(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 091 268**
A2

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: 83301789.0

(51) Int. Cl.³: G 09 G 1/16

(22) Date of filing: 30.03.83

(30) Priority: 02.04.82 GB 8209793

(43) Date of publication of application:
12.10.83 Bulletin 83/41

(84) Designated Contracting States:
BE DE FR IT NL SE

(71) Applicant: McMICHAEL LIMITED
Sefton Park Bells Hill
Stoke Poges Slough Berkshire, SL2 4HB(GB)

(72) Inventor: Bond, James
Brook House Farm Burghfield
Reading Berkshire(GB)

(74) Representative: Dolwin, John Davison
Central Patent Department The General Electric
Company plc Hirst Research Centre East Lane
Wembley Middlesex HA9 7PP(GB)

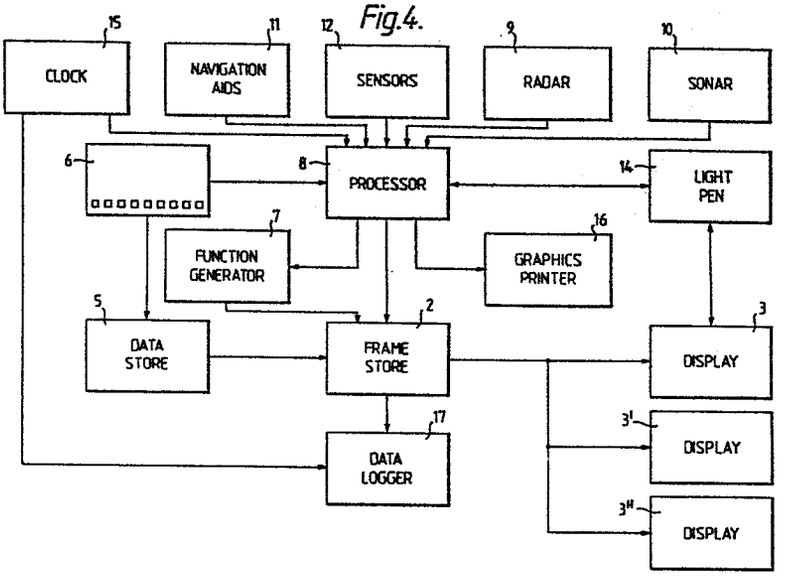
(54) **Map display systems.**

(57) A map display system uses digitally encoded data to define maps and charts. The digital data for a selected map segment is transferred to a frame store for display on a raster scanned display screen. Facilities are provided to annotate the display and to provide markers and symbols on the display by modification of the frame store data. Data defining a map segment as modified may be stored for future reference. Printed charts may be supplied from modified or unmodified data by use of a graphics printer. The system may also be responsive to navigational aids to add symbols to the display.

./...

Croydon Printing Company Ltd.

Fig.4.


15
CLOCK
11
NAVIGATION AIDS
12
SENSORS
9
RADAR
10
SONAR
6
8
PROCESSOR
14
LIGHT PEN
7
FUNCTION GENERATOR
16
GRAPHICS PRINTER
5
DATA STORE
2
FRAME STORE
3
DISPLAY
3'
DISPLAY
17
DATA LOGGER
3''
DISPLAY

The present invention relates to map display systems and more particularly to such systems in which the map display is derived from stored data.

The term map as used herein includes inter-alia maritime charts and topographical maps.

It will be appreciated that maps in a permanent form (for example maps printed on paper) are bulky items, and if large numbers of maps are required, storage and indexing may become significant problems. These problems are enhanced if maps of differing scales are required and/or maps showing particular features are needed.

Furthermore if some kind of temporary information is required to be added to a map, for example when planning a route, the map may be damaged by subsequent removal of the temporary marking.

One solution to providing a location marker on maritime charts involves the use of a moving light source under a translucent chart table, the light source being arranged to move in dependence on the measured location of a vessel in which the system is being used. If further information is required to be added to the chart on a temporary basis - for example the location of other vessels in the vicinity - this may be done by marking the chart or by marking on a transparent overlay.

If a permanent record of information added to a chart at a particular time is required then duplicate copies of the map will be required.

It is one object of the present invention to provide a map display system which overcomes these and other problems.

