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International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 :
G01W 1/00, 1/08, 1/10, G06F 15/00

A1

(11) International Publication Number: **WO 00/13047**

(43) International Publication Date: 9 March 2000 (09.03.00)

(21) International Application Number: PCT/IE99/00085

(22) International Filing Date: 31 August 1999 (31.08.99)

(30) Priority Data:
S980715 31 August 1998 (31.08.98) IE

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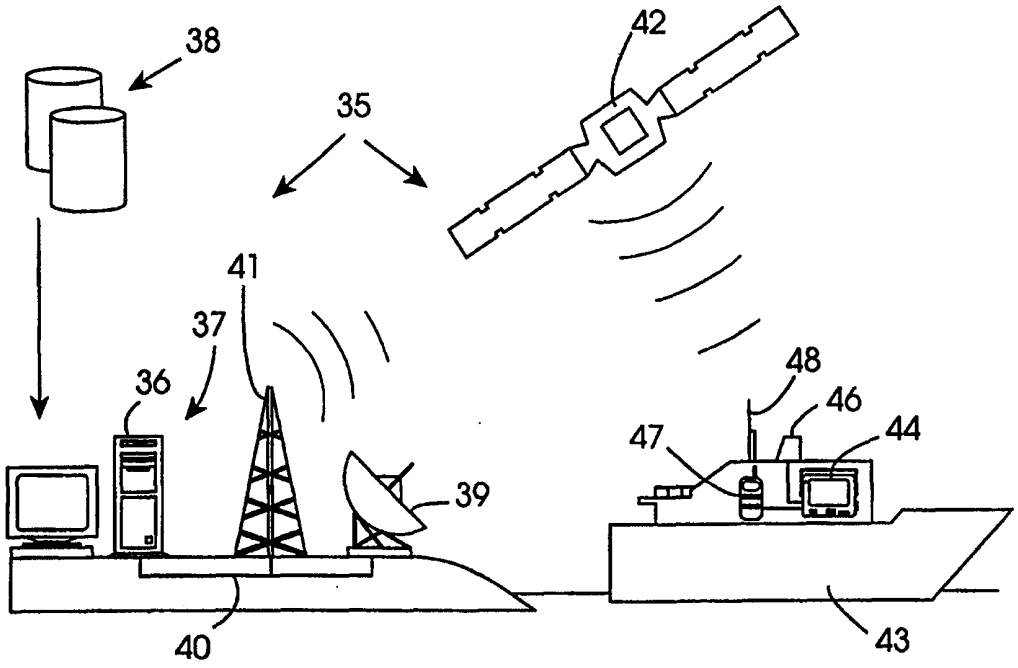
(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: A METEOROLOGICAL AND HYDROGRAPHICAL FORECAST SYSTEM AND METHOD



(57) Abstract

A meteorological and hydrographical forecast system (35) comprising a data (38) receiver (44) locatable on a vessel (43) and a data transmitter (36) for transmitting data selectable by the data receiver (44) to the data receiver (44) characterised in that the data (38) is transmissible to the data receiver (44) on demand from the receiver (44).

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"A meteorological and hydrographical forecast system and method"

This invention relates to a meteorological and hydrographical forecast system and method and in particular to a short-term meteorological and hydrographical forecast system and method.

The progress and safety of vessels at sea is heavily dependant upon meteorological and hydrographical conditions that can be subject to rapid deterioration placing the vessel in danger. Even if dangerous immediate meteorological and hydrographical hazards do not exist, a vessel must follow an optimum course to be effectively navigated. In either event, a crew requires information in relation to imminent or short-term future meteorological and hydrographical conditions in the immediate or planned future location of the vessel when at sea. Similar information is also required by shore based ship management personnel. The necessary information is in general not available by observation from a ship and is only available from weather forecasting services which exploit observation platforms to collate meteorological and hydrographical data. Observation platforms include weather reporting ships, weather sensors and satellites.

The data collected from the observation platforms is usually issued by voice or telefacsimile transmission over radio at fixed times. Moreover, the data is usually issued for large sea areas for any and all vessels within those sea areas. Accordingly, the meteorological and hydrographical data is not issued specifically to individual vessels in accordance with their positions.

Systems for providing meteorological and hydrographical data to ships are known. U.S. Patent Specification No. 4,611,209 describes a navigation warning system for ocean going vessels but the information is restricted to that derivable from electro-optical scanners mounted on satellites and is further

restricted to information concerning storms and possible collision courses between two or more vessels. British Patent Specification No. 2,132,442 describes a coastal water marine hazard warning system in which an alarm is activated when a vessel enters a region previously defined by a shore station as a hazard area. German Patent Specification No. 4,140,170 describes a system in which data is gathered from various sensors and is processed and displayed by an on board computer.

Commercial systems are also known in which long term forecasts are transmitted by radio and the like which comprise wind and atmospheric pressure data for future time block intervals which are typically multiples of periods of twelve hours.

However, none of the systems of the prior art are capable of providing highly localised meteorological and hydrographical forecasts specific to a vessel or of providing short-term forecasts (hereinafter referred to as "nowcasts") which can be specific to a vessel and made available to the vessel upon demand as opposed to predetermined time intervals determined by the forecast provider. Moreover, none of the systems of the prior art are adapted to issue specific warnings to vessels on impending dangerous meteorological or hydrographical conditions.

An object of the invention is to overcome the problems of the prior art.

A further object of the invention is to provide an improved meteorological and hydrographical forecast system and method.

Yet a further object of the invention is to provide a meteorological and hydrographical nowcast system and method.

According to the invention there is provided a meteorological and hydrographical forecast system comprising a data receiver locatable on a vessel and a data transmitter for transmitting data

selected by the data receiver to the data receiver characterised in that the data is transmissible to the data receiver on demand from the receiver.

Preferably, the transmissible data is viewable on a display means at the receiver.

Advantageously, the data transmitter further comprises a data processing means for generating a forecast on the display means. Suitably, the forecast comprises a vessel coordinates.

Advantageously, the system further comprises means for compressing the data prior to transmission by the transmitter. More preferably, the system further comprises means for decompressing the data prior to display at the receiver.

Suitably, the data processing means comprises a server.

Advantageously, the data transmitter comprises a master transmitter communicable with the receiver. Alternatively, the data transmitter comprises a slave transmitter communicable with the receiver.

Preferably, the master transmitter is shore based.

Suitably, the data receiver is communicable with the data transmitter by a cellular telephone, radio phone or satellite.

Suitably, the data transmitted is selected from the group comprising air temperature, pressure, windspeed and direction, wave height, wave spectra and direction, swell height, swell period and direction and oceanographic phenomena, sea temperature, positional data, tidal data and current data.

Preferably, the system further comprises updating means for updating the transmitted data.

Advantageously, the updating means is adapted to update the data at intervals of between three and six hours.

Suitably, the forecasting system is adapted to forecast for a period of up to twenty-four hours.

Advantageously, the system further comprises alarm generating means for automatically transmitting a warning signal to a vessel. Preferably, the alarm generating means is adapted to activate an audio/visual alarm on a vessel. More preferably, the alarm generating means is adapted to effect movement of a vessel from danger.

Preferably, the data transmitter is adapted to transmit data over a narrow band width or at a low data rate.

Suitably, a vessel position is transmissible by the data receiver to the data transmitter.

In a preferred embodiment of the invention, the data receiver and the display means are formed into a ruggedised computing system.

