US005898830A

# United States Patent [19]

Wesinger, Jr. et al.

[11] Patent Number: 5,898,830

[45] Date of Patent: Apr. 27, 1999

[54] **FIREWALL PROVIDING ENHANCED NETWORK SECURITY AND USER TRANSPARENCY**

[75] Inventors: **Ralph E. Wesinger, Jr.**, San Jose; **Christopher D. Coley**, Morgan Hill, both of Calif.

[73] Assignee: **Network Engineering Software**, San Jose, Calif.

[21] Appl. No.: **08/733,361**

[22] Filed: **Oct. 17, 1996**

[51] **Int. Cl.**[6] ..... **G06F 1/00**

[52] **U.S. Cl.** ..... **395/187.01**; 395/200.55; 395/200.57

[58] **Field of Search** ..... 395/186, 187.01, 395/188.01, 200.3, 200.55, 200.68, 200.57; 380/3, 4, 21, 23, 25; 340/825.3

[56] **References Cited**

U.S. PATENT DOCUMENTS

| | | | |
|---|---|---|---|
| 4,713,753 | 12/1987 | Boebert et al. | 364/200 |
| 4,799,153 | 1/1989 | Hann et al. | 380/25 |
| 4,799,156 | 1/1989 | Shavit et al. | 364/401 |
| 5,191,611 | 3/1993 | Lang | 380/25 |
| 5,241,594 | 8/1993 | Kung | 380/4 |
| 5,416,842 | 5/1995 | Aziz | 380/30 |

(List continued on next page.)

OTHER PUBLICATIONS

Kiuchi et al., "C–HTTP The Development of a Secure, Closed HTTP Based Network on the Internet", PRoceedings of SNDSS, IEEE, pp. 64–75, Jun. 1996.

Neuman, "Proxy Based Authorization and Accounting for Distributed Systems", IEEE, pp. 283–291, 1993.

Network Firewalls; *IEEE Communications Magazine*; (Ballovin et al.) pp. 50–57; Sep., 1994.

The MITRE Security Perimeter; *IEEE Communications Magazine*; (Goldberg); pp. 212–218; 1994.

IpAccess—An Internet Service Access System for Firewall Installations; *IEEE Communications Magazine*; (Stempel); pp. 31–41; 1995.

Remote Control of Diverse Network Elements Using SNMP; *IEEE Communications Magazine*; (Aicklen et al.); pp. 673–667; 1995.

Firewall's Information is Money!, *Scientific Management Corporation*.

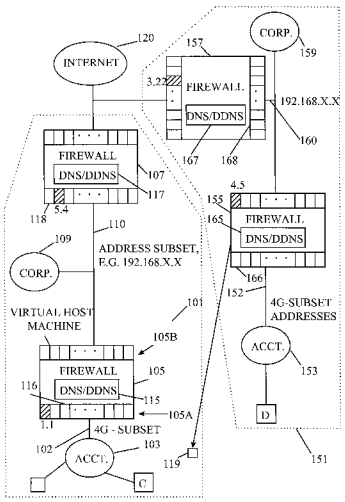
*Primary Examiner*—Joseph Palys

*Attorney, Agent, or Firm*—McDonnell Boehnen Hulbert & Berghoff

[57] **ABSTRACT**

The present invention, generally speaking, provides a firewall that achieves maximum network security and maximum user convenience. The firewall employs "envoys" that exhibit the security robustness of prior-art proxies and the transparency and ease-of-use of prior-art packet filters, combining the best of both worlds. No traffic can pass through the firewall unless the firewall has established an envoy for that traffic. Both connection-oriented (e.g., TCP) and connectionless (e.g., UDP-based) services may be handled using envoys. Establishment of an envoy may be subjected to a myriad of tests to "qualify" the user, the requested communication, or both. Therefore, a high level of security may be achieved. The usual added burden of prior-art proxy systems is avoided in such a way as to achieve fall transparency-the user can use standard applications and need not even know of the existence of the firewall. To achieve full transparency, the firewall is configured as two or more sets of virtual hosts. The firewall is, therefore, "multi-homed," each home being independently configurable. One set of hosts responds to addresses on a first network interface of the firewall. Another set of hosts responds to addresses on a second network interface of the firewall. In one aspect, programmable transparency is achieved by establishing DNS mappings between remote hosts to be accessed through one of the network interfaces and respective virtual hosts on that interface. In another aspect, automatic transparency may be achieved using code for dynamically mapping remote hosts to virtual hosts in accordance with a technique referred to herein as dynamic DNS, or DDNS.

