



US008091477B2

(12) **United States Patent**
Brooks et al.

(10) **Patent No.:** **US 8,091,477 B2**
(45) **Date of Patent:** **Jan. 10, 2012**

(54) **INTEGRATED DETONATORS FOR USE WITH EXPLOSIVE DEVICES**

(56) **References Cited**

(75) Inventors: **James E. Brooks**, Manvel, TX (US);
Nolan C. Lerche, Stafford, TX (US);
Anthony F. Veneruso, Missouri City, TX (US)

U.S. PATENT DOCUMENTS

3,670,653	A *	6/1972	Lunt et al.	102/210
3,721,884	A *	3/1973	Thakore	361/251
3,913,224	A *	10/1975	Preissingner et al.	29/832
3,963,966	A *	6/1976	Mohr	361/260
4,227,461	A *	10/1980	Beezley et al.	102/218
4,304,184	A *	12/1981	Jones	102/202.13
4,421,030	A *	12/1983	DeKoker	102/218
4,538,088	A *	8/1985	Malone	313/325

(73) Assignee: **Schlumberger Technology Corporation**, Sugar Land, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 811 days.

(Continued)

(21) Appl. No.: **10/711,809**

CN 2178346 Y 9/1994

(22) Filed: **Oct. 6, 2004**

(Continued)

(65) **Prior Publication Data**

US 2005/0178282 A1 Aug. 18, 2005

Related U.S. Application Data

(63) Continuation-in-part of application No. 10/304,205, filed on Nov. 26, 2002, now Pat. No. 7,549,373.

FOREIGN PATENT DOCUMENTS

(60) Provisional application No. 60/521,088, filed on Feb. 19, 2004, provisional application No. 60/333,586, filed on Nov. 27, 2001.

OTHER PUBLICATIONS

R.L. Wahlers, C.Y.D. Huang, M.R. Heinz and A.H. Feingold; Low Profile Ltcc Transformers; Presented at the International Microelectronics and Packaging Society IMAPS, Symposium; Denver, CO; Sep. 4-6, 2002.

(51) **Int. Cl.**
F42B 3/10 (2006.01)
F42C 11/00 (2006.01)
F23Q 7/00 (2006.01)

Primary Examiner — Michael David

(74) *Attorney, Agent, or Firm* — Dan Hu; Kevin McGoff

(52) **U.S. Cl.** 102/202.7; 102/202.14; 102/206; 102/207; 102/215; 102/217; 102/218; 102/275.11; 361/248; 361/249; 361/251; 361/252

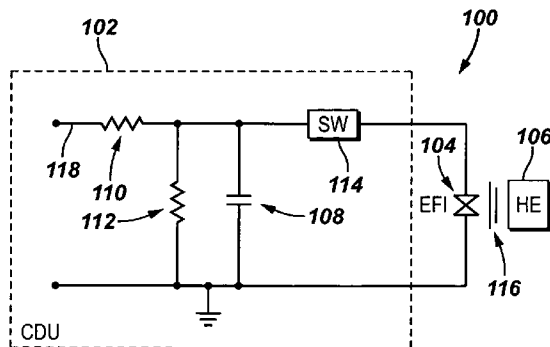
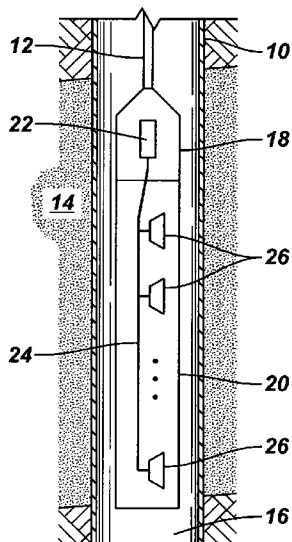
(57) **ABSTRACT**

A detonator assembly includes a capacitor, an initiator, a transformer and an addressable chip. The initiator is electrically connected to the capacitor, the transformer is mechanically and electrically connected to the capacitor and the addressable chip is mechanically and electrically connected to the transformer. The initiator may be bonded or fused to the capacitor, and the transformer may be bonded or fused to the capacitor. The capacitor, initiator, transformer and addressable chip form a unified integrated detonating unit.

