known is set forth in U.S. Pat. No. 3,654,443, Dendy et al., at column 3, lines 35 -38. Moreover, typical examples of such apparatus for carrying out analog vectorial calculations can be found in the 1972 Product Guide of Analog Devices, Inc. at pages 115–121 inclusive and more particularly the monolithic computation circuits included in Model AD531 as indicated on page **116.** When desirable, these calculations can be made digitally without departing from the spirit and scope of the invention.

Where it is desired to reduce the number of analog multipliers required, the multiplex configuration of FIG. **7** can be utilized for time sharing the multipliers shown by reference numeral **146** shown in FIG. **6.** The configuration in FIG. **7** utilizes a pair of multiplier circuits **148** and **150,** a pair of adder circuits **152** and **154,** a pair of circuits **156** and **158** for summing vector components, a pair of storage devices **160** and **162,** and a plurality of switches **164, 165, 166, 167, . . . 175** which are adapted to be respectively closed during one or more of four time intervals shown in FIG. **8.** Each of the switches with exception of **175** actually comprises a switch block including three parallely actuated switches. Switch **175** is comprised of a single switch. When the wearer's foot is on the ground and $\overline{A}=0$, the gravity vector $\overline{G}$ signals which appear on data line **98** shown in FIG. **6,** are applied to terminal **176** which is connected to switch **172** and multiplier **148.** When the wearer's foot is in the air, the double integration output signals corresponding to $\overline{S}$ appearing on data line **126** is applied to terminal **178.** Input terminal **178** is connected to switch **164** and **173.** Whereas the analog vector quantity of $\overline{S}$ is expressed as:

$$\overline{S}=\overline{S}_x+\overline{S}_y+\overline{S}_z \tag{11}$$

Signals $\overline{S}'$ and $\overline{S}''$ having the analog terms rearranged as follows:

$$\overline{S}'=\overline{S}_y+\overline{S}_z+\overline{S}_x \tag{12}$$

$$\overline{S}''=\overline{S}_z+\overline{S}_x+\overline{S}_y \tag{13}$$

are respectively applied to terminal **180** which is connected to switch number **165** and to terminal **182** which is coupled to switch **168.** The magnetic vector $\overline{H}$ which would for example appear on data line **110** of FIG. 6 is applied to terminal **184** which terminal is connected to switch **167** and the (−) input of the adder circuit **154.** Control signals corresponding to the signals appearing on circuit leads **120** and **121** of FIG. **6,** are applied to terminals **186** and **188** which terminals are coupled to the storage devices **160** and **162,** respectively. These signals correspond to waveforms **188** and **190** shown in FIG. **8,** whereas control signals corresponding to the four time periods are illustrated by waveforms **192, 194, 196** and **198,** are also generated by a suitable logic circuit such as shown by reference numeral **118** in FIG. **6.**

In operation, the circuitry shown in FIG. **7** operates in the four time periods t_1, t_2, t_3 and t_4 as shown in FIG. 8 over each computation cycle and provide analog outputs of $\overline{S}_V$ in the time period t_1, the output $\overline{S}_E$ in time period t_3 and $\overline{S}_N$ in the time period t_4. In the second time period t_2, no output is provided because the switch **175** is opened. Also, a meaningless output would be provided at that time, should switch **175** remain closed. It can be seen for example that during time period t_1, switch **164** and **172** provide inputs to the multiplier **150** which is adapted to provide an output of $\overline{G}\cdot\overline{S}$ which according to equation (4) provides the required output. Also during time period t_1, switches **167** and **170** are closed, which feeds the analog vector component signals $\overline{H}$ and $\overline{G}$ to the multiplier **151** whose output is stored in the storer **162.** The data stored during time period t_1 in the store **162** and the data stored in time period t_2 by means of switch **172** being closed in combination with switches **165** and **168** provide the necessary data to perform the required computations in times t_3 and t_4 to provide the necessary computation to solve equation (6) and equation (5).

The position locator system described herein has several advantages over the prior art in that there are no moving parts, resulting in greater reliability and mechanical simplicity. Also, the system is independent of operator parameters, meaning that the compass assembly itself may be mounted in any orientation and the system will accurately measure the course if the operator walks sideways or backwards as well as forwards.

Having described what is at present considered to be the preferred embodiment of the subject invention, I claim:

1. A position locator system mounted on a carrier and having both momentary static and moving modes of operation during each cycle of operation, comprising in combination:

first sensor apparatus and circuit means therefor providing a composite electrical output signal comprised of a gravitational force vector component signal $\overline{G}$ and an acceleration force vector component signal $\overline{A}$, said vector component signal $\overline{A}$ being substantially equal to zero during the stationary mode of operation of said first sensor apparatus;

second sensor apparatus and circuit means therefor providing an electrical output signal corresponding to a magnetic pole force vector $\overline{H}$;

first circuit means coupled to said first sensor apparatus, being responsive to said composite output signal and providing an output signal corresponding to the derivative of the scalor magnitude of said composite output signal;

a logic circuit coupled to the output of said first circuit means and being responsive to the output signal thereof to generate a control signal when the derivative of said composite output signal is substantially zero;

a clamping circuit having an input coupled to said first sensor apparatus and being activated by said control signal from said logic circuit to clamp said composite signal during a moving mode of said sensor to remove the vector component signal $\overline{G}$ from said composite output signal to thereby provide substantially only said vector component signal $\overline{A}$;

double integration circuit means coupled to said clamping circuit and being responsive to the vector component signal $\overline{A}$, performing a double integration with respect to time on said vector component signal $\overline{A}$ to provide electrical output signal $\overline{S}$ corresponding to distance;