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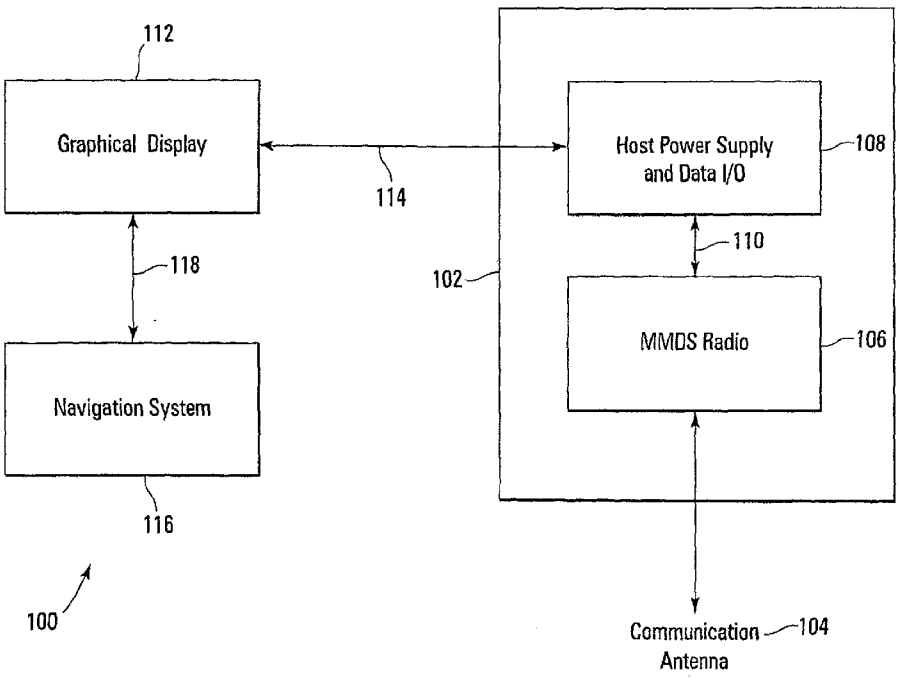
(54) **Title:** SYSTEM AND METHOD FOR CONVERTING VOICE WEATHER DATA INTO DATA FOR DISPLAY IN AN AIRCRAFT COCKPIT



(57) **Abstract:** A method of providing visual data to a pilot in an aircraft cockpit includes receiving information in the form of a voice signal, converting the information to visual data, and displaying the visual data to the pilot in the aircraft cockpit.

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SYSTEM AND METHOD FOR CONVERTING WEATHER DATA INTO DATA FOR DISPLAY IN AN AIRCRAFT COCKPIT

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a system and method for converting weather data into display data for an aircraft cockpit. More particularly, the present invention involves transforming weather broadcast data into visual data displayable in an aircraft cockpit.

Discussion of the Related Art

Currently, a pilot must tune into a COM audio channel to receive voice recorded weather data. As such, a pilot is required to listen to, remember, and apply the weather information to their present aircraft situation. This process requires the pilot's attention and distracts the pilot from other aspects of aircraft operation. Moreover, the pilot must continually receive and account for updated weather information. However, overall safety is sacrificed either by requiring the pilot to continually devote time to obtaining voice recorded weather information at the expense of other pilot functions, or by not having current and updated weather conditions to apply to the aircraft operation.

Moreover, a pilot must also update their equipment manually, such as the altimeter with data concerning, for example, barometric pressure. Otherwise, the altimeter readings would be inaccurate.

SUMMARY OF THE INVENTION

It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

The present invention includes a method of providing visual weather data to a pilot in an aircraft cockpit. The method includes receiving weather information in the form of a voice signal; converting the information to visual data; and displaying the visual data to the pilot in the aircraft cockpit.

The present invention also provides a system for providing visual data to a pilot in an aircraft cockpit. The system includes a receiver for receiving information in the form of a voice signal; a converter for converting the information to visual data; and a display for displaying the visual data to the pilot in the aircraft cockpit.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention.

FIG. 1 illustrates an exemplary embodiment of the present invention.