(58) **Field of Classification Search** 102/202.5, 102/202.7, 202.14, 206, 207, 210, 215, 217, 102/218, 275.11; 361/248, 249, 251, 252

See application file for complete search history.

56 Claims, 10 Drawing Sheets



U.S. PATENT DOCUMENTS

RE32,888 E * 3/1989 Kirby et al. 102/217
 4,829,899 A * 5/1989 Wiker et al. 102/206
 4,870,902 A * 10/1989 Simon et al. 102/201
 5,179,248 A 1/1993 Hartman et al.
 5,309,841 A 5/1994 Hartman et al.
 5,341,742 A * 8/1994 Alford et al. 102/202.8
 5,347,929 A * 9/1994 Lerche et al. 102/202.14
 5,369,579 A 11/1994 Anderson
 5,436,791 A 7/1995 Turano
 5,444,598 A 8/1995 Aresco
 5,725,242 A * 3/1998 Belau et al. 280/735
 5,731,538 A 3/1998 O'Brien et al.
 5,908,365 A * 6/1999 LaJaunie et al. 175/4.56
 6,173,651 B1 1/2001 Pathe
 6,179,064 B1 1/2001 Vaynshteyn
 6,199,484 B1 3/2001 Martinez-Tovar et al.
 6,272,965 B1 * 8/2001 Baginski et al. 86/1.1
 6,302,024 B1 10/2001 Swart et al.
 6,318,267 B1 * 11/2001 Swart et al. 102/202.5
 6,356,455 B1 * 3/2002 Carpenter 361/793
 6,385,031 B1 5/2002 Lerche et al.

6,386,108 B1 5/2002 Brooks et al.
 6,470,803 B1 * 10/2002 Liu et al. 102/206
 6,598,682 B2 * 7/2003 Johnson et al. 166/370
 6,903,938 B2 * 6/2005 Waffenschmidt 361/779
 6,911,373 B2 * 6/2005 Kellar et al. 438/399
 7,191,706 B2 * 3/2007 Chase et al. 102/217
 7,236,345 B1 * 6/2007 Roesler et al. 361/247
 2004/0003743 A1 1/2004 Brooks et al.
 2006/0144278 A1 * 7/2006 Gerez 102/202.5

FOREIGN PATENT DOCUMENTS

EP 0555651 A1 8/1993
 EP 0561499 A1 9/1993
 GB 2253683 A 9/1992
 GB 2352261 A 1/2001
 GB 2357825 A 7/2001
 GB 2388420 A 11/2003
 WO WO 00/20820 A2 4/2000
 WO WO 01/46638 A1 6/2001
 WO 02099356 A2 12/2002