**21 Claims, 9 Drawing Sheets**



U.S. PATENT DOCUMENTS

| | | | |
|---|---|---|---|
| 5,483,661 | 1/1996 | Yoshida et al. | 395/187.01 |
| 5,491,752 | 2/1996 | Kaufnman et al. | 380/30 |
| 5,495,533 | 2/1996 | Linehan et al. | 380/21 |
| 5,548,721 | 8/1996 | Denslow | 395/187.01 |
| 5,550,984 | 8/1996 | Gelb | 395/187.01 |
| 5,577,209 | 11/1996 | Boyle et al. | 395/200.06 |
| 5,590,199 | 12/1996 | Krajewski, Jr. et al. | 380/25 |
| 5,602,918 | 2/1997 | Chen et al. | 380/21 |
| 5,606,668 | 2/1997 | Shwed | 395/200.11 |
| 5,623,601 | 4/1997 | Vu | 395/187.01 |
| 5,632,011 | 5/1997 | Landfield et al. | 395/326 |
| 5,636,371 | 6/1997 | Yu | 395/500 |
| 5,638,448 | 6/1997 | Nguyen | 380/29 |
| 5,657,452 | 8/1997 | Kralowetz | 395/200.57 |
| 5,668,876 | 9/1997 | Falk et al. | 380/25 |
| 5,687,235 | 11/1997 | Periman et al. | 380/25 |