According to the present invention in a map display system display means is arranged to provide a visual display in respect of display data stored in a frame store and control means is arranged to write into the frame store display data which is in respect of a selected segment of a map and which is derived from a

data store arranged to store data defining the whole map, said display data being commensurate with the resolution of the display means.

Preferably the control means is responsive to keys of a manually operable keyboard to select the segment of the map required for display. The display data may be derived from the data held in the data store so that the displayed segment of the map may be at differing scales.

The system may also include means to enter into the frame store information or symbols to be superimposed on the displayed segment of the map. A further store may be provided in which data defining the segment of the map with the information and/or symbols imposed thereon may be stored for subsequent recovery.

The system may also be arranged to provide a chart showing a topographical section along a user definable line of the selected segment of the map.

The control means may also be responsive to mechanical or electromechanical means to enable the displayed segment of the map to be amended in accordance with the position of the vehicle or vessel in which the system is installed.

The means to enter data in the frame store may also be responsive to detection means such as sonar or radar to cause the superimposition of information and/or symbols on the displayed segment of the map.

A graphics printer may be provided to enable a permanent record of a segment of the map with or without superimposed information and/or symbols to be obtained.

The display means may include a touch sensitive or light sensitive screen to facilitate the transfer of information to the control means.

The segment of the map to be displayed is preferably specified as a grid reference or X,Y co-ordinate references of one point on the map, the displayed

segment being selected to surround or emanate from the defined point in a predetermined manner.

Map display systems in accordance with the invention will now be described by way of example with reference to the accompanying drawings of which Figures 1 to 4 are respective block diagrams of map display systems each affording differing facilities.

Referring to Figure 1 the system comprises a video tape reader 1 arranged to read information from a pre-recorded video tape (not shown separately), a frame store 2 and a raster scanned display screen 3 which is, for example, a commercially available television set. A switch 4 is provided to enable the display screen 3 to be controlled by either the video tape reader 1 or from the frame store 2.

Thus a user of the system may run a video tape through the video tape reader 1 with the switch 4 connected to a line 4A to scan the entire content of the video tape in the conventional manner. It will be realised that the video tape stores the data for a complete map in analogue form suitable for controlling a television set.

When the desired section of the map, data for which is held by the video tape, is shown on the display screen 3, the relevant single frame is transferred to the frame store 2. The switch 4 is connected to a line 4B so that the display screen 3 displays the single frame defining the desired section of the map until a further section of the map is required by the user. It will be appreciated that the frame store holds the data in a raster scan format and that the output of the frame store must be suitable for controlling the display of a television set.

To enable annotation of the map segment displayed on the display screen 3 a transparent screen (not separately shown) may be overlayed on the display screen. The user

may write information on the overlay using an eraseable marker.

Referring to Figure 2 a more flexible map display system is shown using a similar frame store 2 and display screen 3 to that shown in Figure 1. In this system the complete map is stored in digitally coded form in a data store 5 and the segment of map to be displayed is selected by use of a keyboard control panel 6. The data store 5 may be for example a disc store, a magnetic core store, a magnetic tape store or a semiconductor memory.

The data held in the data store 5 is not suitable for controlling the display screen 3 directly. The data held in the data store 5 may be arranged to define a basic map whilst data relating to features of the map (topographical features, symbols representing buildings and the like) may be stored separately.

The system is arranged to select from the data stored in the data store 5 that data which is relevant to the map section to be displayed, and to combine the data and re-organise it into raster scan order. The re-organised data is then stored in the frame store 2.

The frame store 2 has a signal conversion circuit (not shown separately) such that its output signals are suitable for controlling a television or other raster scanned display.

The segment of map to be displayed is specified by a user of the system entering the grid reference of a point within the map. On receipt of data from the keyboard 6 the system is arranged to transfer data from the data store 5 to the frame store 2 to cause a segment of the map to be displayed on the display screen 3. The segment displayed is arranged to surround the point specified which is positioned approximately at the centre of the display screen 3.

The display screen 3 has a transparent screen overlayed thereon to enable hand annotation of the

displayed map segment as described for the display screen of Figure 1.