* cited by examiner

FIG. 1A

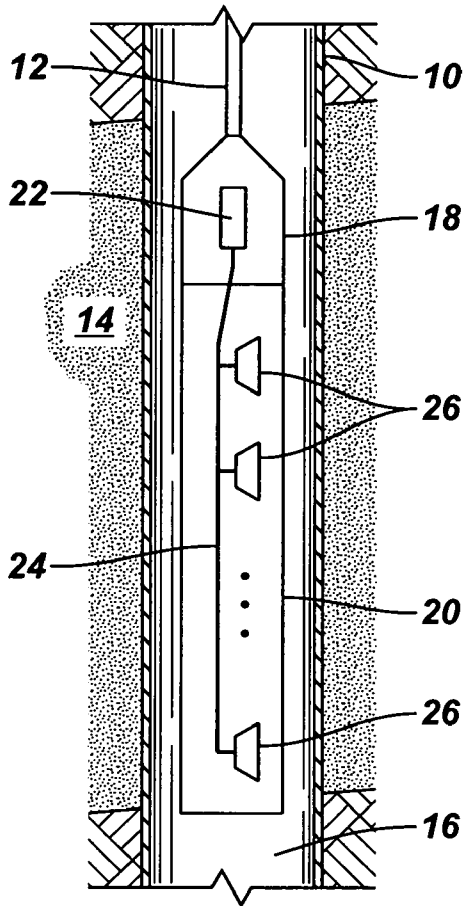


FIG. 1B

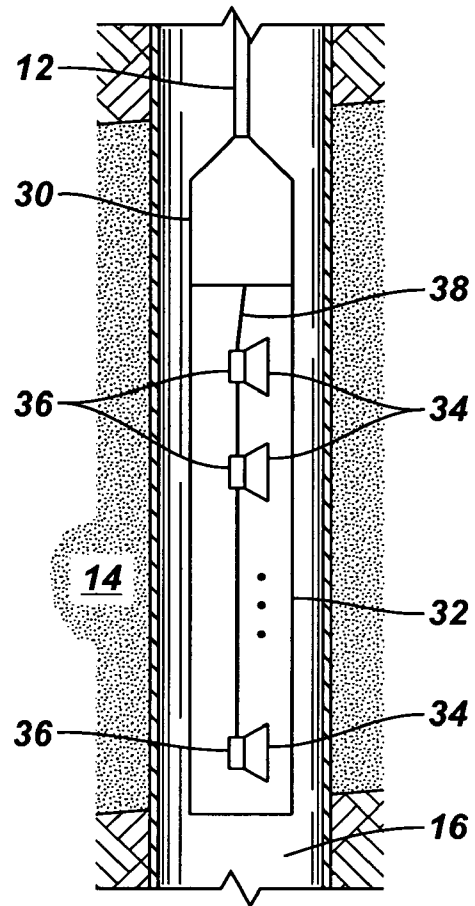


FIG. 2

