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Swenson

[54] **VARIABLE LENGTH AND SENSOR SPACING THERMISTOR ARRAY**

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[51] **Int. Cl.**[4] **G08C 19/12**; G08B 21/00

[52] **U.S. Cl.** **340/870.17**; 340/870.16; 73/300; 374/142

[58] **Field of Search** 374/142, 183, 170; 73/300; 340/870.16, 870.17; 441/11

[56] **References Cited**

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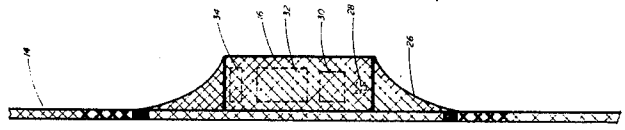
[57] **ABSTRACT**

An adaptable thermistor array of variable length and sensor spacing. A plurality of thermistor modules are attached at any desired interval to a braided line. Each thermistor module contains its own power source, sensor, and an acoustic telemetry transmitter to transmit the temperature related data from the module to an acoustic receiver in a buoy from which the line depends.

1 Claim, 2 Drawing Figures



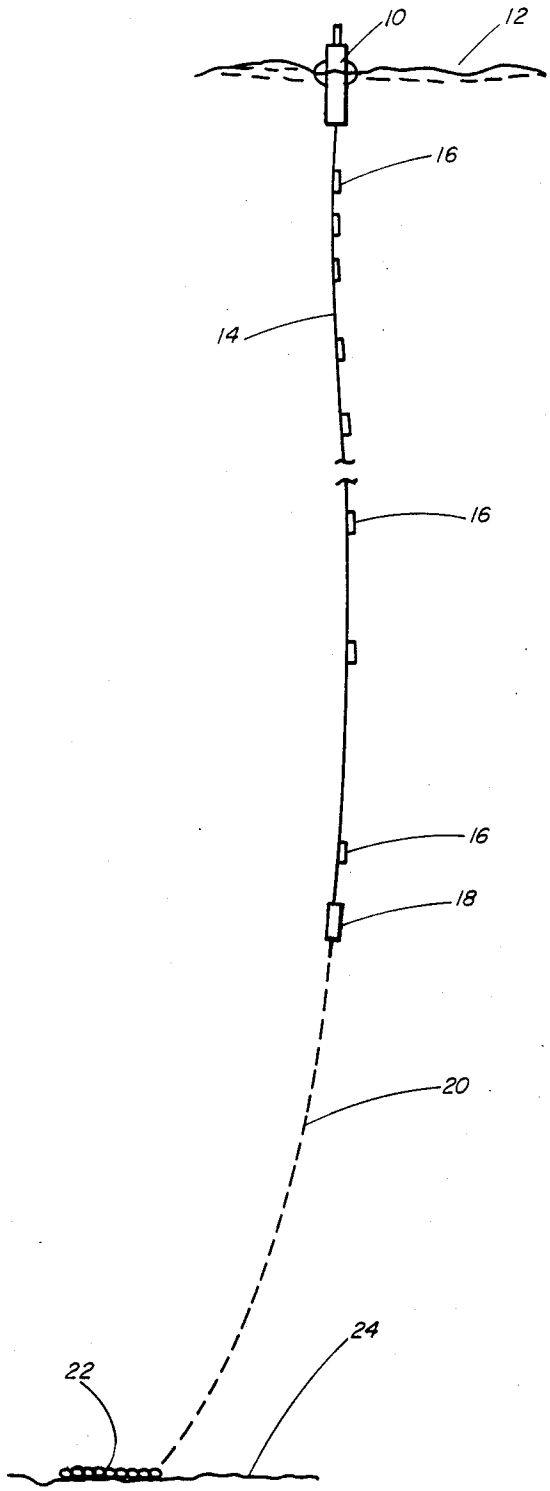


FIG. 1

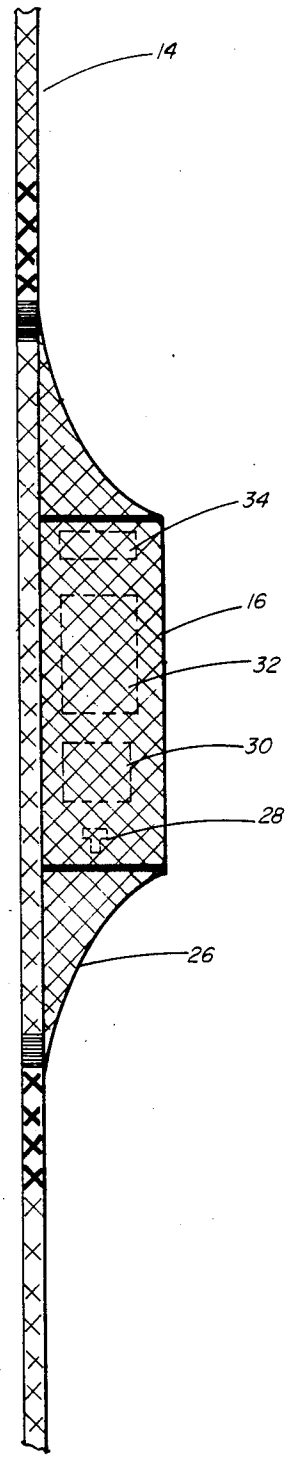


FIG. 2

VARIABLE LENGTH AND SENSOR SPACING THERMISTOR ARRAY

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to obtaining a temperature profile of the upper ocean and more particularly to a variable length and sensor spacing array supported by a remote buoy.

