



US005771022A

United States Patent [19]
Vaughan et al.

[11] **Patent Number:** **5,771,022**
[45] **Date of Patent:** **Jun. 23, 1998**

[54] **COMPOSITE ANTENNA FOR HAND HELD OR PORTABLE COMMUNICATIONS**

4,494,120 1/1985 Garay 343/702

FOREIGN PATENT DOCUMENTS

[75] Inventors: **Rodney Vaughan; Neil Scott**, both of Wellington, New Zealand

| | | |
|-----------|---------|----------------------|
| 520 564 | 6/1992 | European Pat. Off. . |
| 2 605 148 | 10/1986 | France . |
| 2 155 016 | 5/1973 | Germany . |
| 30 46 255 | 10/1981 | Germany . |
| 42 21 121 | 10/1993 | Germany . |
| 1 383 976 | 10/1972 | United Kingdom . |
| 1 390 728 | 4/1975 | United Kingdom . |
| 2 079 063 | 6/1981 | United Kingdom . |

[73] Assignee: **Industrial Research Limited**, Wellington, New Zealand

[21] Appl. No.: **586,707**

[22] PCT Filed: **Jul. 29, 1994**

[86] PCT No.: **PCT/NZ94/00077**

§ 371 Date: **Apr. 25, 1996**

§ 102(e) Date: **Apr. 25, 1996**

[87] PCT Pub. No.: **WO95/04386**

PCT Pub. Date: **May 9, 1995**

[30] **Foreign Application Priority Data**

Jul. 29, 1993 [NZ] New Zealand 248283

[51] **Int. Cl.⁶** **H01Q 1/24; H01Q 21/06**

[52] **U.S. Cl.** **343/702; 343/893**

[58] **Field of Search** 343/702, 893, 343/846, 725, 729, 751, 853; H01Q 1/24, 21/06, 21/12, 21/24

[56] **References Cited**

U.S. PATENT DOCUMENTS

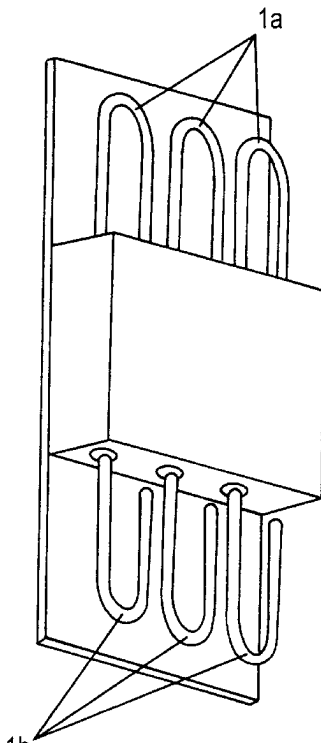
4,396,920 8/1983 Grimberg et al. 343/846

Primary Examiner—Hoanganh T. Le
Attorney, Agent, or Firm—Lowe, Price, LeBlanc & Becker

[57] **ABSTRACT**

A composite antenna for hand held communications applications comprising at least two individual antennas spaced from each other at less than 0.3 wavelengths relative to the frequency to be received. Preferably the individual antennas are arranged in two or more arrays each of 2, 3, 4, 5 or more individual closely spaced antennas. Preferably each of the individual antennas is between 0.1 and 0.7 wavelengths long and most preferably about 1/4 wavelengths long. The composite antenna may be designed to operate in the 800 MHz to 5 GHz range. Preferably the individual antennas are spaced from each other in the direction of orientation of the individual antennas to assist in each individual antenna receiving a signal as uncorrelated as possible to the signal received by the other individual antennas of the composite array.