Referring to Figure 3 the map system is an enhanced version of the system of Figure 2 having additionally a function generator 7. The function generator 7 is controlled from the keyboard control panel 6 and is arranged to modify the data which has been transferred to the frame store 2 from the data store 5 as hereinbefore described.

If a user of the system wishes to superimpose a symbol on the map segment displayed on the display screen 3 he operates keys of the control panel to specify the grid reference (or the X and Y co-ordinates) of the point at which the symbol is required. Further operation of the keyboard specifies the symbol to be superimposed and the function generator is arranged to modify the data held in the frame store 2 at the appropriate addresses to cause the symbol to appear on the display screen 3.

The display screen 3 may include a transparent overlay to enable the user to annotate the map by hand in addition to superimposing symbols or text on the screen from the keyboard control panel 6.

As an alternative to specifying the grid reference or co-ordinates of the point at which the selected symbol is to be displayed the display screen 3 may include a light sensitive screen (not shown) such that the point at which a symbol is to appear may be specified by the user using a light emitting pen, only the symbol being specified from the keyboard control panel 6.

If a light sensitive screen is used for this purpose it will be appreciated that X and Y co-ordinate data leads from the display screen 3 will be connected to the function generator.

Turning now to Figure 4 the map display system may be expanded to receive information from many sources

for superimposition on the display screen 3. As specific examples inputs to a processor 8, which controls the transfer of data to the frame store 8, may be from radar scanners 9 or sonar 10. Other sensors 12 such as from steering controls and the like may also provide an input to the processor 8 together with inputs from any other navigation aids 11.

The inputs from the radar scanners 9 and sonar 10 may be used to cause symbols indicating the presence of other vehicles or vessels on the display screen 3 under control of the processor 8 which causes modification of the data in the frame store 2.

The inputs from the navigation aids 11 and sensors 12 may be used by the processor 8 to cause scrolling of the segment of the map displayed on the display screen 3 in accordance with movement of the vessel or vehicle in which the apparatus is mounted.

Any or all of the functions described in the preceding paragraphs may be requested from the keyboard control panel 6 and only those functions specifically requested at any time will be carried out.

The transfer of data from the data store 5 to the frame store 2 is effected in the same way as that described for the operation of the systems of Figures 2 and 3. However, the introduction of the processor 8 provides a great deal of versatility. For example the data held in the data store 5 may define a map at a scale of, say, ten to one. If a very detailed display of a small segment of the map is required then the processor 8 derives data for the frame store 2 from all of the data held in the data store 5 for the particular segment. If a larger segment of the map is required at a scale of, say, 200 to one then the processor selects which of the data in the data store 5 is processed to produce the data for the frame store 2. For example if contour lines would be displayed at, say, five metre height intervals on a map at a scale of ten to one then

contour lines displayed at a scale of 200 to one may be at height intervals of, say, fifty metres. Certain symbols may be omitted in the smaller scale map with the processor 8 being arranged to cause the display of, possibly, features of the ground (or sea) only and adding selected symbols by request from the keyboard control panel 6.

In an additional mode of working the processor 8 may be arranged to provide a topographical map derived from the data defining contours of land or depths of seas held in the data store 5. The topographical map section line may be defined by grid points for its two ends, or by 'X' and 'Y' co-ordinates of the segment shown on the display screen 5, which may be provided from the keyboard control panel 6.

Alternatively the section line may be defined by use of a light pen 14 on a light sensitive screen (not shown) overlayed on the display screen 3.

The light pen 14 may also be used to define a point on the display screen 3 at which a symbol selected from the keyboard control panel 6 shall be displayed. Textual annotation by use of the light pen 14 and the keyboard control panel 6 may be effected in a similar manner.

A "real time" clock 15 may be provided with inputs to the processor 8 to enable calculations of, for example, estimated positions at specific times to be carried out, or estimated times of arrival at positions shown on the segment of map displayed on an estimated (or light pen input) course shown on the display screen.

The clock 15 is also used by a data logger 17 which may be used, on request from the keyboard control panel 6 or automatically at periodic intervals determined by the processor 8, to record the data held in the frame store 2 at particular times. Such data may be used to reconstruct the map segment displayed including all

overwritten symbols and annotations as and when they may be required.

