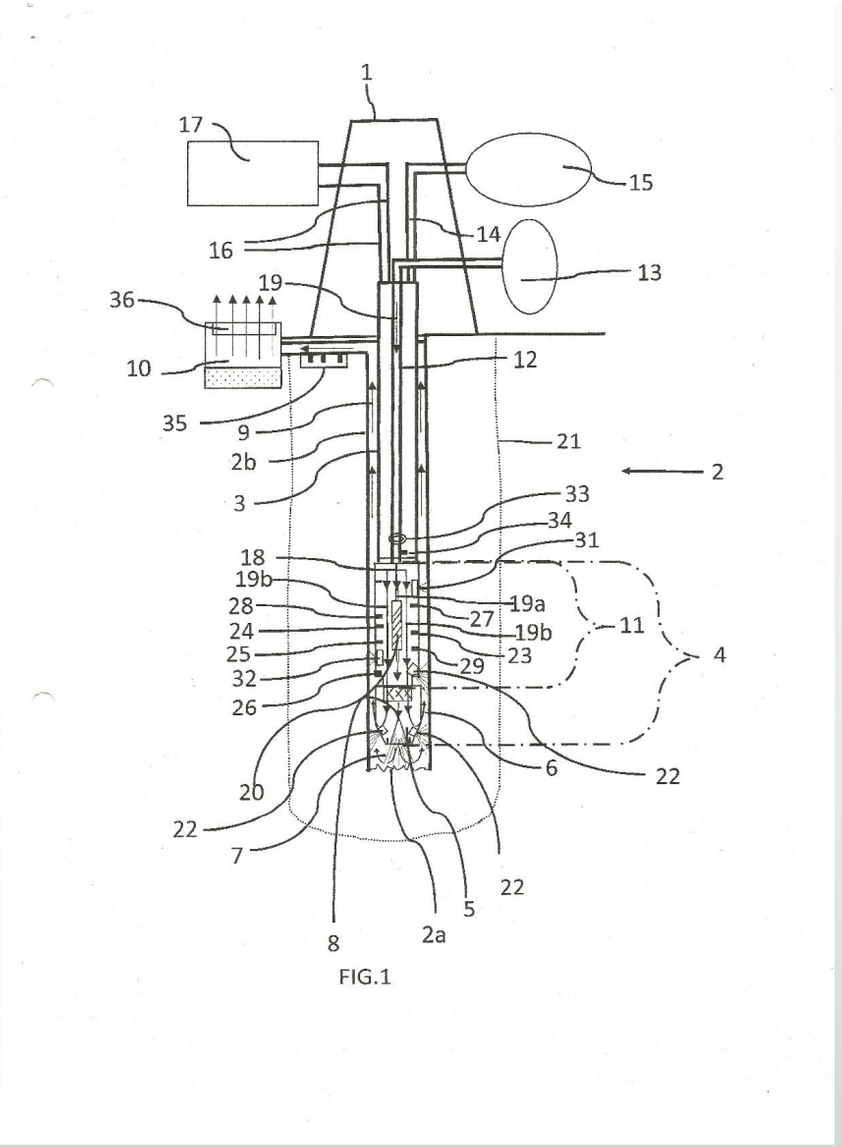
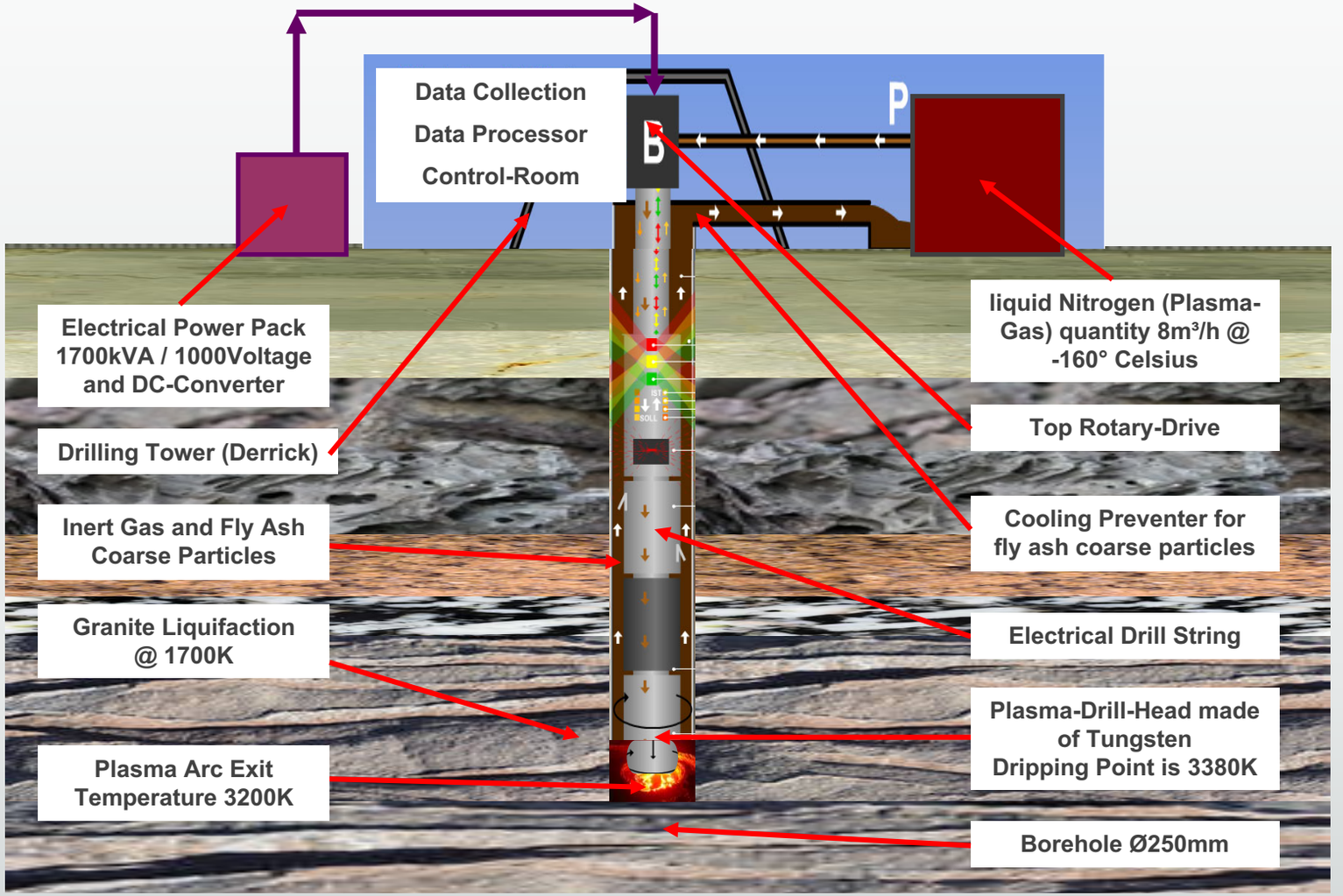