In a preferred embodiment of the invention the forecast comprises a nowcast.

The invention also extends to a method for transmitting meteorological and hydrographical data comprising collating the meteorological and hydrographical data, compressing the data, transmitting the data to a vessel, decompressing the data and displaying the data in a graphical form upon demand.

Preferably, the data is demanded prior to transmission. Suitably, the data is updated at regular intervals. Preferably, the method further comprises the step of transmitting a vessel position whilst demanding the data. Suitably, the position is transmitted from GPS data.

In a preferred embodiment of the invention, the method further comprises displaying coordinates of the vessel, hydrographical and meteorological data in a graphical form on a display.

The method can also comprise the step of transmitting a warning of imminent danger to a vessel.

The method and system of the present invention is adapted to provide individual vessels with appropriate hydrographical and meteorological data specific to that vessel at short time intervals from a server over suitable communication channels either on demand or alternatively or in addition automatically in the event of a rapid deterioration in sea conditions. The data is compressed before transmission and decompressed on the vessel and is displayed on a computer screen for easy comprehension. Moreover, a demand for data from a vessel may include the coordinates of the vessel obtainable as data from a GPS receiver to display the vessel's current position on a preloaded chart loadable from the computer of the vessel.

The visual image of the meteorological and hydrographical data together with the co-ordinates of the vessel can be integrated with an electronic chart digital information system to display either the motion of the vessel relative to the adjacent topography or the relative motion of the topography of the ship.

The on board computer employed in the system and method of the invention can be a conventional computer or a purpose-built ruggedised computing system. A typical ruggedised computer system in accordance with the system and method of the invention is made up of a satellite transceiver, a microprocessor for data manipulation, a memory to store data, an instruction input device such as a trackball and a display unit. The components of the computing system are mounted in a weatherproof container.

In the event of immediate danger, the data transmitted can be used

to either automatically activate a warning device such as a siren or alternatively to automatically control movement of a vessel. Such a facility is of particular value to small vessels with minimal crew as well as fast vessels.

The method and system of the invention facilitates the transmission of nowcasts in near real time to marine vessels requiring accurate and reliable weather predictions. The method and system of the invention serves as an aid in the better scheduling of short sea shipping services and accordingly facilitates better integration of marine transport into inter modal chains. The method and system of the invention also facilitates a reduction in the risk of accidental loss of life and/or property and the efficient planning of fishing fleet exploitation.

The enhanced safety for vessels at sea provided by the method and system of the invention also serves to reduce the risk of environmental pollution, safer conveyance of people and cargo, safer working conditions for sea farers and as a general aid in the coordination of sea going vessels.

The method and system of the invention provides a low cost, vessel based device suitable for hostile marine environments which presents the user with short-range meteorological and hydrographical nowcasts based on their vessel's course and speed. The information is presented in a graphical form such as on a colour display which makes interpretation of the meteorological and hydrographical data quick and straightforward for both novice and experienced sea farers alike. The information presented by the method and system of the invention may then be exploited as an aid to best plan course changes as well as proposed sailing times of vessels.

The method and system of the invention is adapted to occupy a comparatively small space on a vessel where storage space is in

general at a premium.

Nevertheless, the method and system of the invention is adapted to deliver the aforementioned meteorological and hydrographical features.

The system and method of the invention is in general made up of hardware components and software components which include a shore-based or master server (a data collator and transmitter) and a terminal communicable with the server from a vessel (a data receiver).

Hardware Component:

As indicated above, a principal hardware component of the on-board components of the system of the invention is made up of a graphic display on a terminal typically, a computer screen, located in a housing in the form of a box or the like. The hardware component may also be made up of a second communications box in communication with an antennae to facilitate communication by the system of the invention with the server. Global Positioning by Satellite (GPS) communications components can also be integral with the terminal. The vessel-based terminal of the system of the invention can be powered directly by a vessel's battery e.g. by a 12 volt or 24 volt D.C. electrical power supply. The display of the system of the invention is typically a graphic display in the form of a colour display such as that provided by a Video Graphics Adapter (VGA) colour display. The controls of the system of the invention are mounted on the box while the box is fully water proof and salt mist proof to protect both the box and the internal electronic components of the box from corrosion.

Alternatively, the vessel terminal may be in the form of a computer input device and monitor.

The system of the invention comprises a satellite transceiver to provide two-way communication between the vessel terminal of the

system of the invention and the server to provide the nowcast data. As indicated above, the satellite transceiver can be a separate unit located adjacent an antennae or, alternatively, in a preferred embodiment of the invention, is integral with the terminal housing or box but communicable with the antennae.

The hardware of the system of the invention is adapted to facilitate GPS transmissions to relay information concerning vessel latitude longitude, course and speed to the server upon demand of nowcast data.

The hardware of the system of the invention is also made up of a plurality of connectors which include, for example, a BNC connector to facilitate satellite transceiver, GPS and other communications, a line socket to provide power from the vessel battery and National Marine Electronics Association (NMEA) input from an external GPS, an RS 232 nine pin D-type connector for providing serial input and output to the system of the invention and a mains adapter to enable usage of the system of the invention remote from a vessel.

Software Component:

The software employed in the system and method of the invention is adapted to collate data, compress data and transmit data on demand to a vessel to maintain a simplified land/sea chart on the display of the hardware together with a display of the vessel's actual and projected speed and current bearing whilst also facilitating a three dimensional graphical rotation of the land/sea chart to enable a user to see future prevailing weather conditions. The software is also adapted to enable the projection of the vessel to a new position on the screen and provide access to a plurality of system functionalities familiar to those skilled in the software art such as user settings, help functions and the like.

The software of the system of the invention is also adapted to facilitate initiation by a user of downloading of the nowcast data

from the server. Downloading occurs as a background process and does not interfere with other operations performed by the user using the system of the invention. Nowcast data is downloaded by the software relative to the position of the vessel as indicated by the graphic display of the system.

As indicated above, the software employed in the system of the invention is adapted to facilitate customisation by a user of the system. In addition, the system of the invention is provided with default settings.

The software of the system of the invention is adapted to configure variables such as units of measurement e.g. wave height in feet or metres, wind speed in Beaufort, knots or Kilometres per hour, tidal height in feet or metres, Greenwich Mean Time or Local Time together with meteorological and hydrographical alert values such as significant wave height, wind speed and low tides.

As indicated above, the software of the invention is also provided with a help function to facilitate use the meteorological and hydrographical nowcast system of the invention in a simple and effective manner.

The software of the system of the invention can employ a number of known operating systems such as Windows 95, Windows NT, Windows CE or Linux (Trade Mark).

The system of the invention is adapted to relay data to a user on meteorological and hydrographical conditions employing wind, wave and tidal data definable by a number of parameters. For example, wind speed and direction covering approximately every 0.25 of a degree in steps of one hour intervals projected for up to twenty-four hours ahead may be measured in knots, Beaufort or kilometres per hour while wave data can embrace significant wave height covering approximately every 0.25 of a degree in steps of one hour intervals projected for up to twenty-four hours ahead measurable

in metres or feet while tidal data can embrace a complete tidal curve including high water and low water points presented for primary and secondary ports.

