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- [54] ELECTRONIC DIRECTION FINDER
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- [73] Assignee: **Motorola, Inc., Schaumburg, Ill.**
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- [51] Int. Cl.⁵ **G01S 5/04; G01C 9/00;**
G01C 21/00
- [52] U.S. Cl. **342/443; 342/419;**
33/349; 364/444
- [58] Field of Search **342/357, 443, 419;**
364/444, 449; 340/988, 985, 944, 870.15;
33/319, 320, 324, 349

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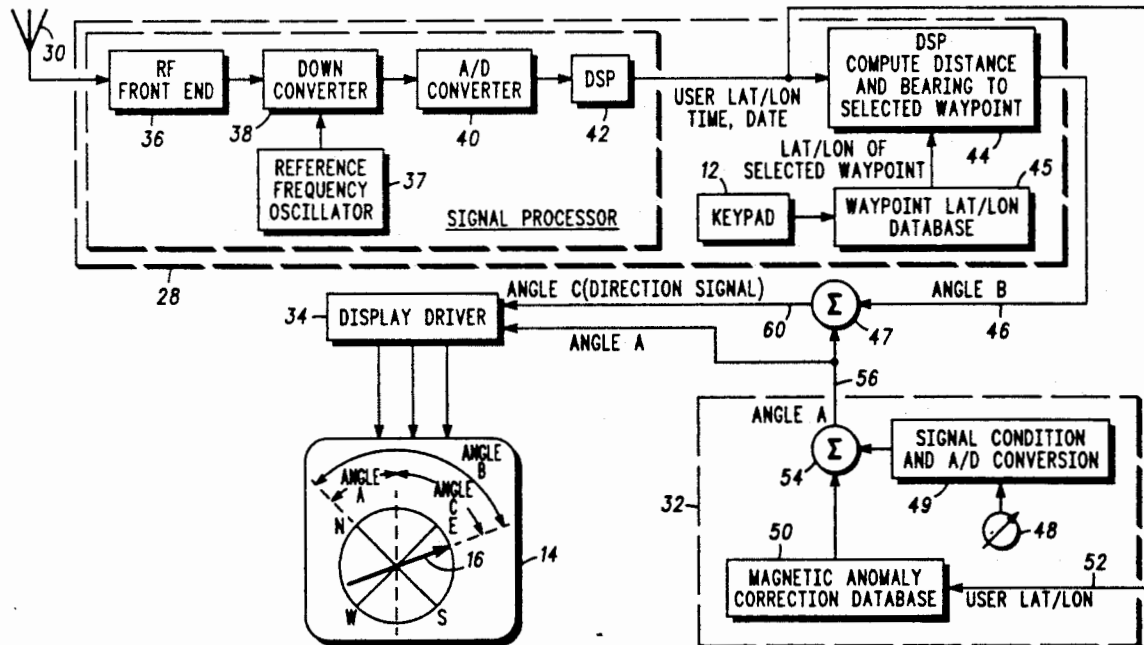
Primary Examiner—Gregory C. Issing
Attorney, Agent, or Firm—John H. Moore

[57] ABSTRACT

An electronic direction finder (10) includes a navigation receiver (28) and a compass (32) to generate a bearing signal that indicates that direction of a desired destination. The bearing signal is received by a display driver (34) which causes an electronic display (14) to generate a visible image of a rotatable pointer that points in the direction of the user's desired destination. Preferably, the display also shows an electronic compass card indicating the direction of north.