FIG.1

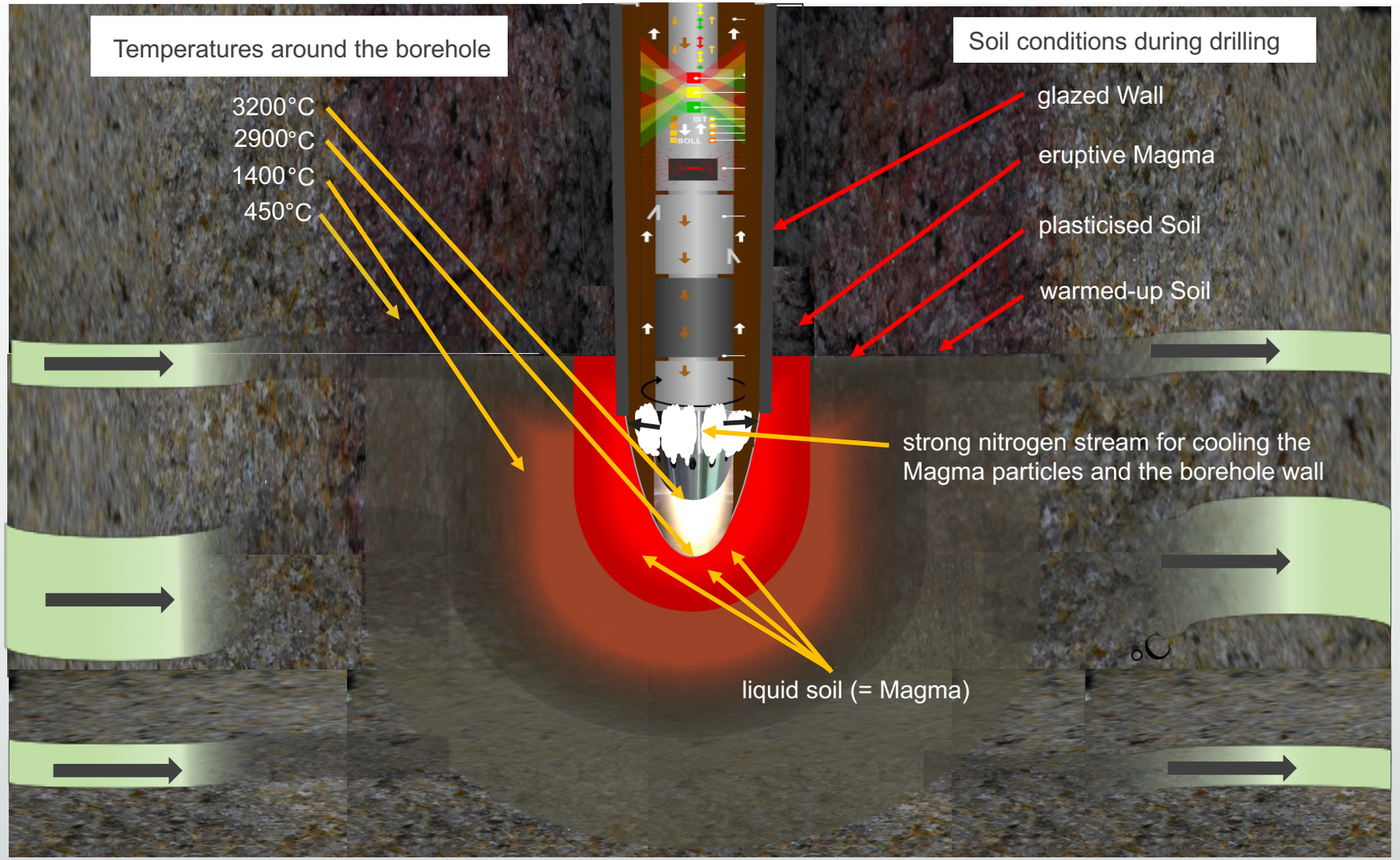
Advantages of Plasma Drilling Technology

