

[54] **METHOD AND APPARATUS FOR TRACKING, MAPPING AND RECOGNITION OF SPATIAL PATTERNS**

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[52] U.S. Cl. .... 364/456; 342/64; 382/16

[58] Field of Search ..... 364/449, 456, 423, 458, 364/454, 443; 342/64, 90, 180; 382/16, 22, 26, 30, 48

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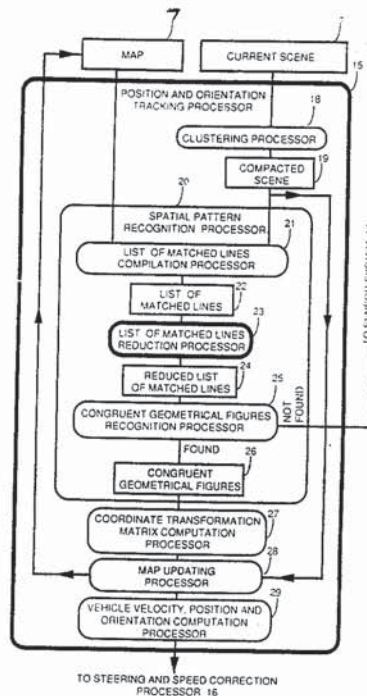
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Assistant Examiner—Thomas G. Black

[57] **ABSTRACT**

A method and apparatus for the identification of spatial patterns that occur in two or more scenes or maps. Each pattern comprises a set of points in a spatial coordinate system collectively represented by the geometrical figure formed by connecting all point pairs by straight lines. The pattern recognition process is one of recognizing congruent geometrical figures. Two geometrical figures are congruent if all the lines in one geometrical figure are of the same length as the corresponding lines in the other. This concept is valid in a spatial coordinate system of any number of dimensions. In two- or three-dimensional space, a geometrical figure may be considered as a polygon or polyhedron, respectively. Using the coordinates of the points in a pair of congruent geometrical figures, one in a scene and the other in a map, a least squares error transformation matrix may be found to map points in the scene into the map. Using the transformation matrix, the map may be updated and extended with points from the scene. If the scene is produced by the sensor system of a vehicle moving through an environment containing features at rest, the position and orientation of the vehicle may be charted, and, over a series of scenes, the course of the vehicle may be tracked. If the scenes are produced by a sensor system at rest, then moving objects and patterns in the field of view may be tracked.