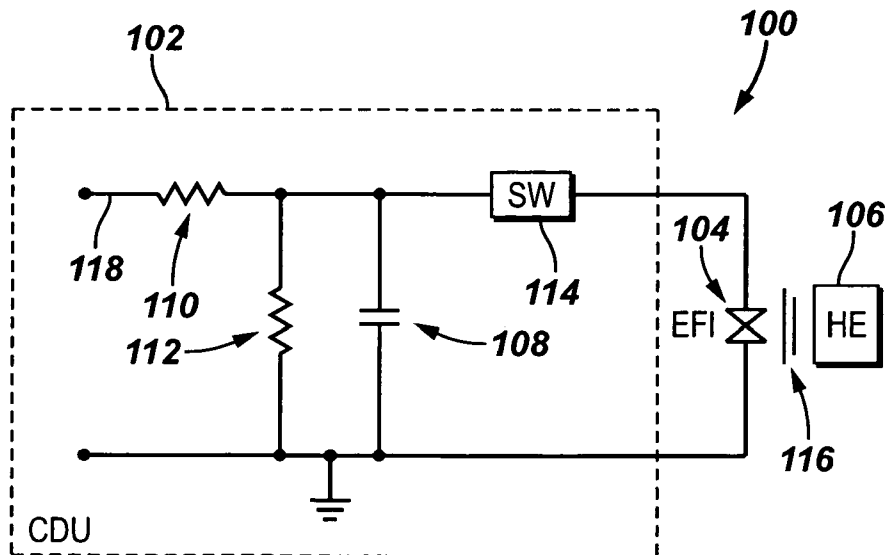


FIG. 3

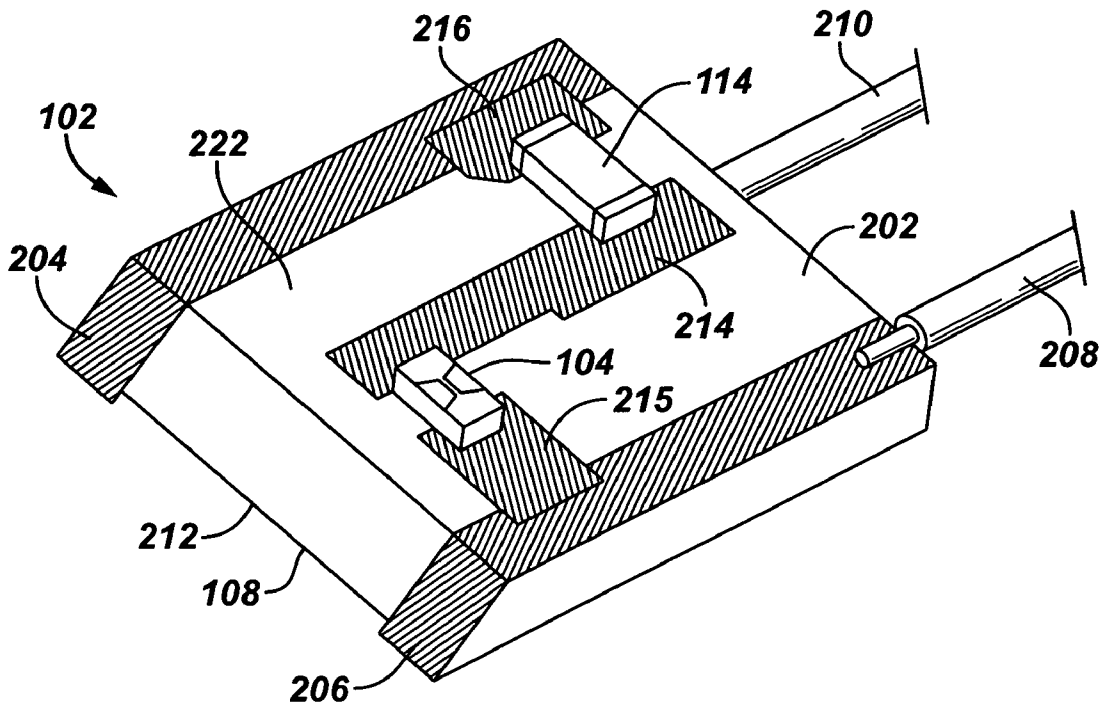


FIG. 4

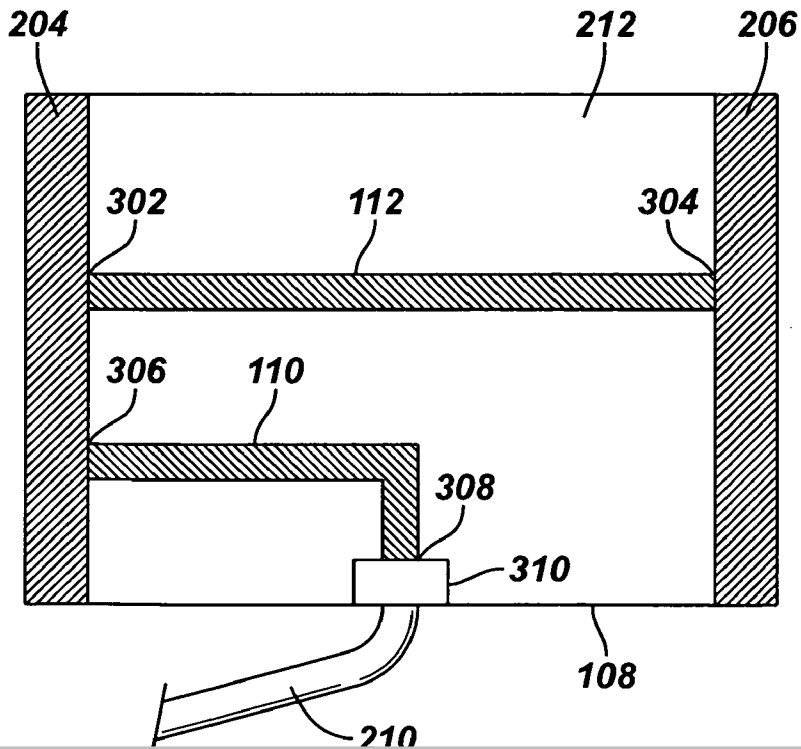


FIG. 5