FIGS. 2A and 2B illustrate exemplary displays of the present invention.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

FIG. 1 illustrates an exemplary embodiment of the system 100 of the present invention. The system 100 includes a processor 102 that includes a Multi-mode Digital Sensor (MMDS) radio 106 and host power supply and data I/O 108. The MMDS radio 106 receives broadcast weather information in the form of a voice signal, over a radio channel at a given radio frequency via a communication antenna 104. The MMDS radio 106 converts the radio signal containing voice weather information into data and provides the data through the host power supply and data I/O 108 via, for example, a data bus 110, typically a Time Divisional Multiple Access (TDMA) data bus, to a graphical display 112 via, for example, an ARINC 429 data bus 114. The graphical display 112 converts the data into a visual display. The graphical display 112 also receives aircraft location information from a navigation system 116 via, for example, an ARINC 429 bus 114. The navigation system may include, for example, a Global Positioning System (GPS) and/or an inertial navigation system.

The MMDS radio 106 receives automated voice weather information broadcast from any number of sources, for example, the Automatic Surface Observing System (ASOS), the Automated Weather Observing System (AWOS), the Automatic Terminal Information Service (ATIS) and/or the Hazardous In-Flight Weather Advisory Service

(HIWAS). The MMDS radio 106 converts the voice weather information, which is in the form of an analog or digital speech signal, into data, for example, a digital data information signal. The MMDS radio 106 can use off-the-shelf or well known voice recognition software to convert the voice weather information into digital information. For example, the MMDS radio 106 can be multi-person recognition software used by computer operated phone answering and routing systems.

The MMDS radio 106 can include a single channel COM radio. Alternately, the MMDS radio 106 can include a multi channel COM radio. The multi channel COM radio enables the MMDS radio 106 to receive data on more than one channel via a single antenna. In this way, the pilot can continue to operate on a non-weather channel, for example, to listen to tower communications, and contemporaneously receive weather information on a separate channel. It is also possible to receive weather information on more than one channel at a time. This enables the pilot to receive weather conditions for multiple locations in order to evaluate weather variation over a geographical area. As such, the pilot can modify the flight plan, if necessary. Receiving signals from multiple transmitting channels also enables the display of more comprehensive weather conditions.

Through the navigation system 116, the system 100 would be able to ascertain the present geographical position of the aircraft as well as projected positions of the aircraft. Thus, the system 100 may include a database containing weather transmitting stations around a particular region or around the world, as well as the radio frequencies over which each is broadcast. This would enable the MMDS radio 106 to automatically identify, based on present geographical and projected geographical positions, as well as automatically tune to one or more local weather transmitting broadcasts. It should be noted that the MMDS radio 106 may select from amongst several weather transmitting broadcasts based on geographical position (i.e., proximity to a weather broadcast transmission station) only, broadcast signal strength only, and/or a combination of geographical position and signal strength of any one or more other factors.

The graphical display 112 can include any manner or variety of methods to display weather information to a pilot. For example, the graphical display 112 can include graphs, icons, images, representations, figures and/or illustrations to convey

weather information, such as an illustration of sky conditions, a weather radar display, or ground based weather radar display. The weather information can include, for example, wind speed, wind direction, precipitation, barometric pressure, air temperature, humidity, time information, due point temperature, cloud heights, precipitation types, and weather warnings, for example, potential icing conditions, area storms, high winds, lightning and tornados.

One exemplary graphical display for displaying weather information is a virtual windsock. The virtual windsock can be in correct compass orientation to an airport on the display. The display can be a North up or track up moving map display. FIG. 2A illustrates an exemplary track up moving map display 200 with a windsock 201, and FIG. 2B illustrates an exemplary North up moving map display 202 with a windsock 203. The virtual windsock enables the pilot to know the wind direction in exact relationship to the airport. Alternately, the windsock can be displayed without a reference to the airport. In either case, the windsock's direction would be relative to the compass orientation on the display.

Pilot safety can further be enhanced by prompting the pilot to adjust the altimeter according to barometric information from the nearest ground station. Utilizing the navigation system 116, the MMDS radio 106 can automatically switch to a nearby station, as discussed above, to thus enable continuous updates of local barometric pressure readings. Again, the MMDS radio 106 can be tuned to receive a particular signal being broadcast based on proximity to the aircraft and/or the destination airport, strength, or any one or more other factors. Alternatively, the radio 106 can be tuned to receive the strongest broadcast signal. This enables the airplane's altimeter to be promptly updated at any time with the most accurate barometric data. The display can prompt the pilot to update the altimeter. The altimeter can be updated when a settable threshold of barometric change has been reached and/or when a predetermined amount of time has lapsed. Other data that can be considered when updating the altimeter can include proximity to origin airport, the proximity to flightplan waypoint airports, and the altitude change or proximity to the destination airport. The altimeter can be updated automatically.