- drilling depths can be reached that cannot be reached to date (> 5,000 m)
- compared to conventional drilling, the costs of drilling are much lower (approx. ¼ only of a 5,000 m deep hole)
- drilling in all types of soil is possible, also in loose rock, hard rock, sand and clay
- fast drilling speeds of more than 10 m per hour are achieved in all soil formations, even in Granite (hard rock)
- no need for roundtrips to replace drill heads (standard roller bits have to be changed every 20 hours)
- the borehole wall is created by the leading heat flow generated by the plasma flame
- the borehole walls are extremely solid and self-supporting
- a glazed, impermeable shaft tube is created
- in earth heat applications there is a closed circulation of the “water-steam circuit” and no soil contamination can occur and no hydraulic fracking is necessary
- large borehole diameters of up to one meter are possible
- the plasma drill head lasts approx. 500 operating hours (sufficient for a complete borehole drilling)

Display of a Borehole - drilled with Plasma Flame



Temperatures around the deep Borehole



The Factors for Success

- Worldwide, no one can drill deeper than 6,000 m and bigger diameter holes except us, due to the existing drilling method of using liquid (water) to flush out the chopped up chips from the bottom of the bore hole. Its because of the high soil temperature at a depth of 6,000 m. By using our Plasma-Drilling method, we melt the soil at the bottom of the bore hole by using a high-temperature nitrogen flame, and blow out by high pressure the flying ash particles from the bottom of the hole. The high soil temperature at the bore hole bottom is not important for our plasma drilling system, because we are using even higher flame temperatures of more than 3,000 Kelvin.
- The German Army University of Munich has confirmed in its Report, that with sufficient energy supply (means temperature), all types of soil (clay, granite, basalt, etc.) can be melted and that a glazed tube is formed during the melting process; exactly as Army University of Munich had already discovered two years ago by their own experiments.
- Our scientific findings, which have been established by simulation calculations, allow any melted material (clay, granite, basalt, etc.) to be blown out of the hole, this has already been confirmed by the Army University of Munich.
- Our double drill rod string with a large area of cross-section, allows very high current energy to be transferred into the borehole bottom in order to make the plasma flame sufficiently large and strong, thus producing a correspondingly large bore hole.
- Other reasons for success that our hole drilling with a plasma flame will quickly find its way into various markets are: a) Today the drilling speed in hard rock is approx. 1 m deep in 1 hour, we can drill up to 10 m in 1 hour. b) Today the maximum drilling diameter for deep holes is approx. 200 mm, we can drill up to ø 1,000 mm. c) Today the drilling cost of a 5,000 m deep bore hole is between € 40 - 50 million we can drill it for € 5 - 7 million
- Greenpeace assumes that the final disposal costs for high-grade radioactive material in the salt mine Gorleben e.g. will be around 500,000 Euro per m3. We can realize the final storage costs for around 50,000 Euro per m3.