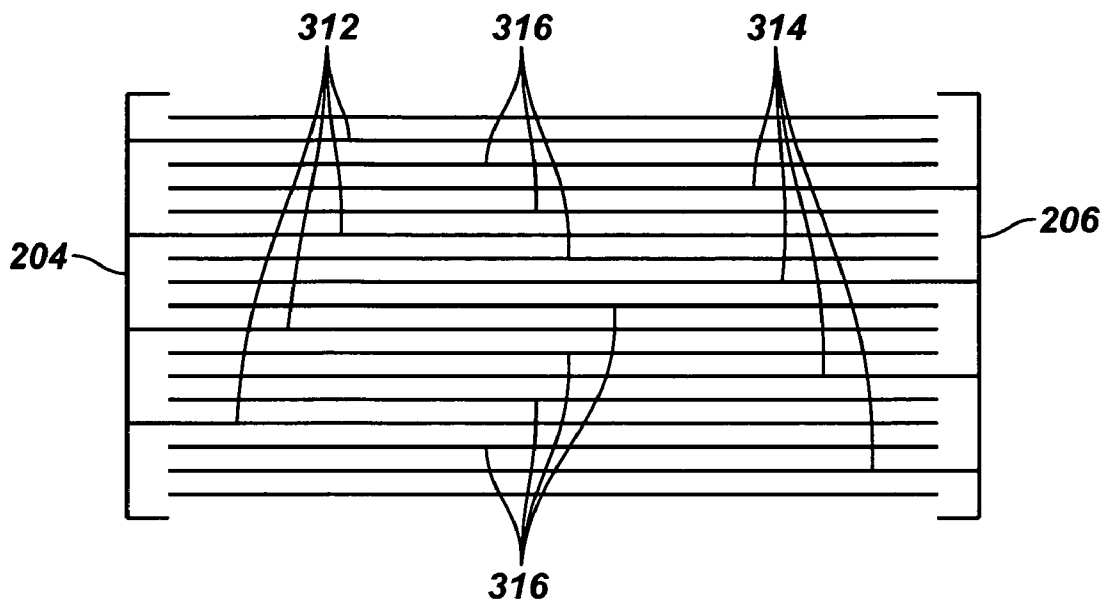
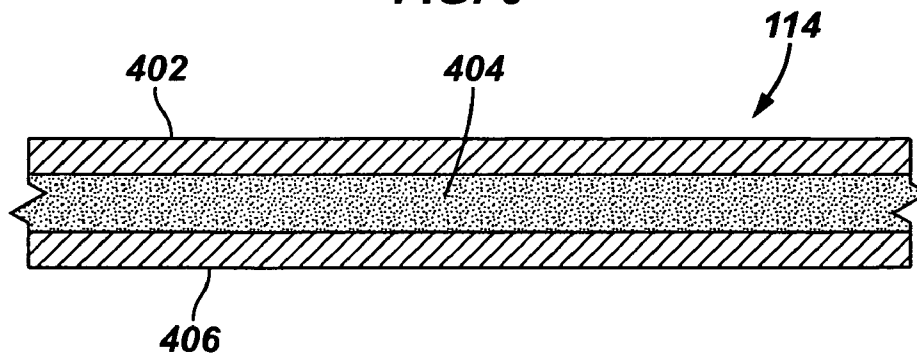


FIG. 6



Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.