10 Claims, 5 Drawing Sheets



SAMSUNG 1077

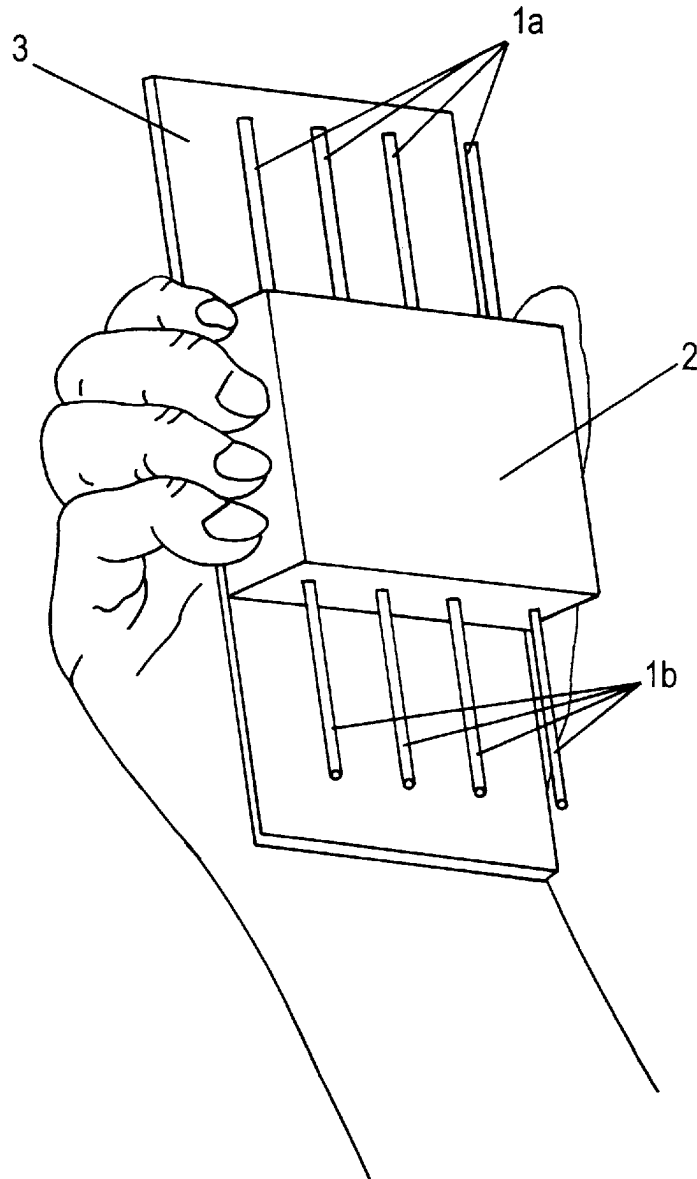


FIG. 1

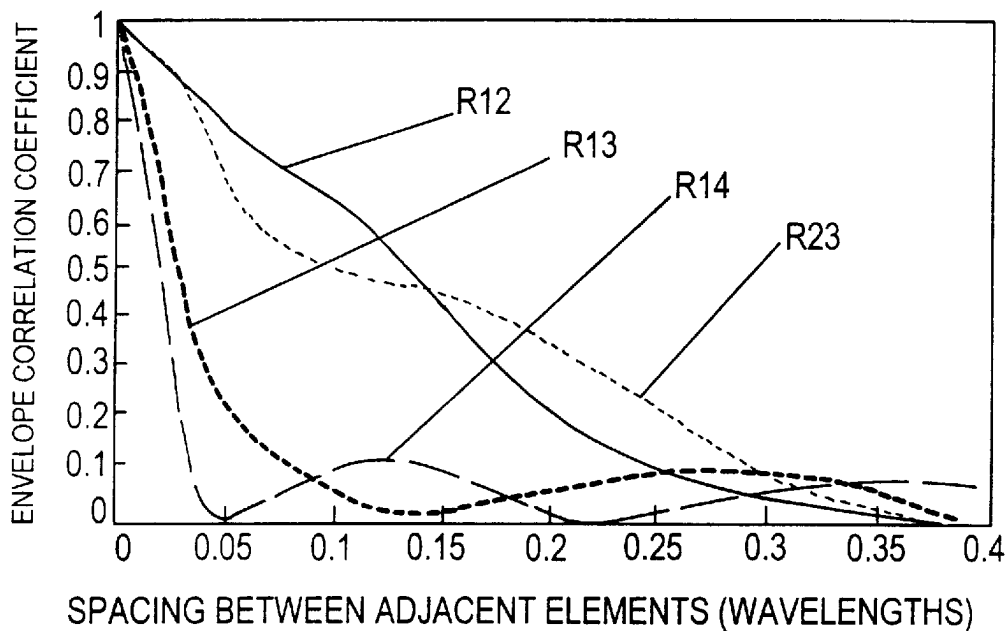
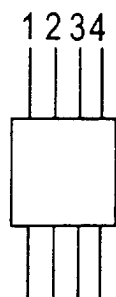
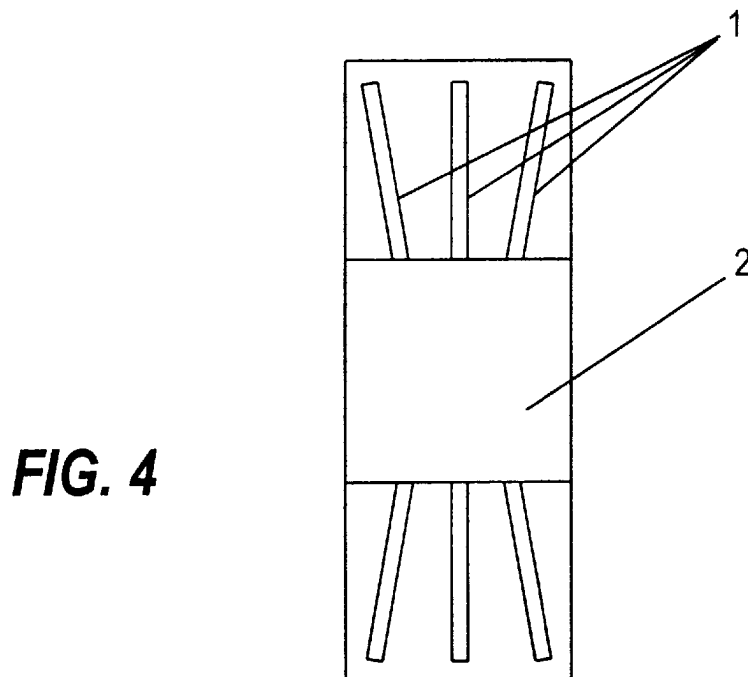
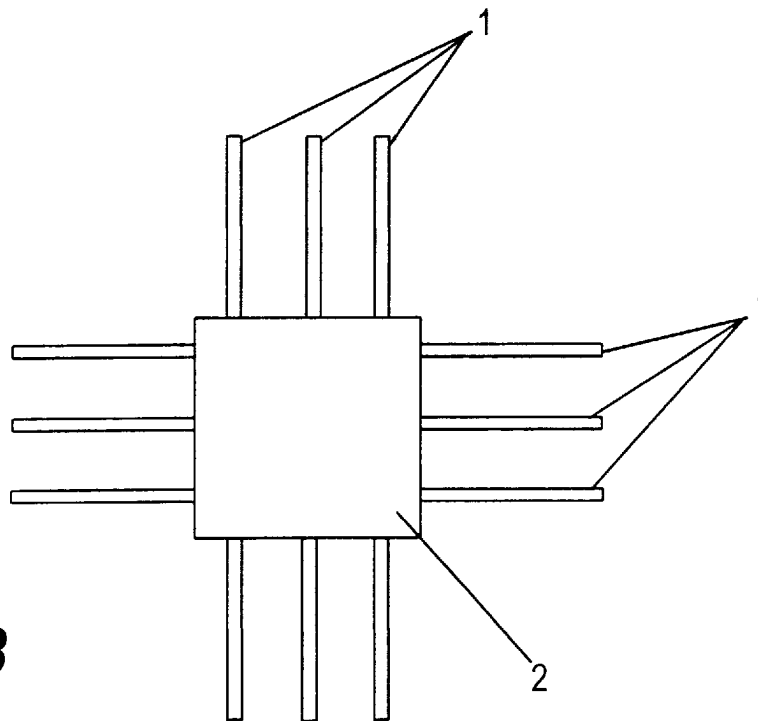