An embodiment of the invention will now be described, by way of example only, having regard to the accompanying drawings in which:

Fig. 1 is a flow chart representing a meteorological and hydrographical forecast system and method in accordance with the invention;

Fig. 2 is a schematic representation of the meteorological and hydrographical forecast system and method of Fig. 1 illustrating the vessel, satellite, communications systems and server of the system;

Fig. 3 is a front elevation of the housing of the on-board terminal component of the meteorological and hydrographical forecast system;

Fig. 4 is a representation of a computer screen generated by meteorological and hydrographical forecast system in accordance with the invention;

Fig. 5 is a representation of a computer screen generated by a second embodiment of the meteorological and hydrographical forecast system in accordance with the invention, and

Fig. 6 is a schematic representation of the server for use in the system and method of the invention in communication with vessels, satellite and data sources.

As shown generally in Figs. 1 and 2, a meteorological and hydrographical nowcast system and method of the invention comprises the provision upon demand of a customised nowcast of meteorological and hydrographical data to vessels at sea from a

data transmitter via radio, telephone or satellite channels to a data receiver to present an image or picture, typically computer generated, of the hydrographical and meteorological situation in the immediate and planned future location of the vessel.

As shown in Fig. 1, the weather or meteorological data is modelled from data originating from weather reporting ships, atmospheric sensors, satellites and the like and is collated, as shall be explained more fully below, into weather data. Similarly, hydrographical data is obtained from observations, models and databases and collated into the hydrographical data at a server. The weather or meteorological data and the hydrographical data is then transmitted, upon demand, in a compressed form from the server via a communications channel to the hardware/software on board a vessel where the meteorological and hydrographical data is decompressed to be displayed graphically on a screen.

Fig. 2 is a schematic representation of the meteorological and hydrographical nowcast system of the invention which is generally indicated by the reference numeral 35. As shown in the drawing, the system of the invention is made up of a data transmitter server 36 at which data from the aforementioned weather reporting ships, sensors, satellites and the like is collated and formed into data to be transmitted using the system and method of the invention.

The server 36 is typically located at a master shore station 37. The data received by the server 36 is generally indicated by the reference numeral 38 in Fig. 2. The server 36 is in communication with a satellite signal receiver/transmitter or transceiver 39 via a communications cable 40. The satellite signal receiver/transmitter 39 can be of a type known in the art such as an Inmarsat or Orbcomm or Iridium Land Earth Station (LES) receiver/transmitter, while the communications cable 40 can be formed by a Public Switched Telecommunications Network/Integrated Services Digital Network (PSTN/ISDN) line or the like. The

communications cable 40 is further communicable with a communications network 41 such as a Global System for Mobiles (GSM) network to facilitate communication between the master shore station 37 and a vessel 43.

The satellite signal/receiver 39 is adapted to receive signals from and transmit signals to a satellite 42 which in turn is adapted to receive signals from and transmit signals to the vessel 43. The vessel 43 is provided with a data receiver in the form of a terminal 44 incorporating the computer hardware and software necessary for demanding, receiving and transmitting meteorological, hydrographical and positional data particular to the vessel 43. The terminal 44 is typically made up of a ruggedised housing 45 incorporating a display screen 1 (see Fig. 3). The terminal 44 is in communication with a satellite signal receiver 46 or a communications hand set indicated by the reference numeral 47 which can be a GSM compatible mobile phone or the like. The communications handset 47 facilitates communication of the terminal 44 with the communications network 41 via a GSM data service or the like.

The vessel 43 is further provided with an antennae 48 to facilitate communication of the vessel 43 with the Global Positioning System to compute the exact location of the vessel 43 which location is in turn communicated to the server 36 upon transmission of a demand for data from the terminal 44 by the vessel 43.

Fig. 3 shows a front elevation of the housing 45 of the terminal 44 of Fig. 2. As shown in the drawing, the housing 45 is box-like in construction and is provided with a computer screen 1 for displaying the graphical nowcast data transmitted from the server 36. The housing 45 is further provided with a handle 49 to facilitate portability and fixing of the housing 45. In addition, the housing 45 is provided with connectors 50 for facilitating connection of the terminal 44 with the communications handset 47,

the satellite receiver 46 and the antennae 48. The housing 45 is provided with an on/off switch 51 to facilitate actuation of the terminal 44 and screen contrast control buttons 52 to facilitate adjustment of images on the screen 1.

An indicator light 53 is also provided on the housing 45 to indicate the on/off status of the terminal 44.

The housing 45 is also provided with a mouse-type pointing device 54 to facilitate operation of the software and manipulation of the data on the screen 45 in conventional manner.

Fig. 4 shows a representation of a first embodiment of a graphical meteorological and hydrographical nowcast of the invention on the computer screen generally indicated by the reference numeral 1. The nowcast is generated by a meteorological and hydrographical forecast system of the invention and is adapted to display data in various fields. As shown in the drawing, the nowcast is arranged to provide a substantially rectangular image of a map 34 having a fields defining longitude axis 2 indicating longitude and a latitude axis 3 indicating latitude. The latitude axis 3 is provided with a latitude scroll bar 4 to adjust the latitude of the map 34 and a longitude scroll bar 5 to adjust the longitude of the map 34.

The enlarged map 34 is displayed between the longitude 2 and latitude 3 coordinates to indicate the position of the vessel or another position selected by adjusting the latitude scroll bar 4 and/or the longitude scroll bar 5.

The nowcast is further provided with a "Windspeed and Direction" field button 6 to cause windspeed and direction data for a selected time to be displayed on a "Windspeed and Direction" display 23 and a "Windspeed and Direction symbol" or icon 24 disposed adjacent the "Windspeed and Direction" display 23 from the decompressed data received from the server 36.

The nowcast has a "Significant Wave Height" button 7 disposed adjacent the "Windspeed and Direction" button 6 to cause the "Significant Wave Height" for a selected time to be displayed on a "Significant Wave Height" at the current position of a vessel display 21 and a "Significant Wave Height" at the current position of the vessel symbol or icon 22 disposed adjacent the "Significant Wave Height" at the current position of a vessel display 21.

A zoom map 15 is also defined in the nowcast from which the area displayed in the map 34 may be selected by clicking with the pointing device 54 on the zoom map 15 in the desired location e.g. by placing a current area marker 16 on the zoom map 15.

The nowcast is further provided with a "Current Time" (plus 23 hours) display 8 disposed adjacent the "Significant Wave Height" for a selected time button 7 and an hour selecting bar 9 to select the hour for which data on the nowcast is to be displayed. Accordingly, by adjusting the hour selecting bar 9, the data from the server 36 for an earlier time period or a later time period may be displayed.

The nowcast also comprises a display 10 to indicate the hour to which the data selected relates while a current hour display 11 is also disposed adjacent the display 10 to indicate the current hour.

Finally, the nowcast is also provided with a clickable button 12 to instruct the display 34 to indicate in a stepwise manner an animation of the meteorological and hydrographical data relevant to each hour period of the nowcast if desired.

The map 34 is provided with a "Current Position" indicator 13 to indicate the current position of the vessel on the map 34. A "Data Type" box 14 is imposed on the map 34 to indicate the "Data Type" to which the system of the invention relates. As shown in Fig. 2 the data for the nowcast relates to Beaufort scale wind

data.

The nowcast is also provided with a "Current Longitude" display box 17 to indicate the exact current longitudinal position of the vessel and a "Current Latitude" display box 18 to display the "Current Latitude" of the vessel. The latitude and longitude data is varied according to the location of the current position indicator 13 on the map 34. The current position indicator 13 can be varied as required over-riding the position reported by the GPS, the latitude and longitude of such position of the current position indicator 13 being reported in the "Current Longitude" display box 17 and "Current Latitude" display box 18.