A graphics printer 16 is provided to enable a "hard" (e.g. paper) copy of any map segment either derived directly from the data held in the data store 5 or as currently displayed by the display screen 3.

Map segments printed by the graphics printer 16 and derived from the data held by the data store 5 may be produced if required whilst the display screen 3 is showing a different map segment.

It will be realised that the graphics printer 16 may be used to produce a copy of a map segment defined by data held by the data logger 17.

It will be appreciated that a number of display screens 3, 3', 3" may be provided at different locations within a vessel or vehicle each receiving data from the frame store 2. Alternatively each display screen 3', 3" may have an independent frame store (not shown) to which data may be written by the processor 8. In the latter case each frame store may be provided with an associated keyboard control panel (not shown) and if necessary more than one processor 8 may be used to derive data from the data held in the data store 5.

CLAIMS

1. A map display system wherein display means is arranged to provide a visual display in respect of display data stored in a frame store and control means is arranged to write into the frame store display data which is in respect of a selected segment of a map and which is derived from a data store arranged to store data defining the whole map, said display data being commensurate with the resolution of the display means.

2. A map display system as claimed in Claim 1 wherein the control means is responsive to a keyboard to select the segment of the map to be displayed by the display means.

3. A map display system as claimed in Claim 1 or Claim 2 wherein the control means is also arranged to vary the display data derived from the data held in the data store such that the segment of the map displayed may be at differing scales.

4. A map display system as claimed in Claim 1, Claim 2 or Claim 3 wherein a function generator is arranged to modify the data held in the frame store to cause additional information and/or symbols to be included in the displayed map segment.

5. A map display system as claimed in any preceding claim wherein a second data store is arranged to store the data held in the frame store at any time to enable the subsequent reconstruction of the displayed segment of the map.

6. A map display system as claimed in any preceding claim wherein a graphics printer is arranged, to provide a print of the displayed segment of the map.

7. A map display system as claimed in any preceding claim wherein the display screen includes a light sensitive or pressure sensitive screen arranged to provide data to the control means defining the co-ordinates of a point or points on the display screen in accordance with light or pressure on the screen.

8. A map display system as claimed in any preceding claim wherein the control means is also arranged to derive data defining a topographical section for display from the data held in the data store.

9. A map display system as claimed in any preceding claim wherein the control means is also responsive to movement sensors to provide to the frame store data defining a segment of the map at periodic intervals such that the segment of the map displayed on the display screen is determined by the location of the vehicle or vessel in which the system is in use.

10. A map display system as claimed in any preceding claim wherein the control means is also responsive to detection means to cause the superimposition of symbols and/or text on the segment of the map displayed on the display screen.

11. A map display system as claimed in any preceding claim wherein the system is arranged such that the segment of map to be displayed on the display screen is selected so as to at least partly surround a defined grid reference.

12. A map display system substantially as hereinbefore described with reference to Figure 2, Figure 3 or Figure 4 of the accompanying drawings.

Fig.1.

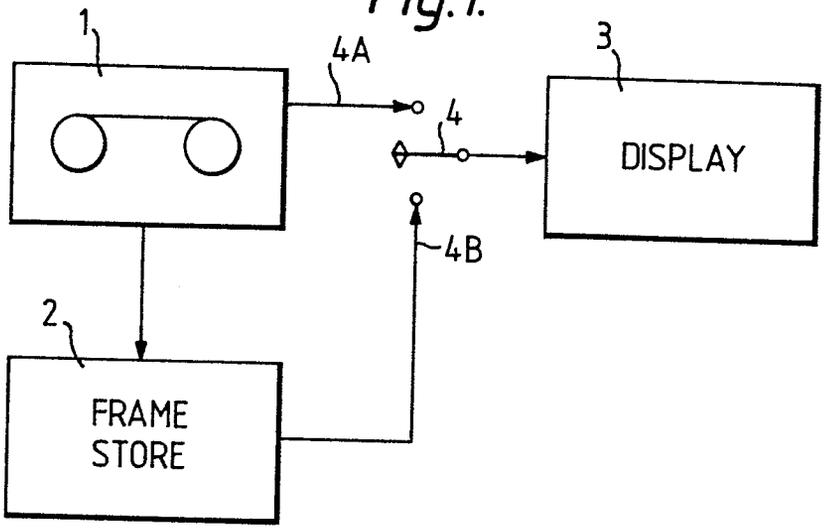


Fig.2.