2. Description of the Prior Art

Small remote buoys supporting thermistor arrays have been in use for many years by the oceanographic community to measure the water temperature profile of the upper ocean. These systems use copper conductors of various lengths to reach thermistors distributed along the aperture of the array. Various techniques are used to incorporate these into a cable and, in some cases, a mooring line. However, these arrays are rigidly made for a specific length and sensor spacing, and different arrays are required for different uses. Further, changes in conductivity of the copper conductors and/or insulation results in temperature measurement uncertainties.

SUMMARY OF THE INVENTION

Accordingly the present invention provides an adaptable thermistor array of variable length and sensor spacing. A plurality of thermistor modules are attached at any desired interval to a braided line. Each thermistor module contains its own power source, sensor, and an acoustic telemetry transmitter to transmit the temperature related data from the module to an acoustic receiver in a buoy from which the line depends.

Thus it is an object of the present invention to provide a thermistor array which can be readily varied as to length and sensor spacing.

Another object of the present invention is to provide a thermistor array which eliminates temperature measurement uncertainties due to changes in copper conductor/insulation conductivity.

Other objects, novel features and advantages will be apparent from the following detailed description when read together with the appended claims and attached drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. **1** is a pictorial view of a temperature profiling system according to the present invention.

FIG. **2** is a plan view of a thermistor module attached to a braided line according to the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIG. **1** a remote buoy **10** is shown on the surface **12** of a body of water. Suspended from the buoy **10** is a line **14** to which are attached a plurality of sensor modules **16** at variable spacings. At the end of the line **14** is a weight **18** to maintain the line in an essentially vertical orientation. A mooring cable **20** may be attached to the end of the line **16** to form a moored buoy system, and is terminated by an anchor **22**, such as a heavy chain, on the sea floor **24**.

As shown in FIG. **2** the line **14** is braided. The sensor module **16** is retained in a tubular net **26** whose ends are

tuck spliced into the braided line **14**. Additionally the ends of the net **26** are seized to the line **14** to assure that the module **16** is securely attached. Each module **16** has a sensor **28**, such as a thermistor for temperature measurements, an associated electronics package **30** with a clock, a power source **32** such as a battery, and an acoustic transmitter **34**. These components are sealed or potted in polyurethane in a pipe, such as 3 to 4 inch diameter PVC 8 inches in length, which forms the housing of the module **16**. The removal of a magnet (not shown) attached to the exterior of the module **16** serves to initiate it by releasing an interior contact to energize the power source **32**.

In operation each array can be prepared in the field using standard seamanship techniques. Each module **16** to be attached to a given array line **14** has a different frequency for unit identificaton. The modules **16** are attached to the line **14** at any desired intervals, the magnets are removed, and the array is deployed. At periodic intervals, such as every 12 hours, determined by the clocks in the respective electronic packages each xodule **16** transmits its unique frequency modulated in proportion to the resistance of the thermistor **28**. An acoustic receiver in the buoy **10** receives the data, processes it for retransmission such as to a standard ARGOS satellite. The data may be stored in a recorder and played back upon command. Approximately fifteen modules **16** are required per array which vary in length from 100 meters in the Arctic to 600 meters in the equatorial zones.

Thus, the present invention provides a variable length and sensor spacing thermistor array which can be used in either a free drifting or a xoored configuration to provide periodic temperature profiles in the upper levels of any body of water without degradation due to copper conductor/insulation resistance changes, and which may be readily configured in the field for a specific application using ordinary seamanship techniques.

What is claimed is:

1. A variable length and spacing thermistor array comprising:

a buoy having an acoustic receiver and means for retransmitting data received by said acoustic receiver;

a braided line having a weight at the end said braided line being suspended from said buoy and having a length dependent upon the oceanographic environment where said array is to be deployed;

a plurality of thermistor modules, each of said thermistor modules having a thermistor, an acoustic transmitter with a unique frequency, means for sequentially activating each of said acoustic transmitters at periodic intervals;

means for attaching said thermistor modules to said braided line at variable intervals dependent upon the oceanographic environment where said array is to be deployed; and

said attaching means comprising a tubular net within which said thermistor module is contained, the ends of said tubular net being woven into and seized onto said braided line.

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