A "Time to Which the Nowcast Data Relates" box 19 is disposed adjacent the "Current Latitude" display box 18 together with a "Time Zone Indicator" 20 to indicate the time zone to which the nowcast data relates.

Fig. 5 shows a nowcast operating in accordance with an alternative embodiment of the meteorological and hydrographical system of the invention. The system of Fig. 3 is broadly similar to the system of Fig. 2. Accordingly, like numerals indicate like parts. In the present embodiment, the nowcast is provided with a "Vessel Speed" indicator 25 and a "Direction" indicator 26 disposed adjacent the "Speed" indicator 25. In addition, the nowcast of the second embodiment is provided with a "Tide Height" display 27 for indicating the current tide height at a selected time. The nowcast is further provided with a "Course Selection" control 28 from which the direction of movement of the vessel may be selected and a "Position Bar" 29 to instruct the nowcast to display the current position of the vessel on the map 34. The nowcast is also provided with a "Tide Information" button 30, a "Wave Information" button 31 and a "Wind Information" button 32 to display information on tide, wave and wind data as required. Finally, the nowcast is provided with a download button 33 to demand download of data as previously described.

As will be appreciated by those skilled in the art, the nowcast may be varied as required to display desired meteorological and hydrographical data. Accordingly, the nowcast may be varied to include additional information on the nowcast or indeed to remove data from the nowcast to provide a simplified nowcast as required.

In an alternative embodiment of the invention, the nowcast may be transmitted automatically to a vessel whose position is known or estimated in advance.

In use, the weather data 38 is first collated at the shore based station 37 from the hydrographical and meteorological models and observation platforms which include, inter alia, the aforementioned weather reporting ships, sensors, satellites and the like. As indicated by the data displayable in the aforementioned fields the nowcast examples of the data collated include air temperature, pressure, windspeed and direction, wave height, wave spectra and direction, swell height, swell period and direction and oceanographic phenomena such as sea temperature, tides and currents. Other data of the system 35 includes the time indicator to indicate the time that has elapsed since the nowcast data was last updated, the current time, time zone, the time to which the nowcast data relates, the longitude of the vessel, latitude of the vessel and the like. In addition, a user may vary the time to which the nowcast data is applicable by adjusting the time to which the hour selecting bar 9 so that the user on the vessel 43 may view the nowcast data for a particular time period or time e.g. in steps of one hour, within the period of time embraced by the nowcast.

Generally, the nowcast data transmitted according to the method of the invention is updated over time intervals of approximately three to six hours and embraces time periods up to twenty-four hours. Moreover, the nowcast data can be displayed for wide geographical areas which may be selected by a vessel. Moreover, due to the compression and decompression of the data in the system

and method of the present invention, the nowcast data only requires a few seconds to be received by a computer system on board a vessel so that the nowcast data is economical to transmit and is still current when received.

The weather data 38 is formed into a specific form to generate nowcasts or forecasts using various modelling methods, such as Numerical Weather Products (NWP). The use of such modelling methods results in the generation of a forecast or nowcast in a specific format. In accordance with the present invention it is envisaged that the specific format of meteorological and hydrographical data required for the system and method of the invention would be pre-generated by commercial forecasting services. The data can be updated at frequent intervals in order to ensure that the data is as current as possible.

Upon demand from the vessel 43, the vessel 43 may access the meteorological and hydrographical data directly from the server 36 at the master shore station 37 or alternatively indirectly from a slave shore station in communication with the master shore station. The demand from the vessel can be in the form of a signal transmitted manually or automatically via radio, telephone or satellite channels e.g. via the communication handset 47.

The demand signal from the vessel typically includes a signal giving geographical coordinates for the vessel location which can be derived from the Global Positioning by Satellite (GPS) systems. The co-ordinates are incorporated into the meteorological and hydrographical data at the server 35 at the shore station 37 so that the graphical picture or image ultimately visible at the computer screen 1 on the vessel 43 includes the hydrographical and meteorological data together with the location of the vessel 43 to present a complete breakdown of the prevailing conditions which can be related directly to the immediate and planned future location of the vessel 43.

The compressed data transmitted to the vessel 43 is stored in a computer memory at the terminal 44 on board the vessel 43, and subsequently decompressed before being converted into a displayable form on the nowcast.

As indicated above, in order to minimise the transmission time of the data from the shore based station 36 to the vessel 43, and also to minimise transmission costs, the meteorological and hydrographical data transmitted by the shore based station 36 is compressed before transmission. Moreover, compression of the data minimises transmission time thereby allowing more vessels to be contacted within a given time period to maximise the efficiency of the meteorological and hydrographical system and method of the invention. The compressed data is reconstituted on board the vessel 43 at the terminal 44.

The compressed meteorological and hydrographical data can also be transmitted on demand rapidly over a narrow band width channel at minimum cost so that a large number of vessels can be contacted in a minimum time thereby reducing the time lag between a demand for meteorological and hydrographical data and supply of the hydrographical and meteorological data. In an alternative embodiment of the invention, the compressed meteorological and hydrographical data can be transmitted at a low data rate.

Warnings of immediate or imminent rapid deterioration of meteorological and hydrographical conditions may be transmitted in graphics or other forms to the vessel 43 within a specific geographical area automatically. In addition, the system and method of the invention can also be adapted to generate an audible or visual warning of such deteriorations on board a vessel. Moreover the system and method of the invention can be adapted to automatically control movement of a vessel so that any danger can be avoided. Examples of such dangers include potential collisions with other vessels or severe and localised hydrographical or meteorological conditions.

Fig. 6 is a detailed schematic representation of the server 36 in communication with hardware and software components of the method and system 35 of the invention in use.

As shown in the drawing, the server 36 is adapted to download periodically Nowcasting Data Parameters (NDP) from various Meteorological Data Sources (MDS) and store them in a local custom format data file. Simultaneously, the server 36 is adapted to process demands or requests from user terminals 44 on vessels.

The server 36 provides the necessary data to the user terminals 44 in accordance with Licence Agreements which can be put in place between a User and a System Administrator.

As indicated previously, the server 36 can be embodied in an NT server machine or the like.

As shown in Fig. 6, the server 36 is adapted to receive data from various meteorological data sources via the Internet as indicated by the reference numeral 56. In addition, the server 36 is in communication with a satellite base station 55 for receiving and transmitting satellite messages. As indicated previously, communication can be via an ISDN line indicated by the reference numeral 59. The server 36 is also adapted to receive data from a Licence Database indicated by the reference numeral 57 in which details of licence arrangements with users are stored and also an NDP data file indicated by the reference numeral 58 for receiving meteorological data.

Finally, the server 36 is communicable with the user terminals 44 as previously described via modems indicated by the reference numeral 60.

The server 36 is adapted to be operable 24 hours a day.