4 Claims, 3 Drawing Sheets

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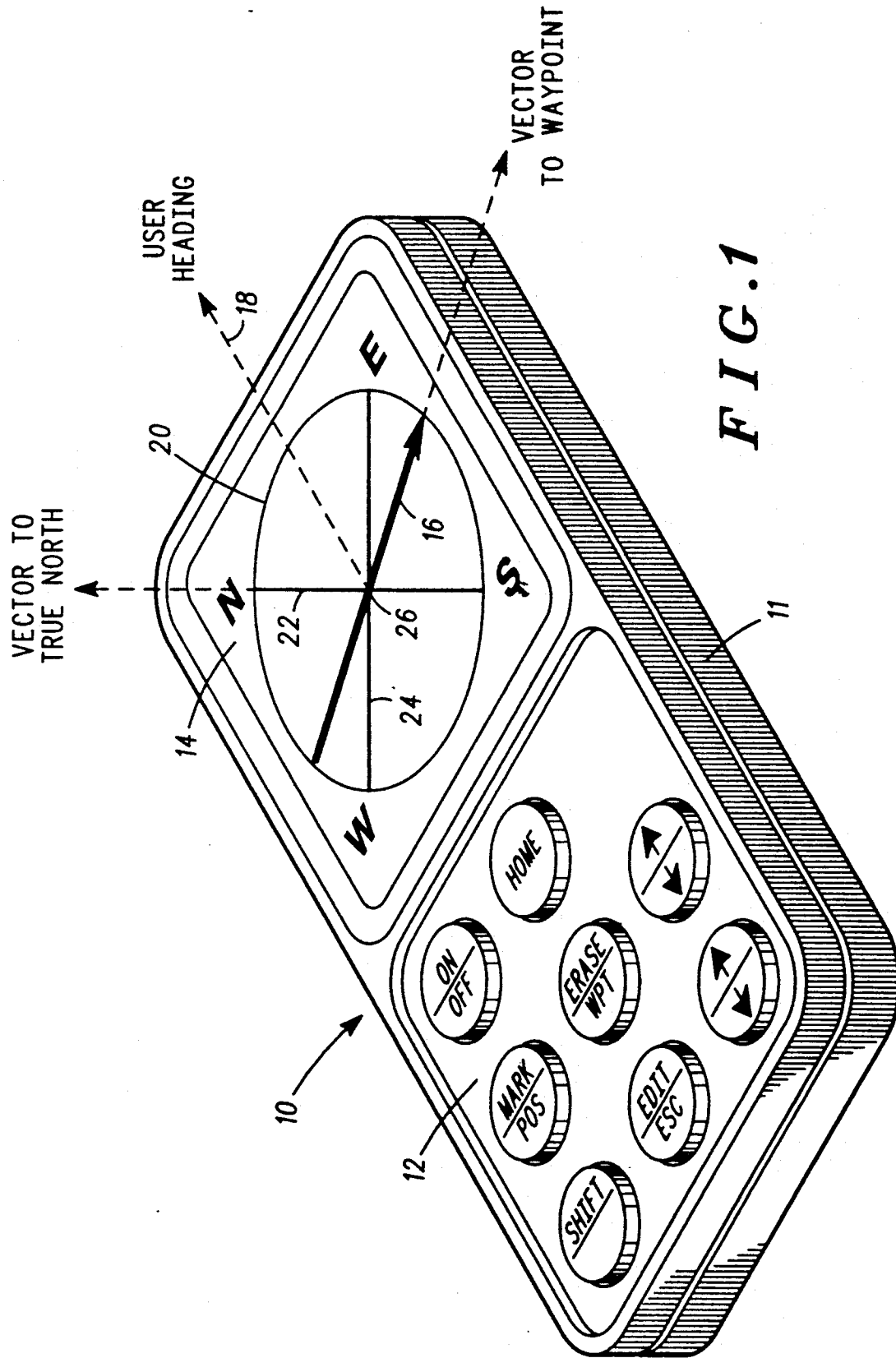


