



(12) **United States Patent**
Camp

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(54) **LOCATION SYSTEM COMBINING RANGING MEASUREMENTS FROM GPS AND CELLULAR NETWORKS**

(75) Inventor: **William O. Camp**, Chapel Hill, NC (US)

(73) Assignee: **Ericsson Inc.**, Research Triangle Park, NC (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/315,002**

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Related U.S. Application Data

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(51) **Int. Cl.**⁷ **G01S 5/02**; H04B 7/185

(52) **U.S. Cl.** **342/357.06**; 342/357.01; 342/450; 342/463; 701/213; 455/422; 455/426; 455/427; 455/456; 455/457; 327/291

(58) **Field of Search** 342/357.01-357.17, 342/450-465; 455/403, 422, 426, 427, 432, 433, 456, 457; 380/247-250, 255, 270-273, 31-34, 274; 701/200, 207, 213-216; 331/46-56; 327/291, 293, 298; 377/106

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,982,324 * 11/1999 Watters et al. 342/357.06
6,081,229 * 6/2000 Soliman et al. 342/357.05

* cited by examiner

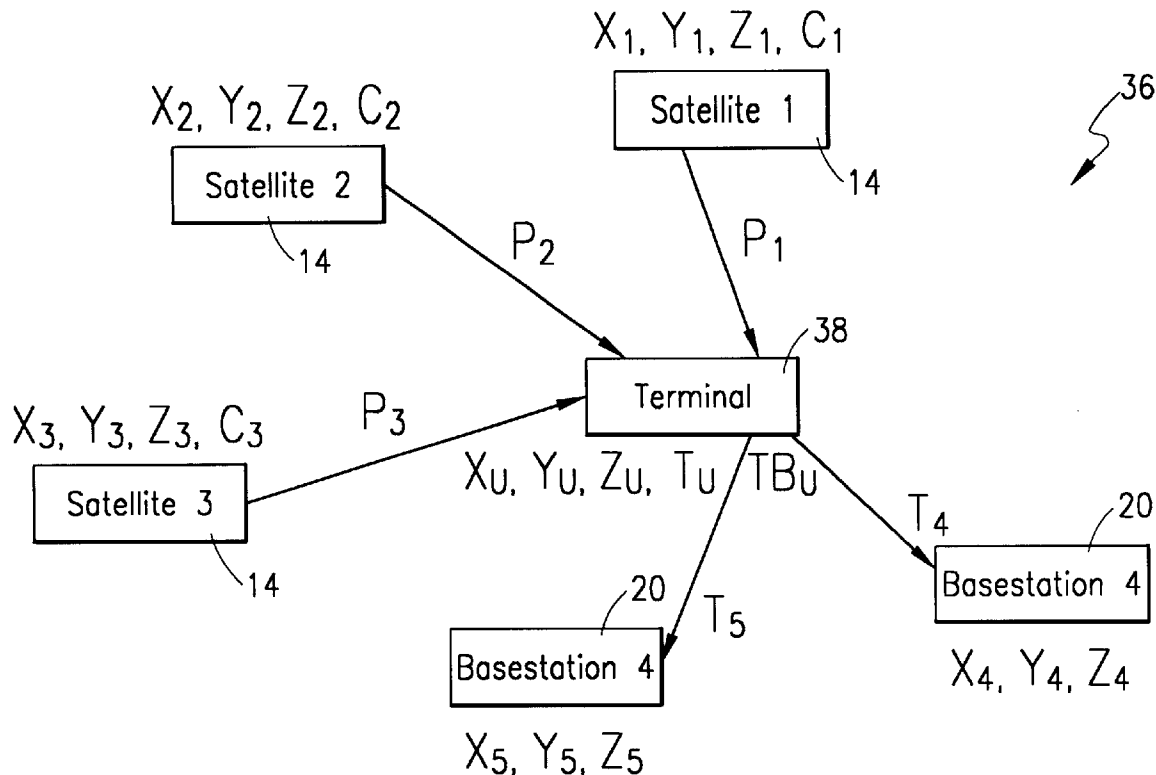
Primary Examiner—Bernarr E. Gregory

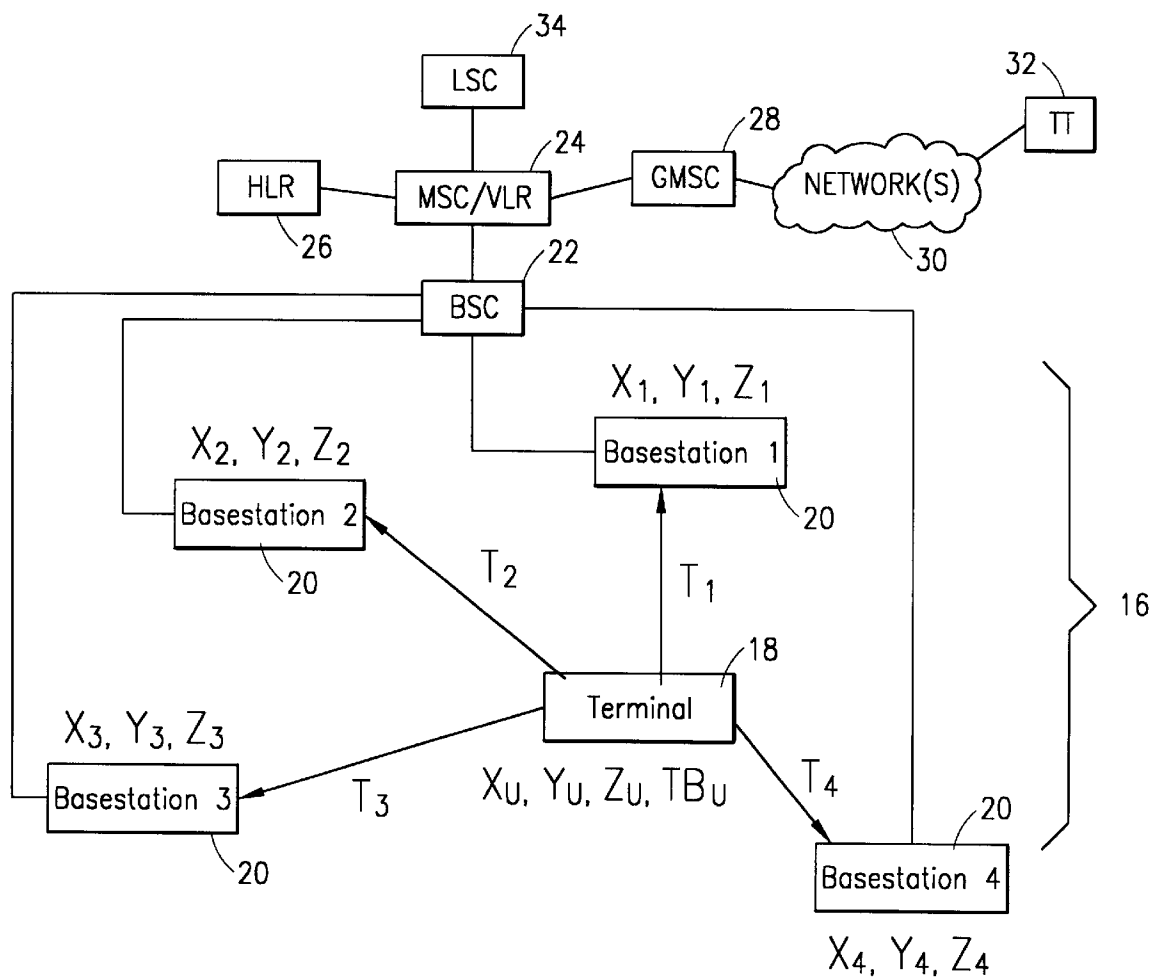
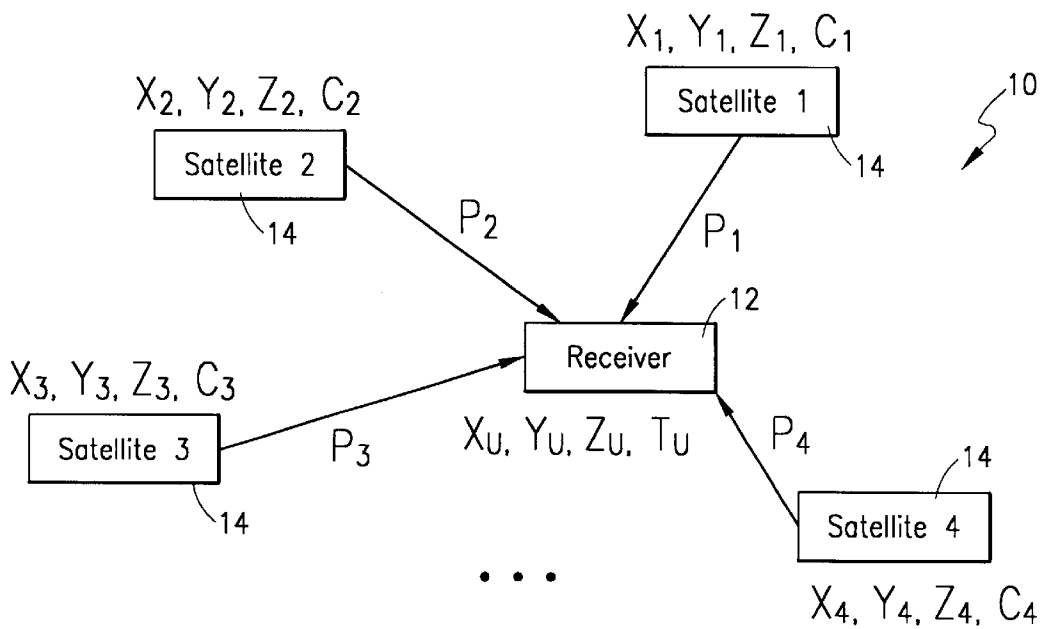
(74) *Attorney, Agent, or Firm*—Jenkins & Gilchrist, P.C.