The server 36 is adapted to download files e.g. in Gridded Binary

(GRIB) format from a number of MDS sources employing Internet File Transfer Protocols (FTP). Each MDS employed in the method and system of the invention is defined on the server 36 by name, host address, log-on, password, file name, start time and download interval. A user at a user terminal 44 communicates with the server 36 via an interface (not shown) provided by a server library which facilitates the configuration and operation of different communications options available to the user. A user can log-on to the server 36 by passing their user name, location and password to the server 36. The server 36 can then verify the name, location and password against user data maintained on a subscription table in the License Database. Once a log-on by a user has been confirmed, the terminal 44 demands data as hereinbefore described and, assuming the user has a valid active licence to avail of the method and system of the invention, the requested data is transmitted to the user. The system 35 of Fig. 6 is adapted to accommodate two demand types namely position specific demands and grid reference demands.

In a position specific demand, a user can request weather data embracing a widening arc based on the current vessel position, maximum speed and current direction. As indicated previously, a demand from the user for such information includes data on the latitude, longitude, direction and details of the data required.

Upon receipt of a demand, the server 36 can compute the meteorological and hydrographical data required for a particular area in accordance with the typical maximum speed associated with the vessel and the aforementioned latitude, longitude and directional data. The appropriate NDP records are then transmitted to the vessel 43 as previously described. Upon downloading of data from the server 36 by the terminal 44 of a user a charge may be made.

In grid reference demands from a user, meteorological data relating to specific regions e.g. 1° square sea areas are

requested by the user. The server 36 simply effects transmission of appropriate data parameters for NDP that falls within said sea areas. For example, twelve hours of the selected data parameters for NDP may be transmitted.

In order for a user to effect a demand at the terminal 44, the user is presented with a database log-on dialogue box by the server 36 via the ISDN line 59. The log-on dialogue box prompts the user for a server name, log-on name and password.

Once a user has successfully logged-on, the user may proceed with the demand as previously described.

The system of the invention is adaptable to display various specific or dedicated data types on the screen 1. For example, the screen 1 is adapted to solely display the position of the vessel 43 in accordance with GPS. In another embodiment of the invention, the system of the invention is adapted to facilitate transmission and receipt of textual messages employing the communications channels of the invention.

In a further embodiment of the invention, the system is provided with an intruder alarm mode of operation interfaceable with an intruder detector or other sensory device adapted to transmit a signal such as a twelve volt signal to the terminal 44 via the connectors 50 to trigger a pre-set alarm message which could be transmitted to an emergency number by the system of the invention.

The screen 1 of the invention can be formed using a liquid crystal display known to those skilled in the art. A preferred form of liquid crystal display is a VGA display referred to above such as an Hitachi (Trade Mark) LMG 9520 RPCC colour ¼ VGA 320x240 pixel display.

The pointing device 54 of the terminal 44 of the system of the invention may have controls in the form of a versa-point mouse,

integrated track ball mouse or the like.

As indicated above, the housing 45 of the terminal 44 is water proof and salt mist proof and can be formed from injection moulded plastics, folded metal or the like. The system of the invention is adaptable to accommodate various satellite transceiver devices such as Inmarsat D+, Orbcomm, Iridium and the like.

The system of the invention may employ an integral GPS from a satellite transceiver or interface directly with the vessel's own GPS receiver using a interface such as an NMEA 0183 interface.

The terminal 44 is provided with a suitable processor. An example of a suitable processor is an Intel (Trade Mark) 486 processor with for example 16MB of Random Access Memory (RAM) embedded on a PC 104 module.

An example of a satellite transceiver suitable for use in the system of the present invention is a Panasonic KX-G 7101 Orbcomm transceiver with integrated GPS receiver.

As indicated previously, the operating system employed and the software component of the system of the invention can for example be a Windows (Trade Mark) operating system.

CLAIMS

1. A meteorological and hydrographical forecast system (35) comprising a data (38) receiver (44) locatable on a vessel (43) and a data transmitter (36) for transmitting data selectable by the data receiver (44) to the data receiver (44) characterised in that the data (38) is transmissible to the data receiver (44) on demand from the receiver (44).

2. A meteorological and hydrographical forecast system (35) as claimed in Claim 1 characterised in that the data (38) is viewable on a display means (1) at the receiver (44).

3. A meteorological and hydrographical forecast system (35) as claimed in Claim 2 characterised in that the data transmitter (36) comprises a data processing means (36) for generating a forecast on the display means (1).

4. A meteorological and hydrographical forecast system (35) as claimed in Claim 3 characterised in that the forecast (1) comprises a vessel coordinates field (13,17,18)

5. A meteorological and hydrographical forecast system (35) as claimed in any of Claims 1 to 4 characterised in that the system further comprises means for compressing the data (38) prior to transmission by the transmitter.

6. A meteorological and hydrographical forecast system (35) as claimed in any of Claims 2 to 5 characterised in that the system (35) further comprises means for decompressing the data prior to display at the receiver (44).

7. A meteorological and hydrographical forecast system (35) as claimed in any of Claims 3 to 6 characterised in that the data processing means comprises a server (36).

8. A meteorological and hydrographical forecast system (35) as

claimed in any of Claims 1 to 7 characterised in that the data transmitter (36) comprises a master transmitter (36) communicable with the receiver (44).

9. A meteorological and hydrographical forecast system (35) as claimed in any of Claims 1 to 8 characterised in that the data transmitter (36) comprises a slave transmitter communicable with the receiver (44).

10. A meteorological and hydrographical forecast system (35) as claimed in Claim 8 or Claim 9 characterised in that the master transmitter (36) is shore based.

11. A meteorological and hydrographical forecast system (35) as claimed in any of Claims 1 to 10 characterised in that the data receiver (44) is communicable with the data transmitter (36) by a cellular telephone, radio phone or satellite.

12. A meteorological and hydrographical forecast system (35) as claimed in any of Claims 1 to 11 characterised in that the data (38) transmitted is selectable from the group comprising air temperature, pressure, windspeed and direction, wave height, wave spectra and direction, swell height, swell period and direction and oceanographic phenomena, positional data, tidal data and current data.

13. A meteorological and hydrographical forecast system (35) as claimed in any of Claims 1 to 12 characterised in that the system further comprises updating means for updating the transmitted data.

14. A meteorological and hydrographical forecast system (35) as claimed in Claim 13 characterised in that the updating means is adapted to update the data at intervals of between three and six hours.

15. A meteorological and hydrographical forecast system (35) as claimed in any of Claims 1 to 14 characterised in that the system is adapted to forecast for a period of up to twelve-four hours.

16. A meteorological and hydrographical forecast system (35) as claimed in any of Claims 1 to 15 characterised in that the system further comprises alarm generating means for automatically transmitting a warning signal to a vessel (43).

17. A meteorological and hydrographical forecast system (35) as claimed in Claim 16 characterised in that the alarm generating means is adapted to activate an audio/visual alarm on a vessel (43).

18. A meteorological and hydrographical forecast system as claimed in Claim 16 or Claim 17 characterised in that the alarm generating means is adapted to effect movement of a vessel (43) from danger.

19. A meteorological and hydrographical forecast system as claimed in any of Claims 1 to 18 characterised in that the data transmitter (36) is adapted to transmit data over a narrow band width or at a low data rate.

20. A meteorological and hydrographical forecast system (35) as claimed in any of Claims 1 to 19 characterised in that a vessel (43) position is transmissible by the data receiver (44) to the data transmitter (36).

21. A meteorological and hydrographical forecast system (35) as claimed in any of Claims 2 to 20 characterised in that the data receiver (44) and the display means (1) are formed into a ruggedised computing system.

22. A meteorological and hydrographical forecast system (35) as claimed in any of Claims 1 to 21 characterised in that the

forecast comprises a nowcast.

