



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶: E21B 10/32, 10/56, 47/18	A1	(11) International Publication Number: WO 96/13648 (43) International Publication Date: 9 May 1996 (09.05.96)
(21) International Application Number: PCT/GB95/02540 (22) International Filing Date: 31 October 1995 (31.10.95) (30) Priority Data: 9422022.5 31 October 1994 (31.10.94) GB 9505430.0 17 March 1995 (17.03.95) GB (71) Applicant (for all designated States except US): THE RED BARON (OIL TOOLS RENTAL) LIMITED [GB/GB]; Blackness Avenue, Altens, Aberdeen AB1 4PG (GB). (72) Inventors; and (75) Inventors/Applicants (for US only): McGARIAN, Bruce [GB/GB]; 23 East Glebe, Stonehaven, Aberdeen AB3 2HW (GB). ARMELL, Richard, Alvin [GB/GB]; Nufstro Casa, Kirkton, St. Cyrus, Montrose, Angus DD10 0BW (GB). (74) Agent: GOODENOUGH, Nigel; A.A. Thornton & Co., Northumberland House, 303-306 High Holborn, London WC1V 7LE (GB).		(81) Designated States: AU, CA, GB, NO, RU, <u>SG</u> , US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>

SG 9701748-7

(54) Title: 2-STAGE UNDERREAMER

(57) Abstract

A 2-stage underreamer for use in a subterranean wellbore comprises a unitary body (2) having upper and lower blades (5A, 5B) and (6A, 6B) mounted in slots (3, 4) formed perpendicular to each other in the body. Separate upper and lower piston assemblies are provided for driving the blades (5A, 5B) and (6A, 6B) respectively from a storage configuration in which they are located substantially completely within the slots (3, 4) to a use position as illustrated in the figure. The blades each preferably comprise a steel arm having mounted thereon a base of tungsten nickel cobalt matrix in which diamond and/or tungsten carbide inserts are provided. A signal is given to the surface that the blades are in their extended position by changing the mud.