5 Claims, 7 Drawing Sheets



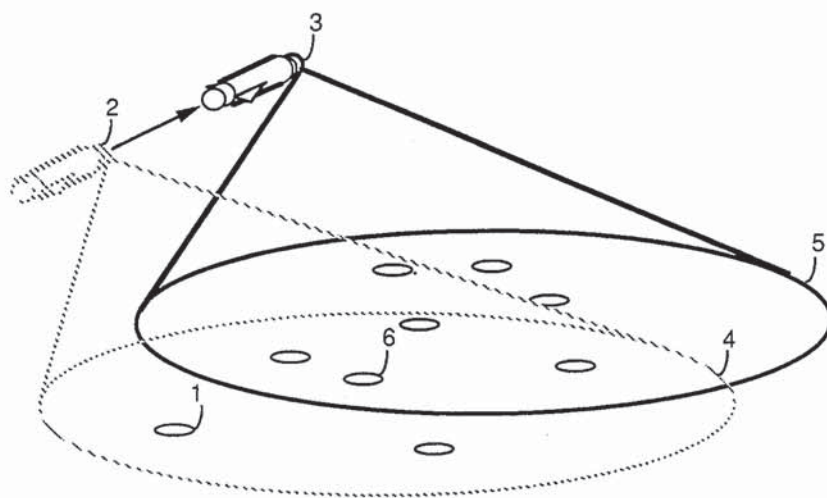


Fig. 1

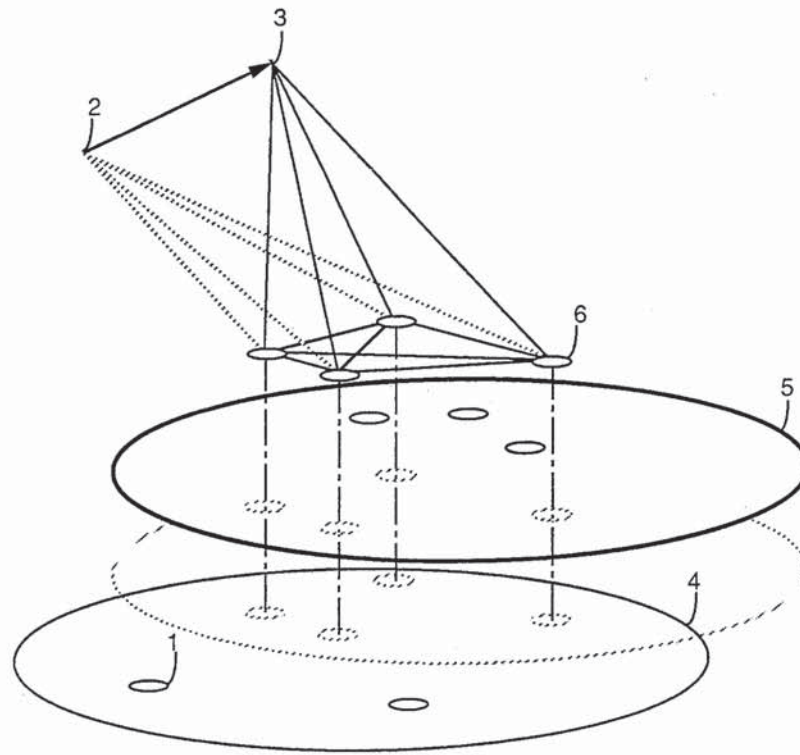


Fig. 2

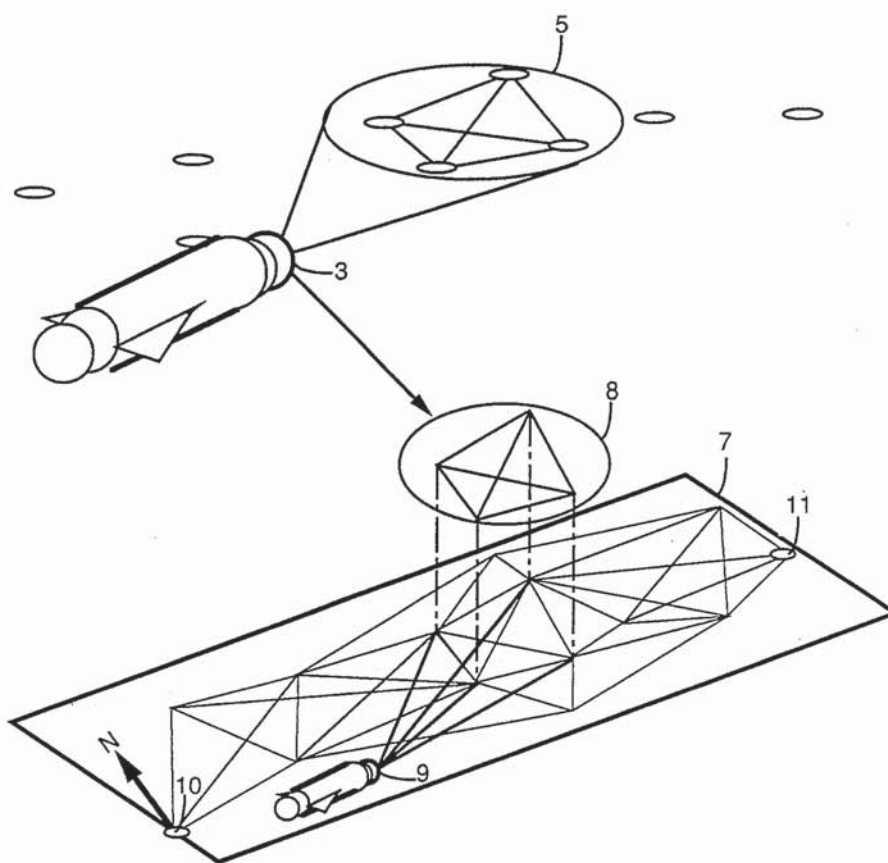


Fig. 3

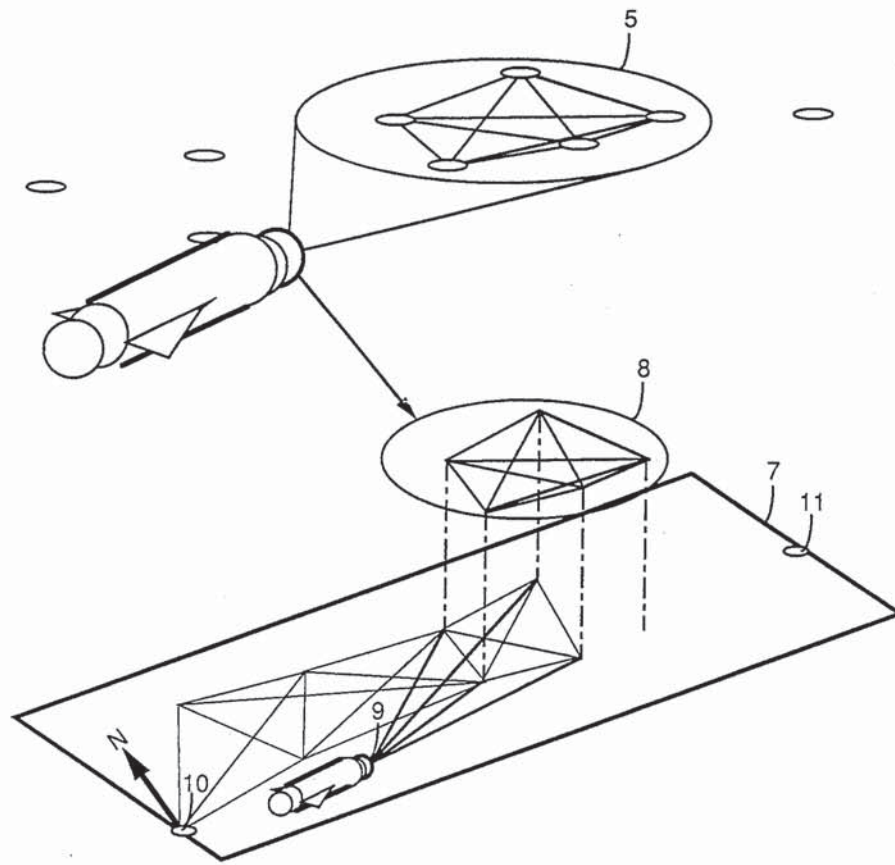


Fig. 4

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