23. A method for transmitting meteorological and hydrographical data comprising collating the meteorological and hydrographical data, compressing the data, transmitting the data to a vessel, decompressing the data and displaying the data in a graphical form.

24. A method for transmitting meteorological and hydrographical data as claimed in Claim 23 characterised in that the data is demanded prior to transmission.

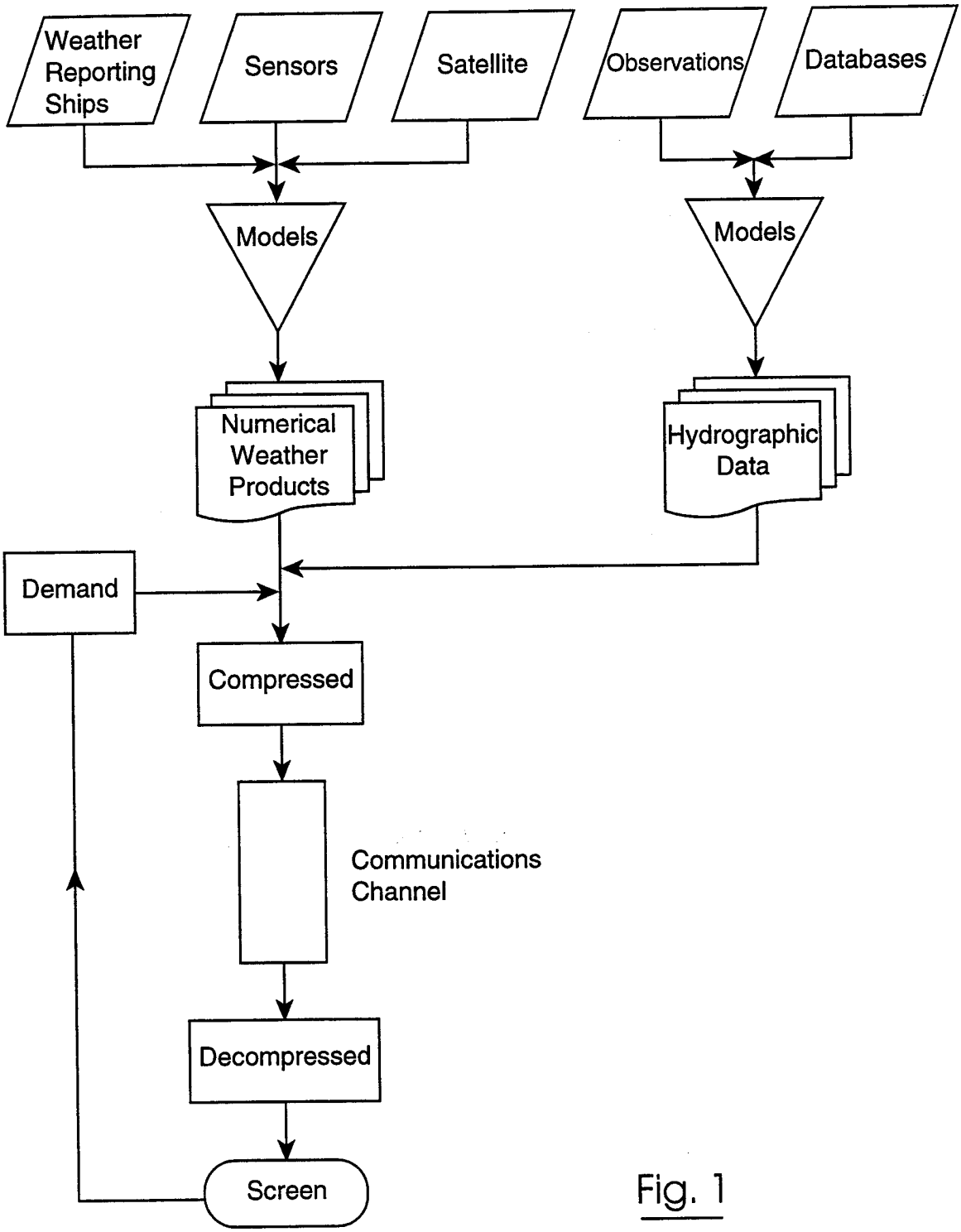
25. A method for transmitting meteorological and hydrographical data as claimed in Claim 23 or Claim 24 characterised in that the data is updated at regular intervals.

26. A method for transmitting meteorological and hydrographical data as claimed in any of Claims 23 to 25 characterised in that the method further comprises the step of transmitting a vessel position whilst demanding the data.

27. A method for transmitting meteorological and hydrographical data as claimed in Claim 26 characterised in that the position is transmitted from GPS data.

28. A method for transmitting meteorological and hydrographical data as claimed in any of Claims 23 to 27 characterised in that the method further comprises displaying coordinates of the vessel, hydrographical data and meteorological data in a graphical form on a display.

29. A method for transmitting meteorological and hydrographical data as claimed in any of Claims 23 to 28 further comprising transmitting a warning of imminent danger to a vessel.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Demand
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Fig. 1