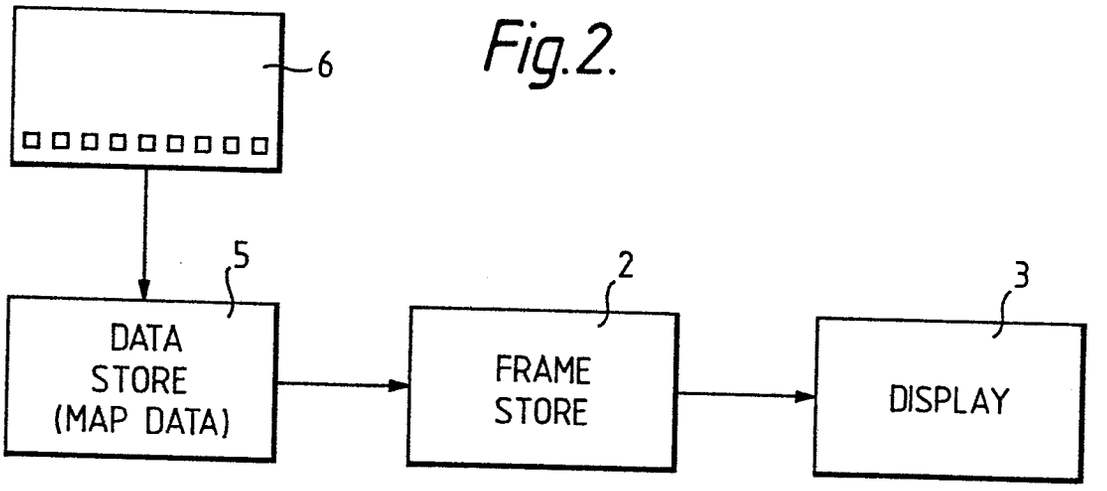
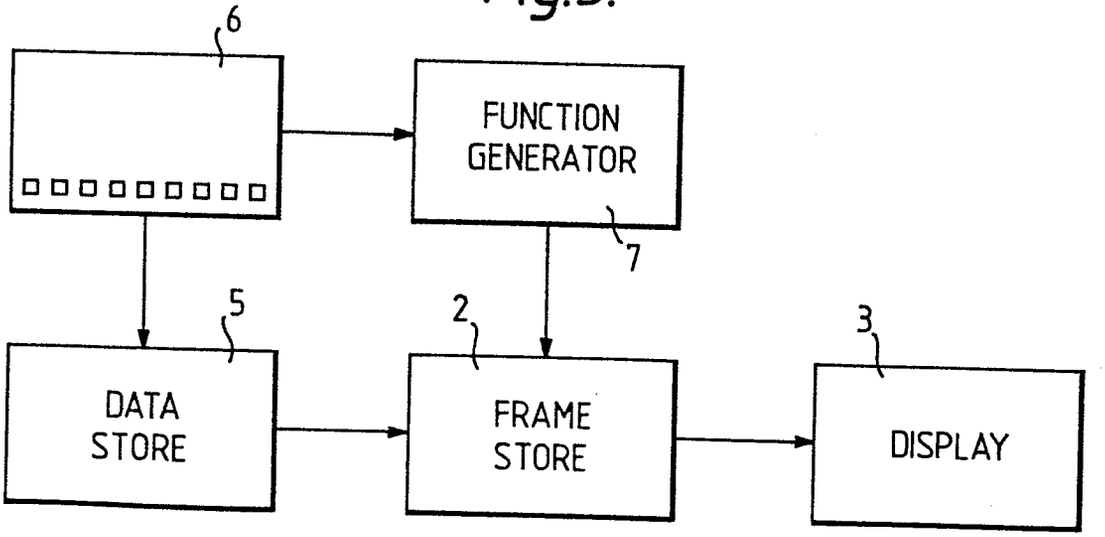


Fig.3.