It will be apparent to those skilled in the art that various modifications and variation can be made in the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

WHAT IS CLAIMED IS:

1. A system for providing visual data to a pilot in an aircraft , comprising:
a receiver 106 for receiving weather information in the form of a voice signal;
a converter 106 for converting the information to visual data; and
a display 112 for displaying the visual data to the pilot .

2. The system of claim 1, wherein a navigation system 116 determines the geographical position of the aircraft.

3. The system of claim 2, wherein the receiver 106 identifies transmitting channels carrying voice weather information in range using the geographical position, and auto-tunes to a transmission of at least one of the transmitting channels in range.

4. The system of claim 3, wherein the navigation system 116 includes a GPS receiver.

5. The system of claim 1, wherein the display 112 displays weather information.

6. The system of claim 5, wherein the display 112 displays visual representations of at least one of wind speed, wind direction, precipitation, barometric pressure, air temperature, humidity, time information, and weather warnings.

7. The system of claim 1, wherein the receiver 106 includes a multi channel COM radio.

8. The system of claim 1, wherein the information includes barometric pressure information.

9. The system of claim 1, wherein the information includes information concerning at least one of potential icing condition, area storms, high winds, and tornadoes.

10. The system of claim 1, wherein the receiver 106 receives information from a channel associated with a strongest signal.

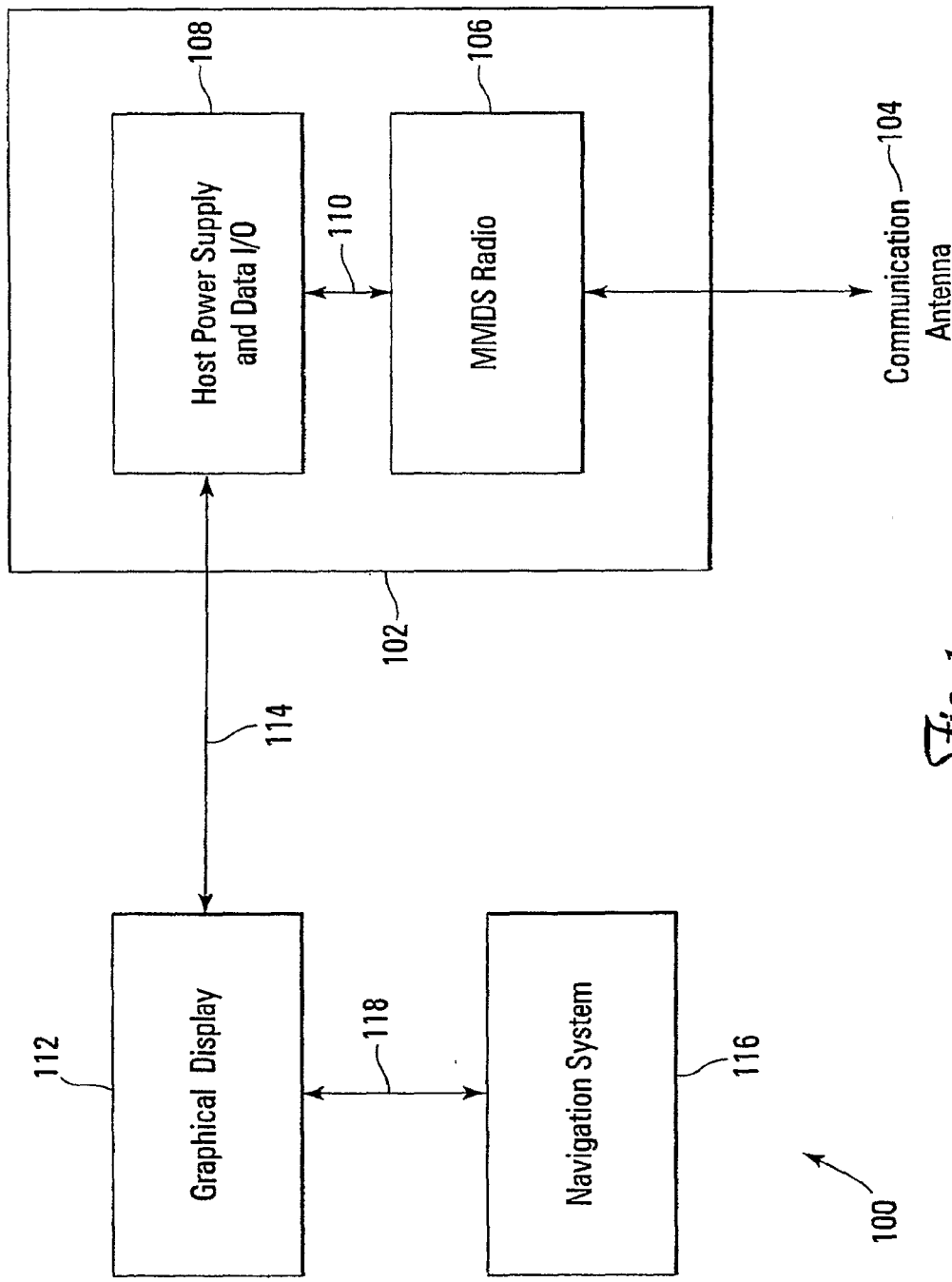
108
106
Host Power Supply and Data I/O
110
MMDS Radio
Communication Antenna
104
102
114
112
Graphical Display
118
Navigation System
116
100