FIG. 2



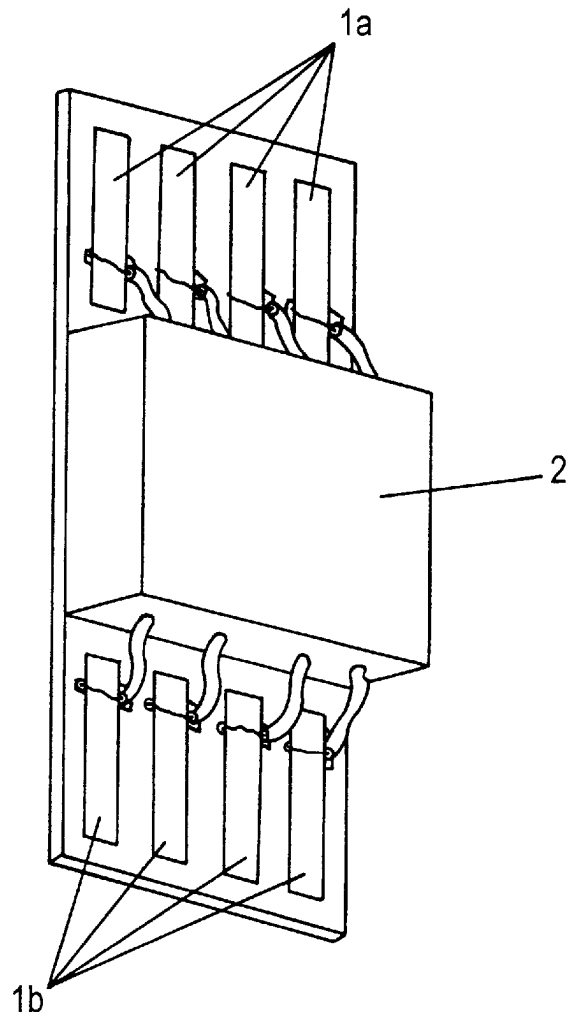


FIG. 5

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.