FIG. 1

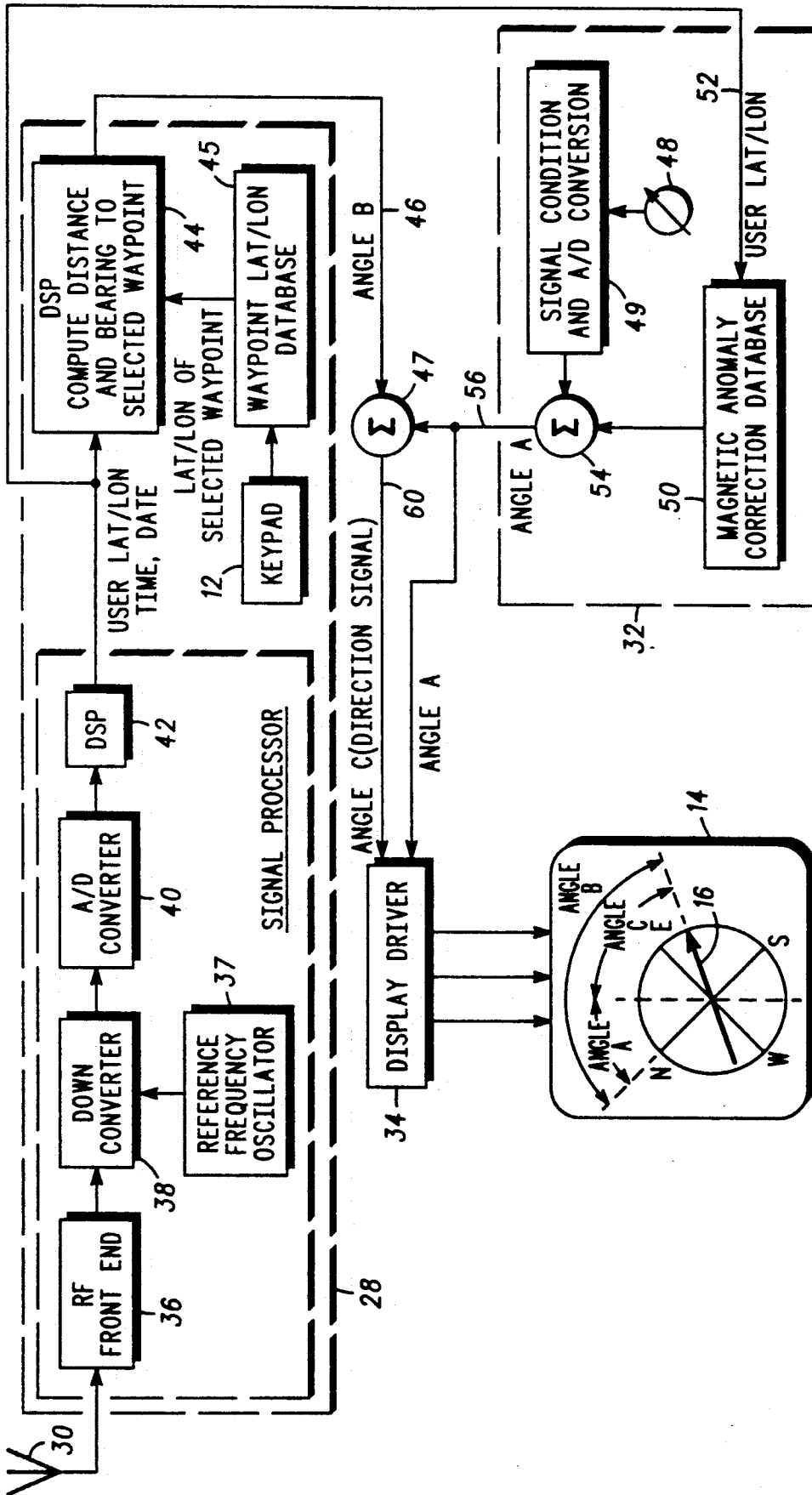


FIG. 2

FIG. 4

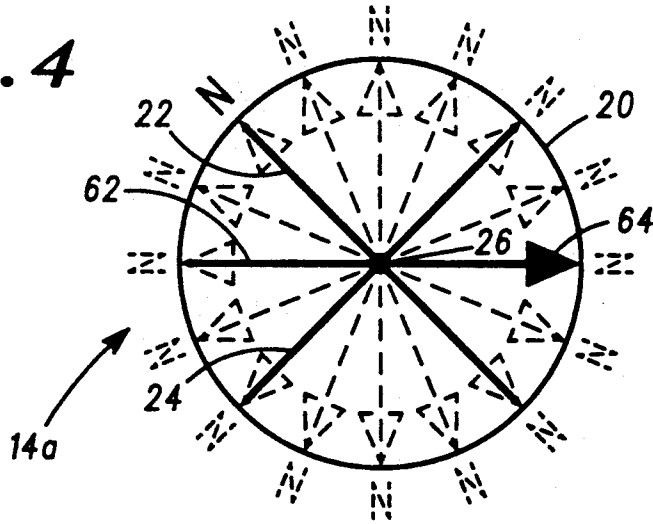
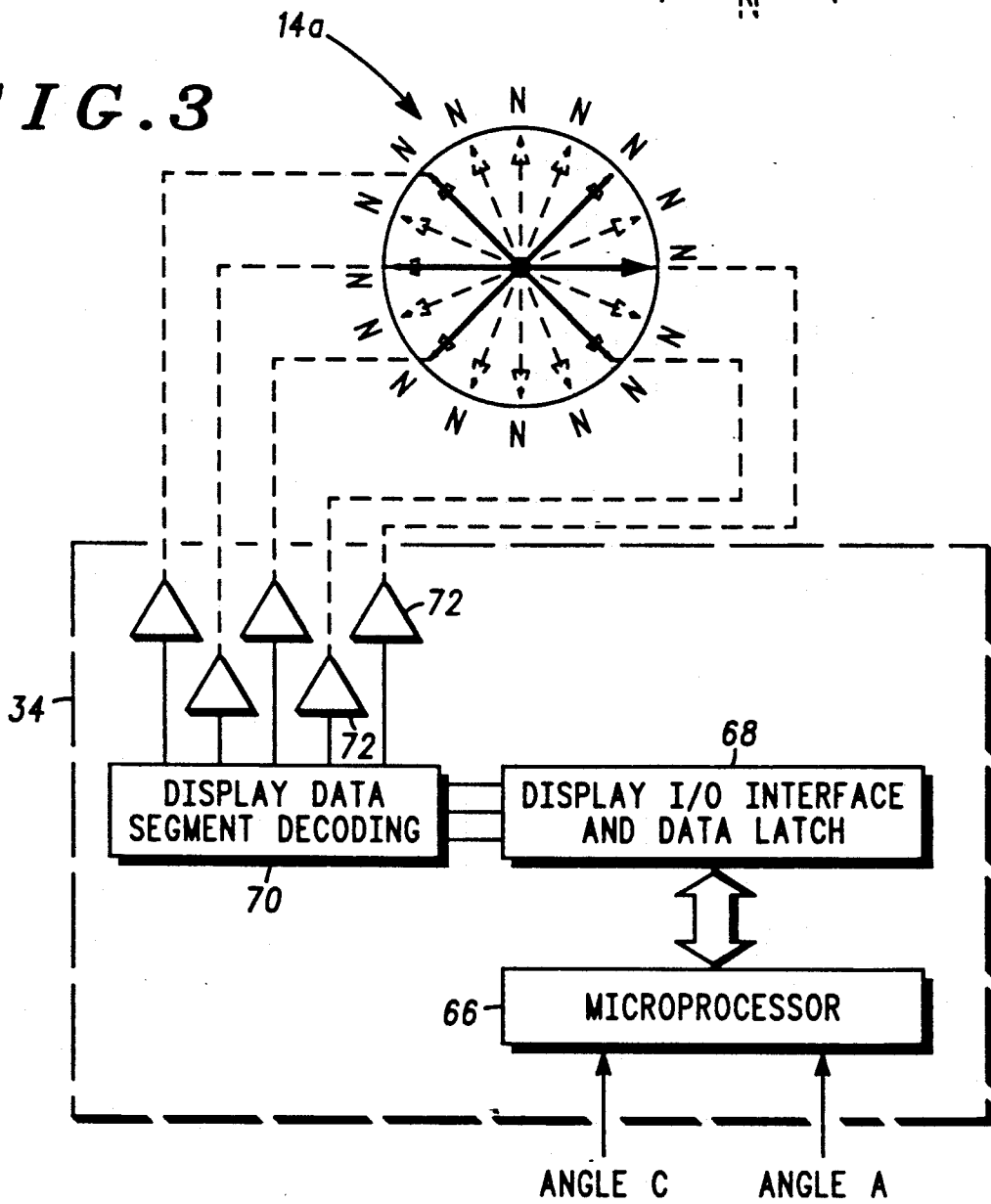


FIG. 3



ELECTRONIC DIRECTION FINDER

FIELD OF THE INVENTION

This invention is directed generally to the field of electronic direction finders which provide a user with information as to the distance and bearing from the user's present position to a desired destination.

BACKGROUND OF THE INVENTION

Conventional navigation instruments, such as GPS (Global Positioning System) receivers, Loran receivers, and the like can provide a user with the latitude and longitude of the user's present position. If the latitude and longitude of a desired destination (sometimes referred to as a "waypoint") is input to the navigation instrument, the instrument can readily calculate the distance and bearing to the destination.