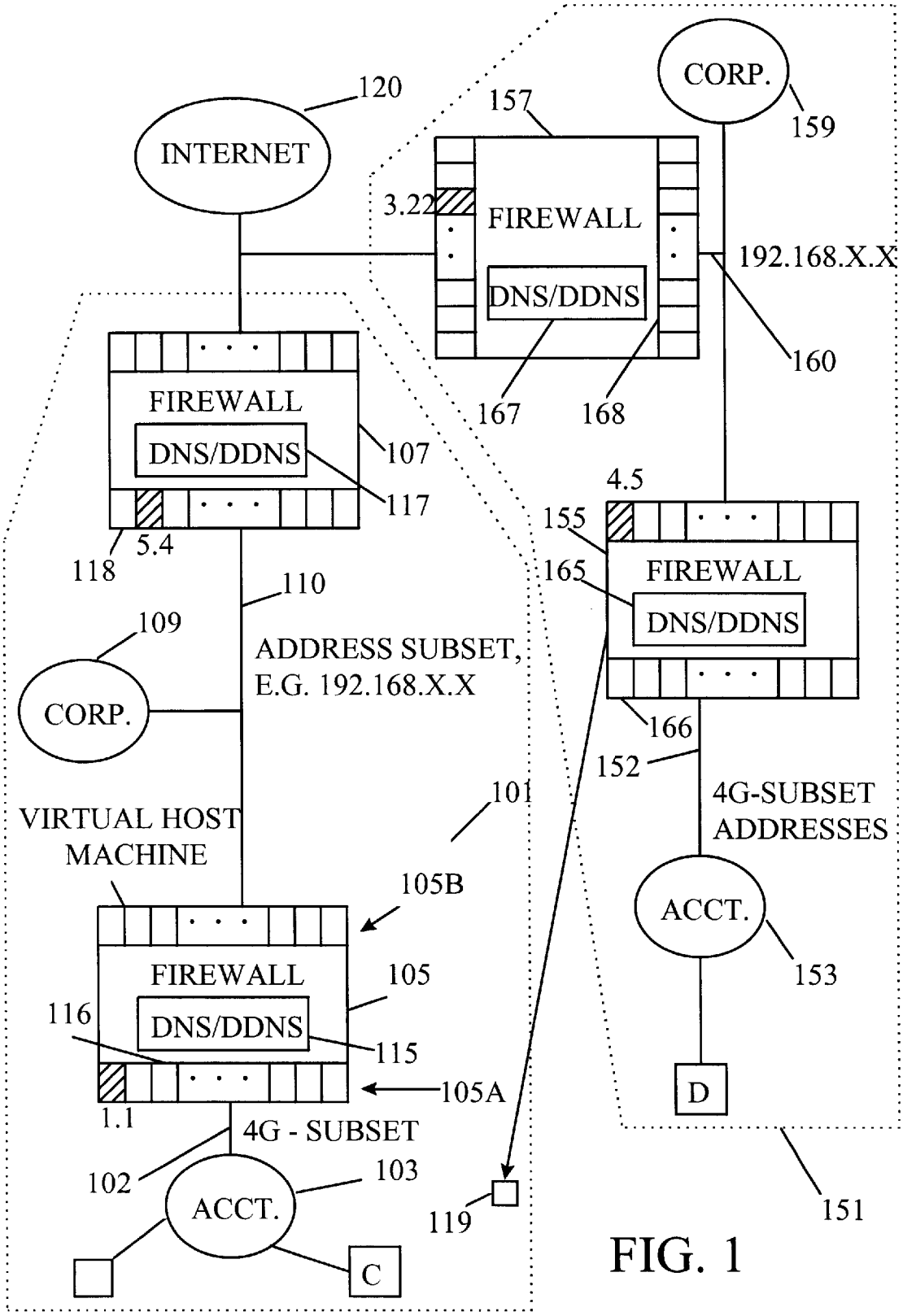



FIG. 1

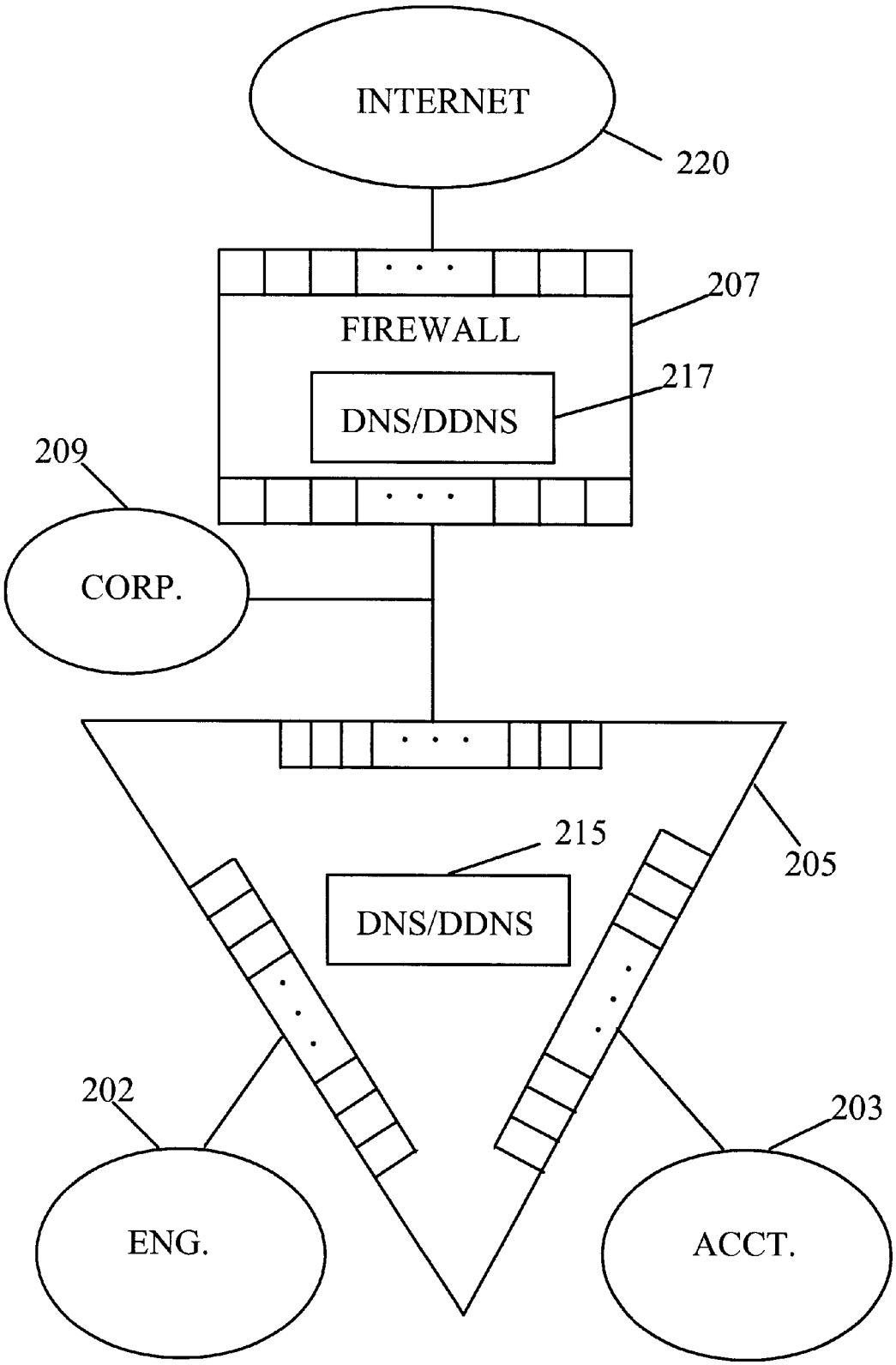



FIG. 2