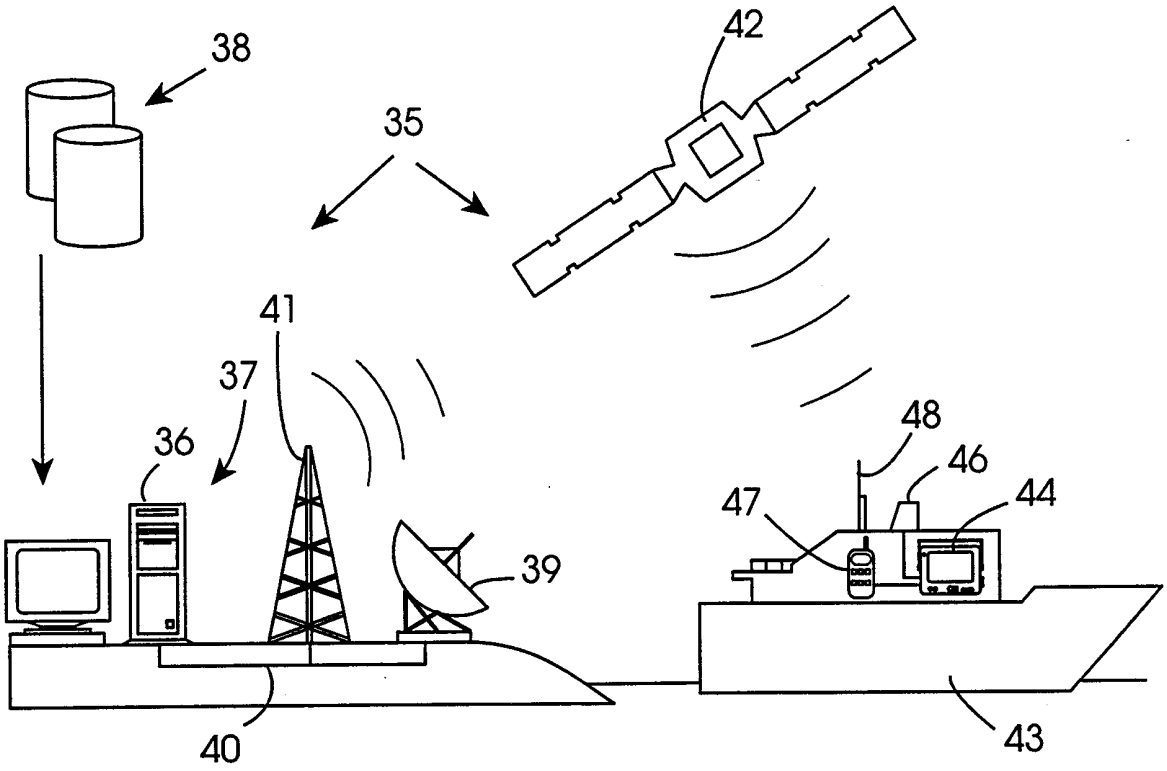

Fig. 2

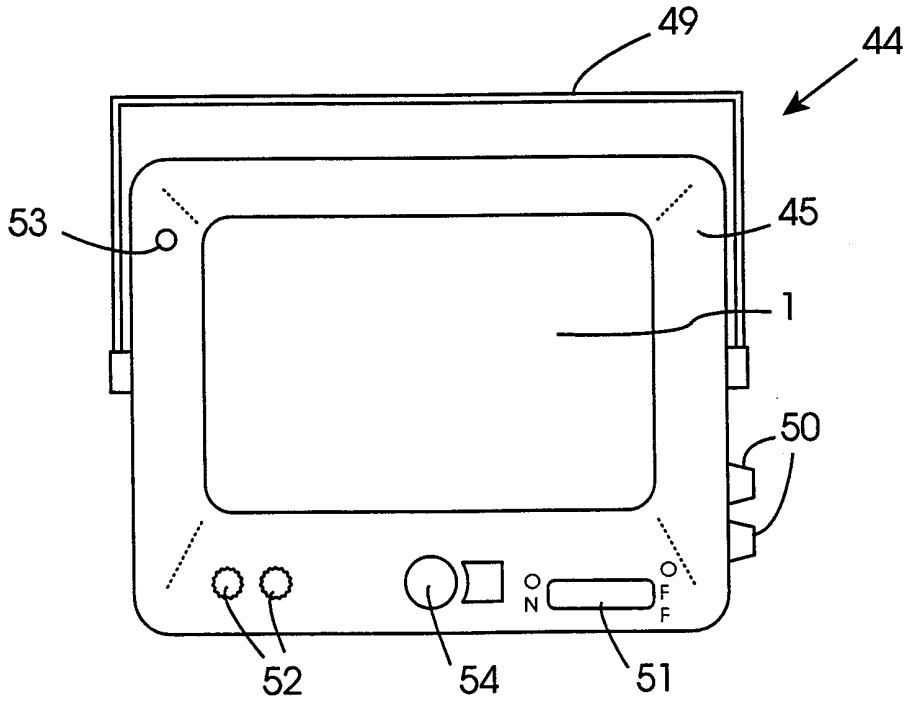

Fig. 3

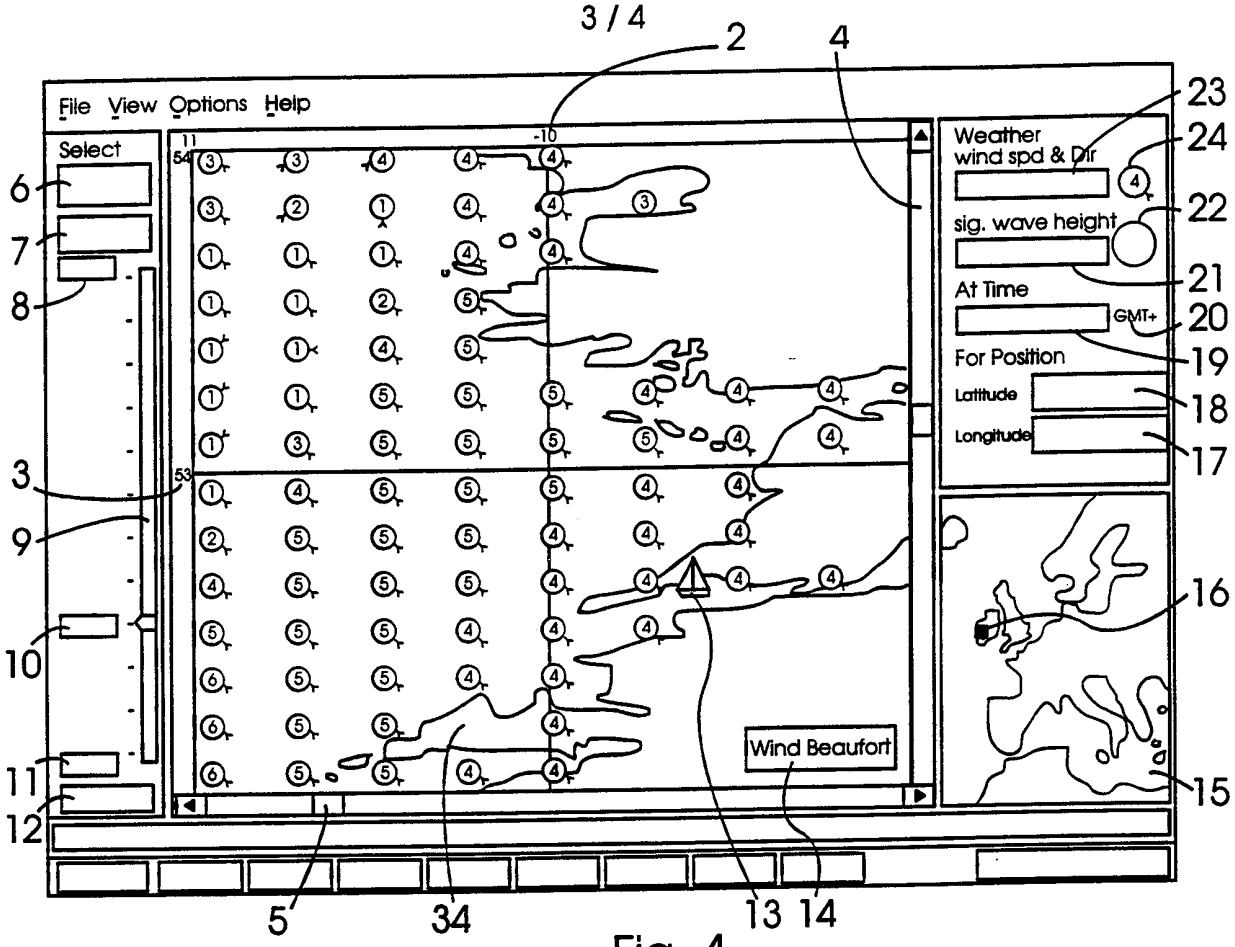
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Fig. 4

