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(19) **United States**
(12) **Reissued Patent**
Brown

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(54) **SEVERE WEATHER DETECTOR AND ALARM**

(75) Inventor: **Anthony Brown**, Hyattsville, MD (US)

(73) Assignee: **Richmond IP Holdings, LLC**, Richmond, VA (US)

(21) Appl. No.: **11/186,013**

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Related U.S. Patent Documents

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Filed: **Apr. 10, 2000**

U.S. Applications:

(63) Continuation of application No. 09/246,784, filed on Feb. 1, 1999, now Pat. No. 6,076,044, which is a continuation of application No. 08/799,838, filed on Feb. 13, 1997, now Pat. No. 5,978,738.

(51) **Int. Cl.**
G01W 1/02 (2006.01)
G06F 19/00 (2006.01)

(52) **U.S. Cl.** ..... **702/3**; 702/2; 342/26 R

(58) **Field of Classification Search** ..... 702/3, 4, 702/57, 58, 61, 65, 68, 75, 99, 104, 122, 702/130, 138, 177, 179, 188, 189, 193, 2; 455/412.2, 553.1, 555, 556.1, 557; 370/310, 370/338; 342/26 A, 26 B, 26 C, 26 D, 26 R
See application file for complete search history.

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Primary Examiner — Mohamed Charioui
(74) *Attorney, Agent, or Firm* — Banner & Witcoff, Ltd.

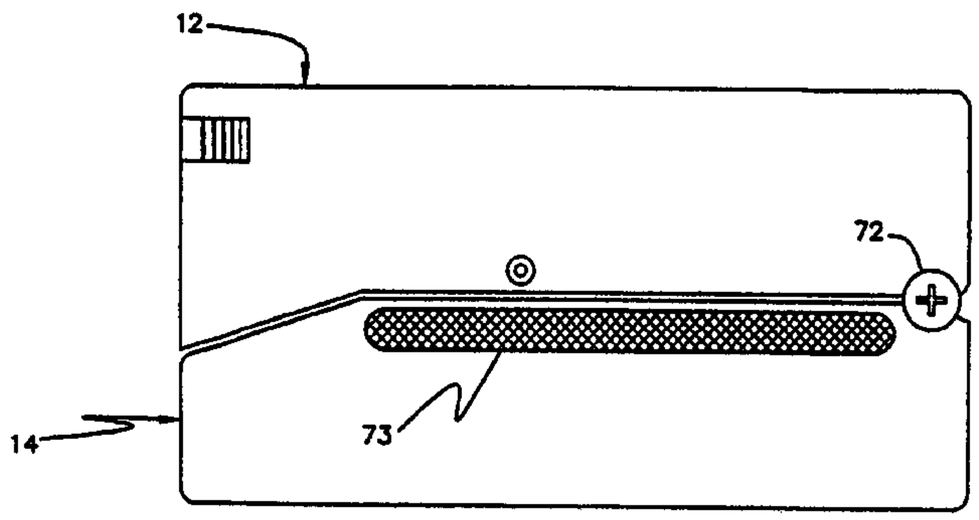
(57) **ABSTRACT**

A compact, portable weather station for predicting local extreme weather conditions and for reporting remote weather conditions. The weather station has sensors for determining local temperature, barometric pressure, humidity, ambient light, and ambient static charge. A microprocessor has memory for storing data relating to past weather conditions and data processing apparatus and algorithms for determining probable developing weather conditions responsive to sensed local conditions. The weather station has a radio receiver for communicating with global weather reporting communications systems utilizing cellular communications. Operating commands, predicted local weather conditions, and remote weather conditions are annunciated in synthesized voice in any one of a variety of predetermined languages. The weather station includes voice synthesizing and recognition apparatus for annunciating verbal prompts and weather conditions, and for responding to vocal control. The weather station is formed in two separable components, one having sensors and the other having radio communications apparatus.

REEXAMINATION RESULTS

The questions raised in reexamination proceeding No. 90/008,410, filed Jan. 5, 2007, have been considered, and the results thereof are reflected in this reissue patent which constitutes the reexamination certificate required by 35 U.S.C. 307 as provided in 37 CFR 1.570(e) for *ex parte* reexaminations, or the reexamination certificate required by 35 U.S.C. 316 as provided in 37 CFR 1.997(e) for *inter partes* reexaminations.