Fig. 1

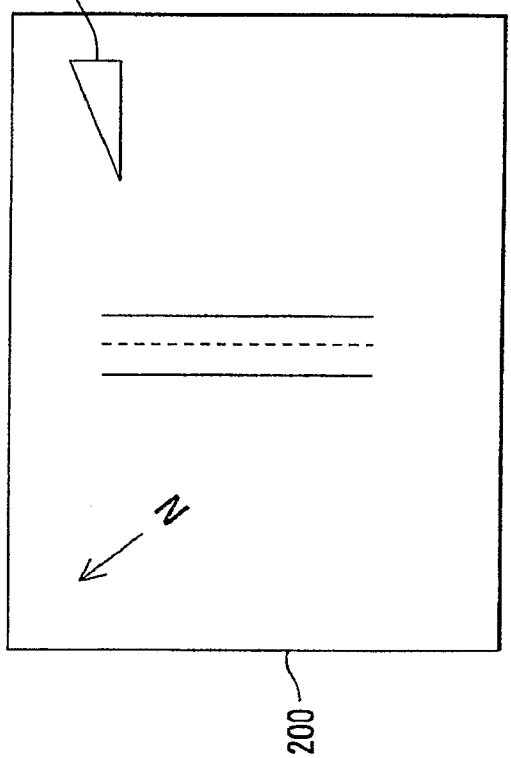

Fig. 2A

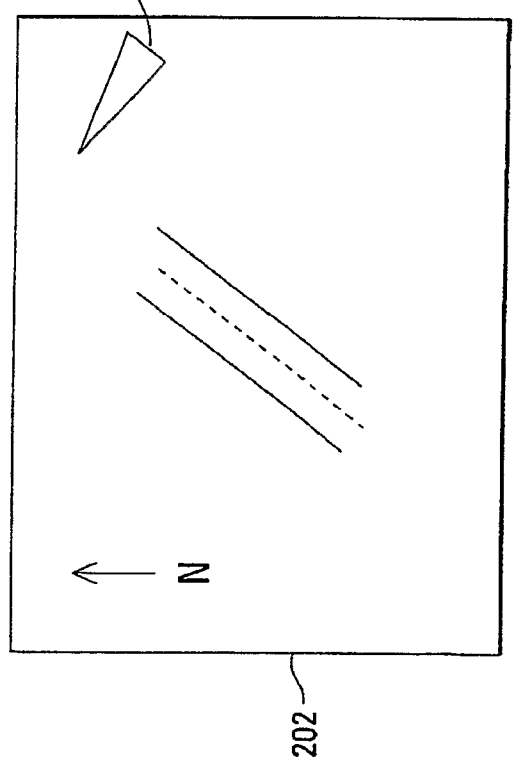

Fig. 2B