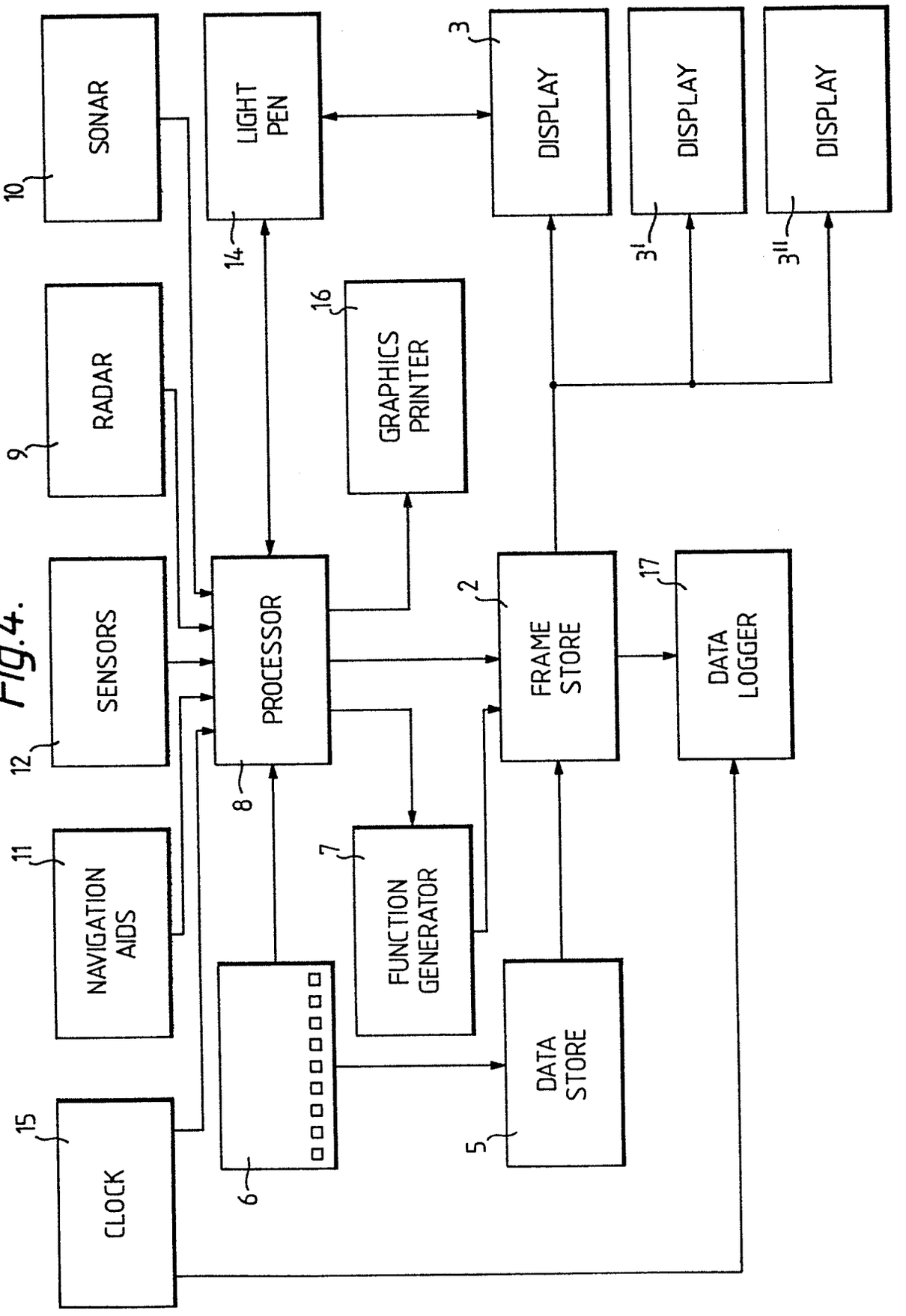

SONAR
10
LIGHT PEN
14
3
DISPLAY
DISPLAY
3'
DISPLAY
3''
RADAR
9
GRAPHICS PRINTER
16
SENSORS
12
PROCESSOR
8
2
FRAME STORE
17
DATA LOGGER
NAVIGATION AIDS
11
7
FUNCTION GENERATOR
6
DATA STORE
5
CLOCK
15

Fig.4.