(57) **ABSTRACT**

Methods and arrangements are provided for locating a mobile terminal within a mobile telecommunications system. In certain embodiments, GPS ranging signals and cellular base station transmitted downlink signals are received by a mobile terminal, which is configured to determine its current location using a combination of these two types of ranging signals. In certain other embodiments, GPS ranging signals are received by the mobile terminal, which is also configured to transmit uplink signals to cellular base stations. The current location of the mobile station is determined by fusing measured data from each of these different ranging signal transmissions. By combining the available resources of satellite and terrestrial locating processes, the potential for locating a mobile terminal is significantly increased.

26 Claims, 6 Drawing Sheets





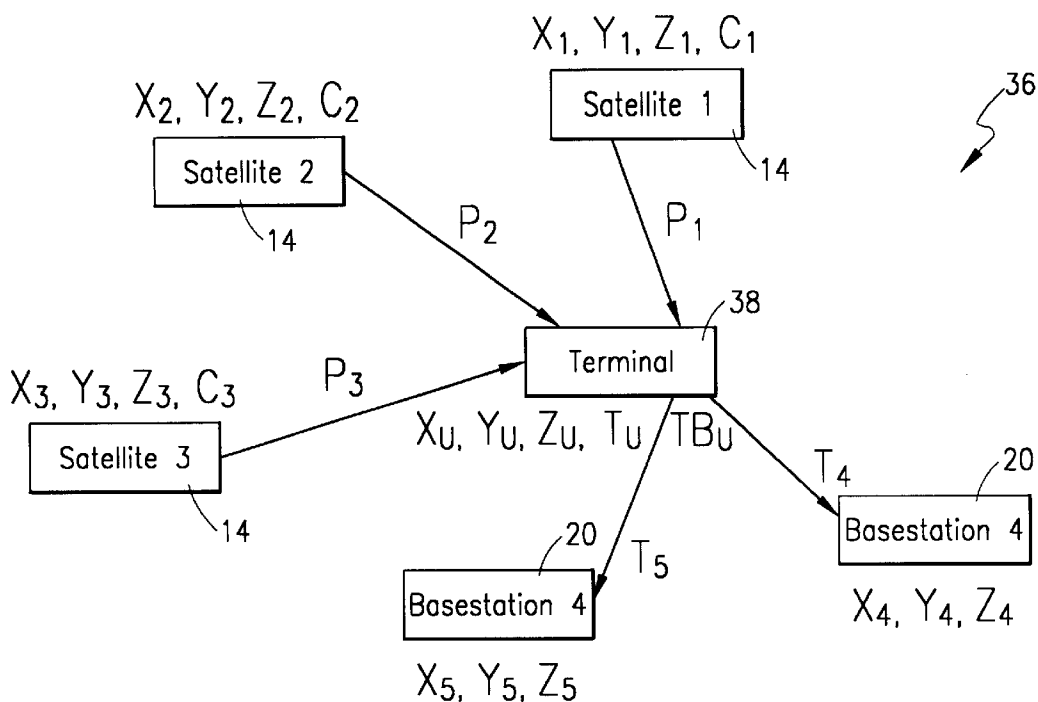


FIG. 3

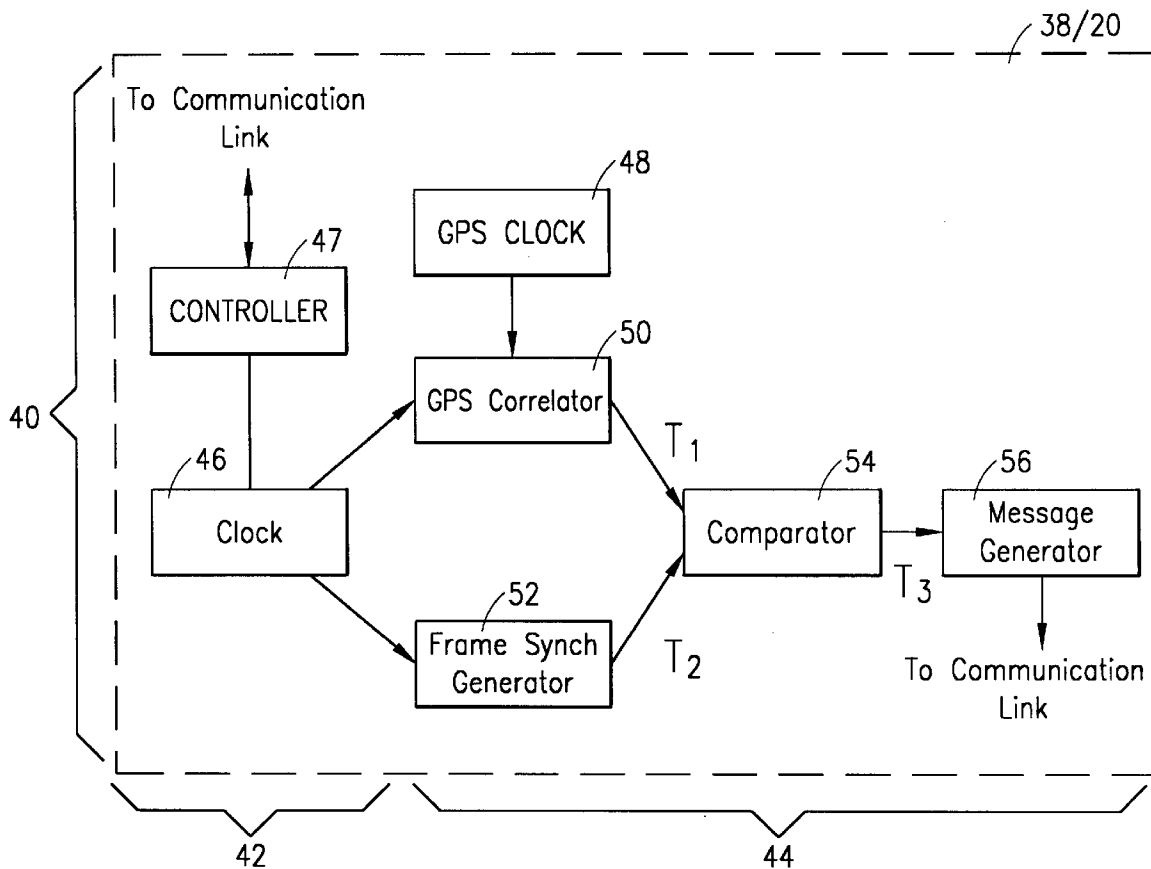