Conventionally, the bearing to the destination is displayed to the user in a digital format in degrees relative to true north. Thus, a conventional display might indicate that the bearing to a desired destination is 225°. To those users who are familiar with compass terminology and/or navigational charts, the bearing of 225° clearly means that the desired destination lies southwest of the user.

A problem with this approach arises when the user is not familiar with such traditional compass headings, or with the use of compasses generally, and, therefore, is unsure of which direction in which to turn in order to be properly headed toward the desired destination. Moreover, even those who are familiar with traditional compass terminology may not be able to readily turn toward the desired destination unless they also reliably know the direction of north.

BRIEF DESCRIPTION OF THE FIGS.

FIG. 1 shows a portable direction finder constructed according to the invention;

FIG. 2 is a schematic block diagram illustrating the internal construction of the direction finder shown in FIG. 1;

FIG. 3 shows more detail of the display finder shown in FIG. 2, plus details of a modified display; and

FIG. 4 is an enlarged view of the display shown in FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, a portable direction finder 10 is shown whose housing 11 contains a keypad 12 and a display 14. The keypad 12 allows a user to input data regarding the latitude and longitude of the user's present position, and the latitude and longitude of waypoints (also referred to herein as "desired destinations"); the keypad may also permit the user to command the direction finder to point in the direction of a specific desired destination that is commonly referred to as "home". Other functions that are not pertinent to this invention may also be actuated by the keypad.

Inside the direction finder 10 is a navigation receiver, a compass and other circuits (discussed more fully below) that enable the direction finder to point the user toward "home" or toward another desired destination.

Referring now to the display 14, one of its most significant features is that it generates an image of a pointer 16 (preferably in the form of the illustrated arrow) that points toward the desired destination selected by the

user, irrespective of the user's heading. Herein, the user's heading is considered as parallel to the major axis 18 of the direction finder. Thus, with the user facing in the direction of the axis 18, the pointer 16 clearly indicates that the user should turn to his right approximately 75° in order to be headed directly toward the desired destination. As the user turns in that direction, the head of the pointer 16 automatically moves in a counterclockwise direction. When the user is facing directly toward the desired destination, the pointer 16 will point directly along the axis 18. An advantage of this "pointing" system is that the user does not need to be familiar with compass or navigation terminology to determine the direct route toward the desired destination.

The pointer 16 may be the only image generated by the display 14. Preferably, however, the display also generates an image of a compass card which indicates at least one compass point, such as north. In the illustrated embodiment, the compass card includes a circle 20, the compass points N, S, E and W, and a pair of line segments 22, 24 connecting N to S and E to W, respectively. In response to the compass and other circuitry within the direction finder 10, the image of the compass card rotates around its center 26 so that the compass point N and the line segment 22 line up with north, preferably true north. This arrangement provides the user not only with the easy-to-read pointer 16, but also with a compass to provide additional navigational information. And because the pointer 16 is overlaid on the image of the compass card, and rotates around the card's center 26, the compass heading of the desired destination can be read directly from the display.

It should be noted that the complexity of the compass card may be modified to provide the desired degree of resolution. For example, if only approximate compass readings are needed, then the compass card image may include only the four illustrated compass points, or it may include only the compass point N, while including the line segments 22 and 24 to indicate the other three primary compass directions. If greater resolution is desired, intermediate compass points may be added because the electronic circuitry which provides the compass information is capable of high resolution.

As an option, the images of the compass card and the pointer may be selectively erased from the display at the user's election, and replaced by numerical information indicating the user's present latitude and longitude, the range and bearing of the desired destination, etc. The same numerical information could also be displayed in a portion of the display 14 that is not occupied by images of the compass card and pointer.

The electronic circuitry which provides the information for effecting the functions of the compass card and the pointer will now be described with reference to FIG. 2. As shown, the major components of the direction finder are the display 14, a navigation receiver 28 coupled to a receiving antenna 30, a compass 321 and a display driver 34. Generally speaking, the navigation receiver 28 and the compass 32 generate signals that are combined so as to generate a "direction signal". This direction signal is indicative of a bearing toward a desired destination of the user, and the bearing is relative to the user's heading. The "direction signal" is applied to the display driver 34 which causes the display 14 to generate the image of the rotatable pointer 16 and to

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