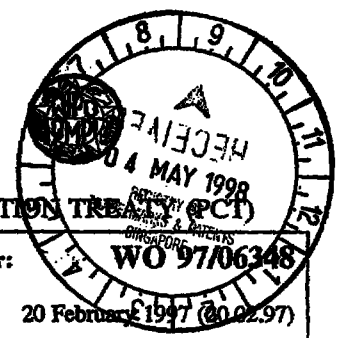


9801863 - 3
IPOS



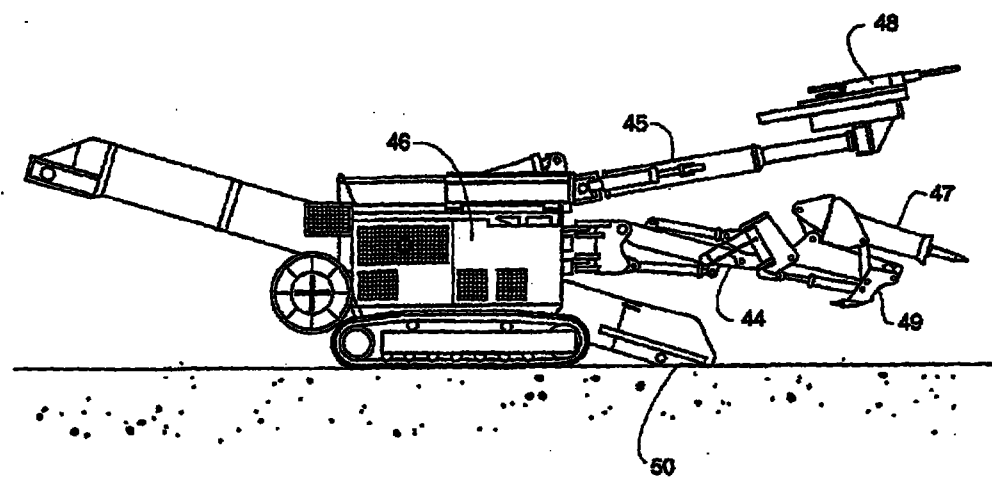
PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : E21C 3/02, 37/14, F42D 3/04		A1	(11) International Publication Number: (43) International Publication Date: 20 February 1997 (20.02.97)
(21) International Application Number: PCT/US96/12801 (22) International Filing Date: 7 August 1996 (07.08.96) (30) Priority Data: 60/001,956 7 August 1995 (07.08.95) US (71) Applicant: BOLINAS TECHNOLOGIES, INC. [US/US]; 22910 Pinecrest Road, Golden, CO 80401 (US). (72) Inventors: WATSON, John, David; 34804 West Meadow Road, Evergreen, CO 80439 (US). MICKE, Brian, P.; 22901 Pinecrest Road, Golden, CO 80401 (US). (74) Agents: SWARTZ, Douglas, W. et al.; Sheridan Ross & McIntosh, Suite 3500, 1700 Lincoln Street, Denver, CO 80203 (US).		(81) Designated States: AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.	

(54) Title: METHOD FOR CONTROLLED FRAGMENTATION OF HARD ROCK AND CONCRETE BY THE COMBINATION USE OF IMPACT HAMMERS AND SMALL CHARGE BLASTING



(57) Abstract

Rock and other hard materials, such as concrete, are broken by a combination of a mechanical impact breaker (33, 47) and a small-charge blasting process. A mechanical impact breaker (33, 47) fragments rock by delivering a series of mechanical blows to the rock. The fracturing process is accomplished by pressurizing the bottom of a drill hole (9) in such a way as to initiate and propagate a controlled fracture (18, 30) or propagate any pre-existing fractures near the hole-bottom (12). In practice, a small-charge blasting method is used to fracture and partially break out the center portion of the excavation. A mechanical impact breaker (33, 47) can then be used efficiently to further break and dislodge the rock that has been weakened by the small-charge blasting.