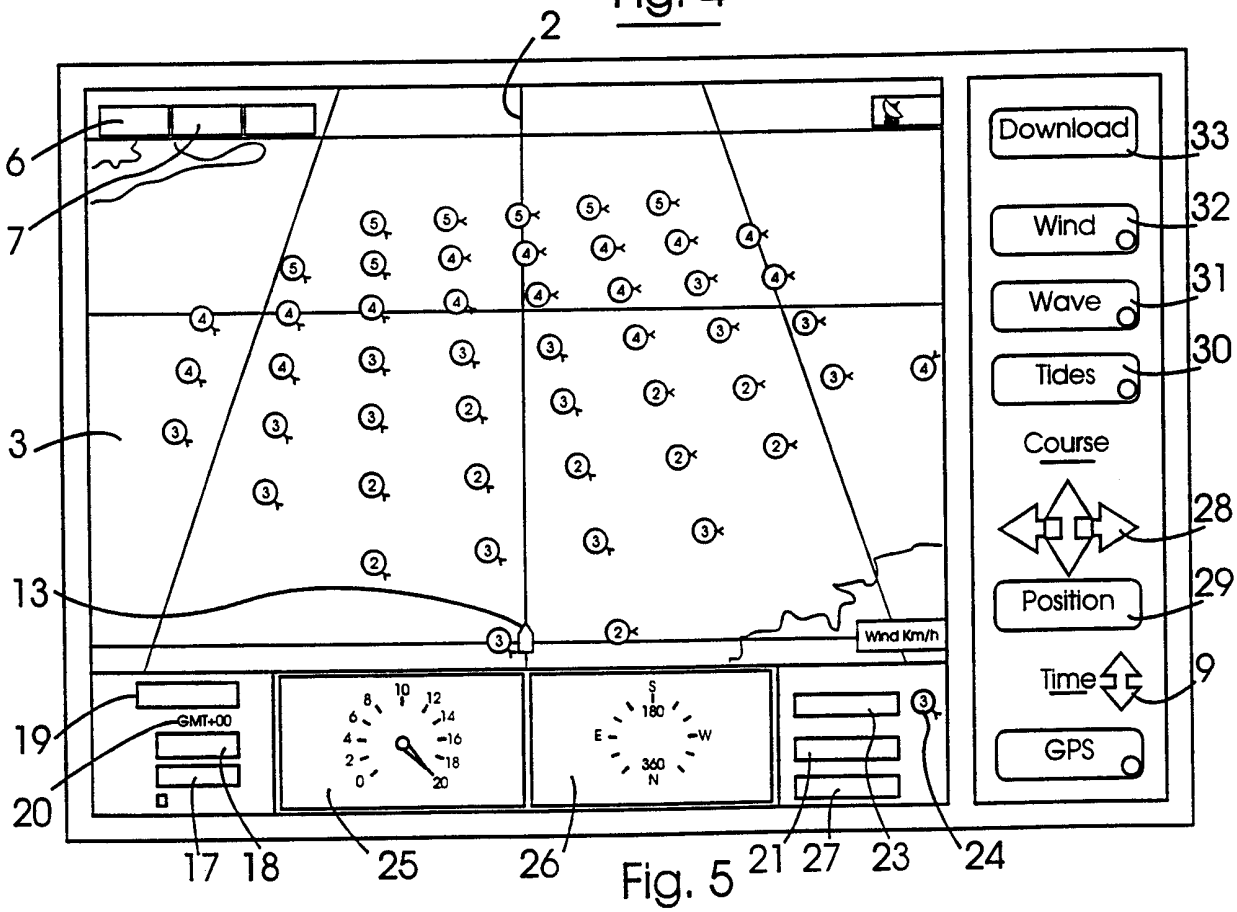
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Fig. 5

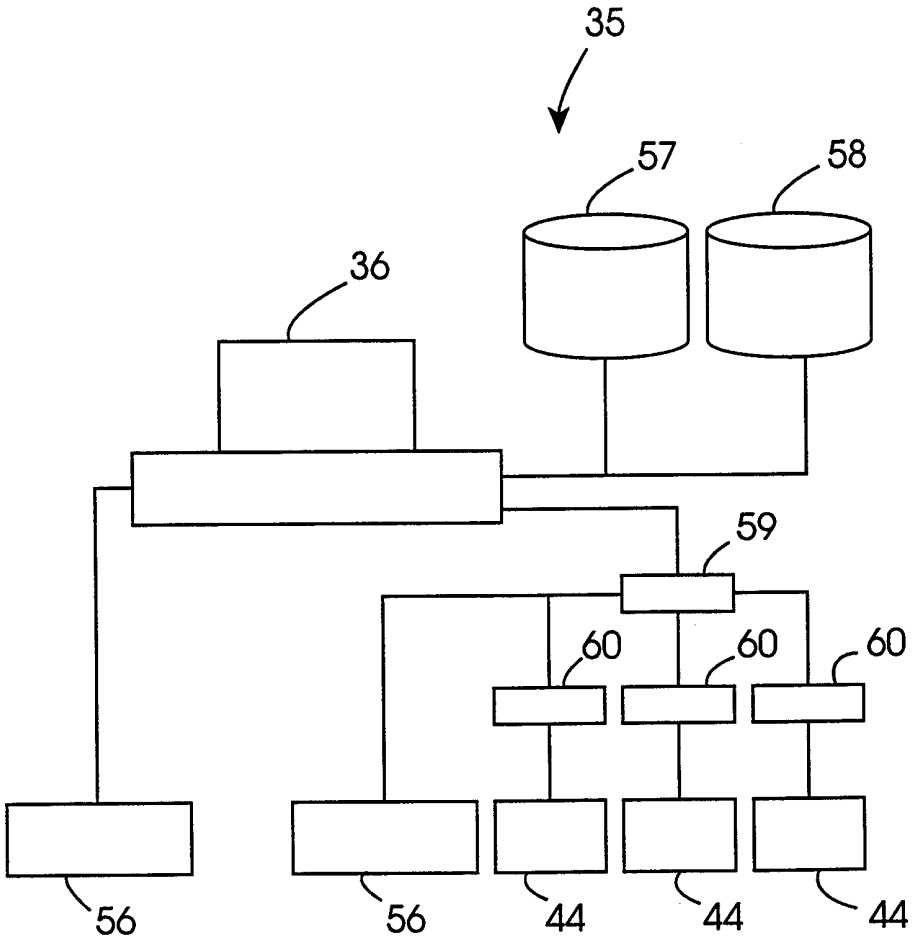

Fig. 6

INTERNATIONAL SEARCH REPORT

International Application No
PCT/IE 99/00085

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G01W1/00 G01W1/08 G01W1/10 G06F15/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G06F G01W

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 521 857 A (AVIMAGE, INC) 4 June 1985 (1985-06-04) abstract column 7, line 45 -column 11, line 16	1-5, 23-26
X	US 4 611 209 A (LEMELSON ET AL) 9 September 1986 (1986-09-09) abstract column 1, line 18 - line 64	23
X	US 5 265 024 A (VIGYAN, INC) 23 November 1993 (1993-11-23) abstract column 4, line 49 -column 5, line 20	23
Y	column 6, line 53 -column 9, line 29	1-7

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
29 December 1999	11/01/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Skulikaris, I

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INTERNATIONAL SEARCH REPORT

Inte .onal Application No
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5 654 886 A (WSI CORPORATION) 5 November 1997 (1997-11-05) abstract column 1, line 65 -column 2, line 20 column 7, line 54 -column 9, line 24 ---	1-7
A	BESSIS J L: "METEOROLOGICAL APPLICATIONS OF THE ARGOS SYSTEM" ADVANCES IN EARTH ORIENTED APPLICATIONS OF SPACE TECHNOLOGY, vol. 1, no. 1, 1981, pages 205-214, XP000863760 the whole document -----	1-29

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INTERNATIONAL SEARCH REPORT

Information on patent family members

Inter. nal Application No
PCT/IE 99/00085

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4521857 A	04-06-1985	NONE	
US 4611209 A	09-09-1986	NONE	
US 5265024 A	23-11-1993	NONE	
US 5654886 A	05-08-1997	NONE	