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(54) MODULAR COVERT REMOTE ELECTRONIC WARFARE SIMULATOR

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Related U.S. Application Data

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(56) References Cited

U.S. PATENT DOCUMENTS

| 4,192,082 A | * | 3/1980 | Deaton et al 434/2 |
|-------------|-----|---------|------------------------|
| 4,666,407 A | * | 5/1987 | Jones 434/2 |
| 4,969,819 A | 蜂 | 11/1990 | James 434/5 |
| 5,010,342 A | * | 4/1991 | Jones, Jr 342/169 |
| 5,133,663 A | * | 7/1992 | Willingham et al 434/2 |
| 5,134,412 A | | 7/1992 | Baseghi et al 342/169 |
| 5,150,127 A | 轉 | 9/1992 | Aw 342/169 |
| 5,313,209 A | 181 | 5/1994 | Michaels et al 342/13 |
| | | | |

| 5,341,146 A | * 8/1994 | Vennum et al 342/170 |
|-------------|-----------|----------------------|
| 5,359,329 A | * 10/1994 | Lewis et al 342/17 |
| 5,549,477 A | * 8/1996 | Tran et al 434/5 |
| 5,886,626 A | * 3/1999 | Hynes et al 342/169 |

OTHER PUBLICATIONS

Loo, James et al. "The Dreo Electronic Warfare Engagement Simulation Facility" IEEE 1993, Electrical and Computer Engineering, 1993. Canadian Conference on 14–17 1993, pp. 1097–1114.*

Vaccarino, Carmine A. et al. "Real-Time Simulation For Verification Of Tactical Electronic Warfare System" Proceedings of the 1978 annual conference, Dec. 1978, pp. 334–341.*

* cited by examiner

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(57) ABSTRACT

An apparatus for electronic warfare signal simulation which is used in an external test system to simultaneously test a plurality of "victim" communication systems for vulnerability to jamming. The test system includes a remote radiator of a signal free of jamming effects, and a remote radiator of one or more radio frequency control signals which represent one or more predetermined jamming threats in the low and mid bands. The simulation apparatus has a pair of couplers, each adapted to be coupled between a respective one of a plurality of "victim" antennas and its associated "victim" receiver, for coupling off the control signals to a receiving circuit, a plurality of modules for generating simulated jamming signals, and a band select circuit for translating the frequency of each simulated jamming signal, setting its level to that determined for its control signal, and replicating the "victim" antenna gains, and feeding the modified simulated jamming signals together with the desired signal to the plurality of "victim" receivers.

20 Claims, 4 Drawing Sheets