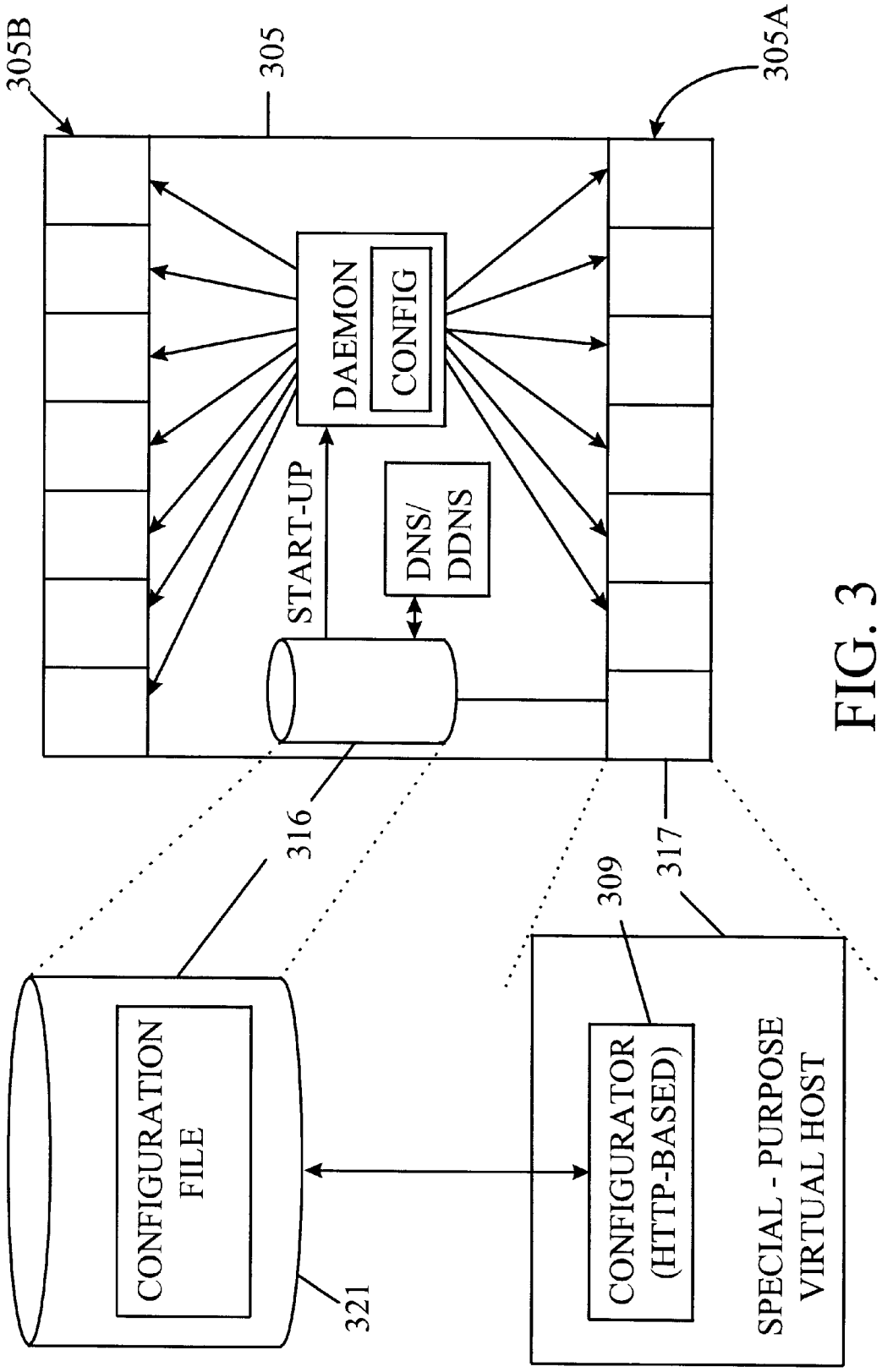



FIG. 3

DOCKET ALARM

# 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.