FIG. 4

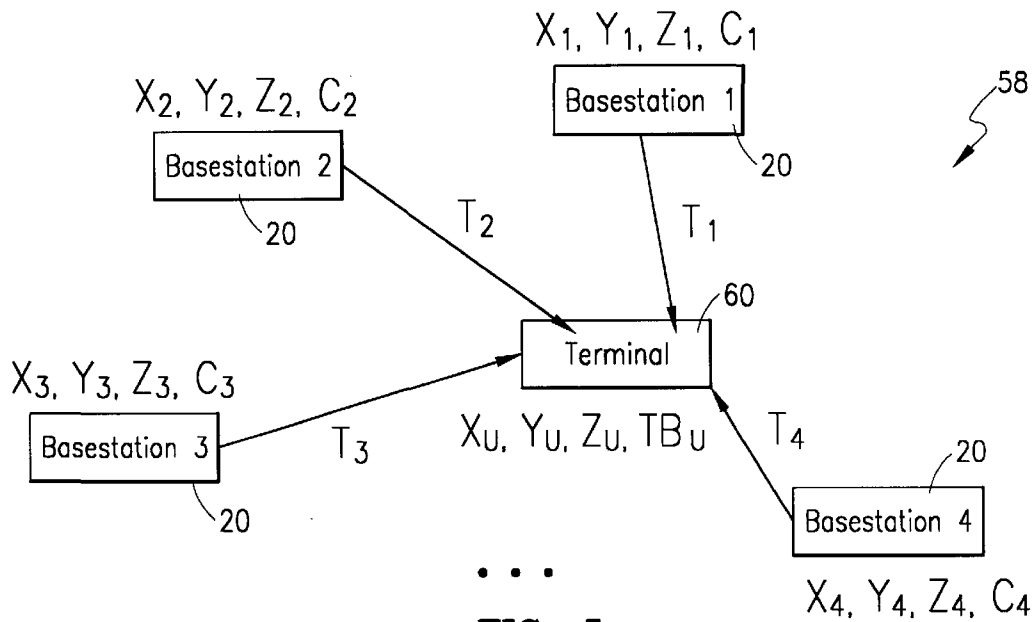


FIG. 5

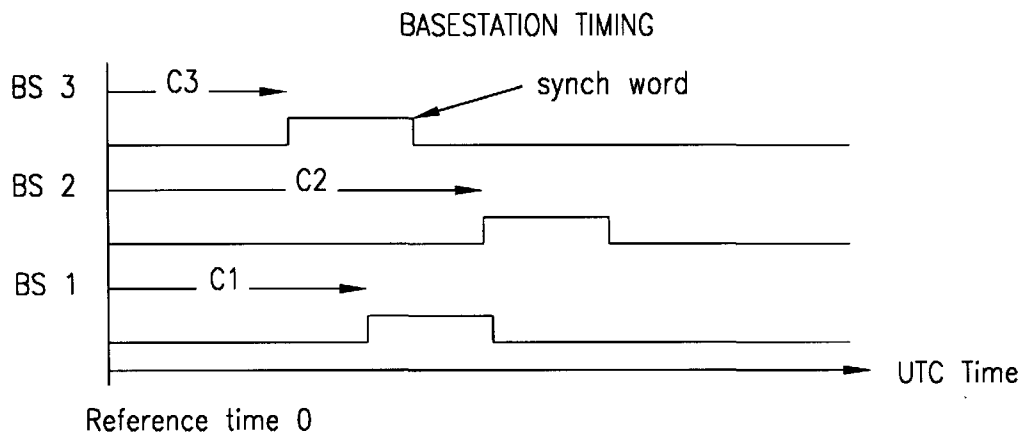


FIG. 6

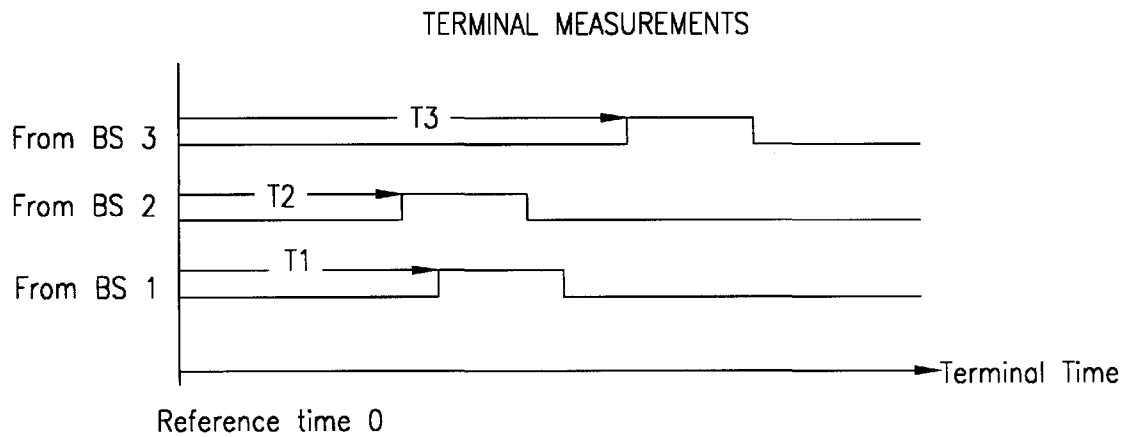


FIG. 7

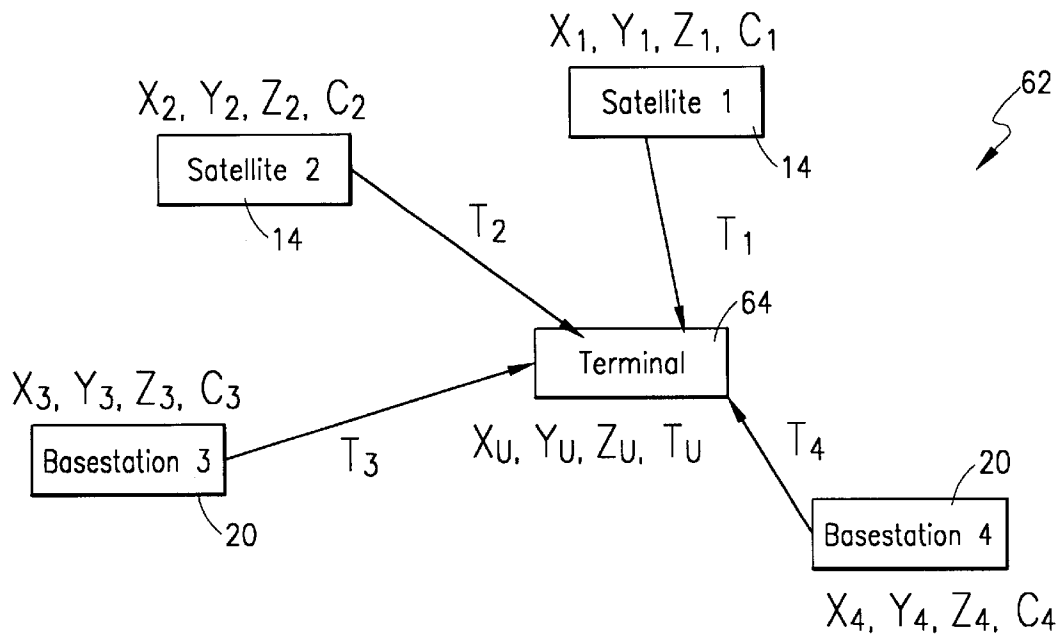


FIG. 8

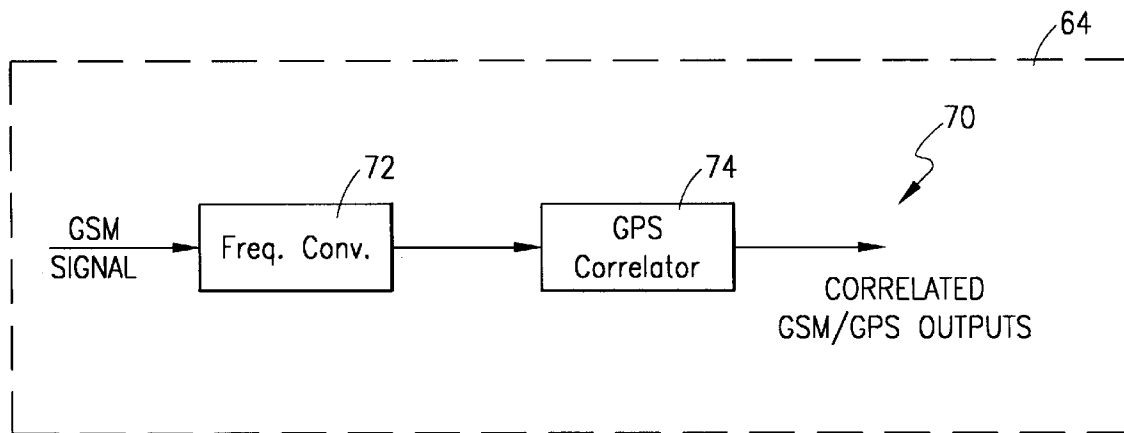


FIG. 9

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