20 Claims, 13 Drawing Sheets



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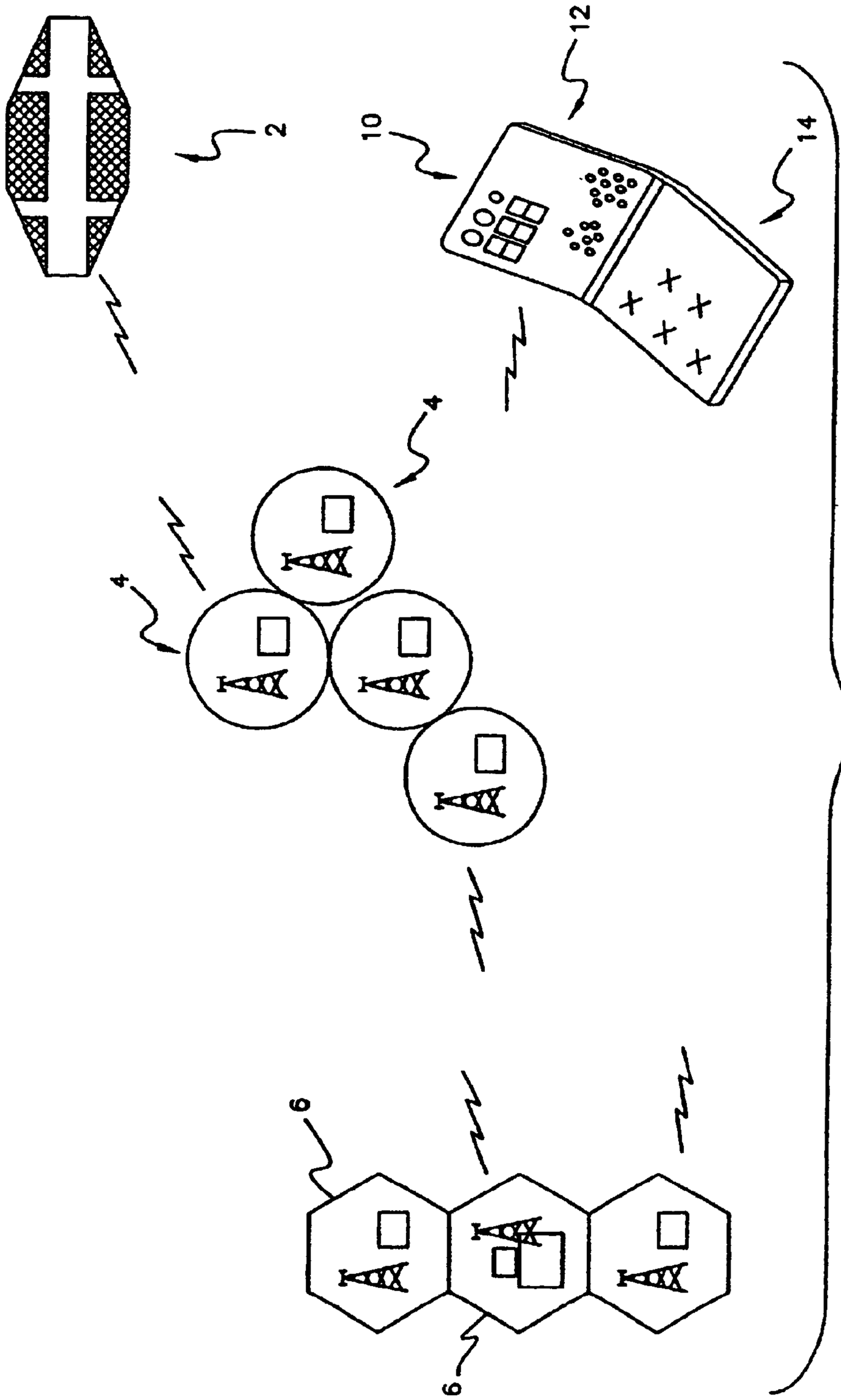


FIG. 1

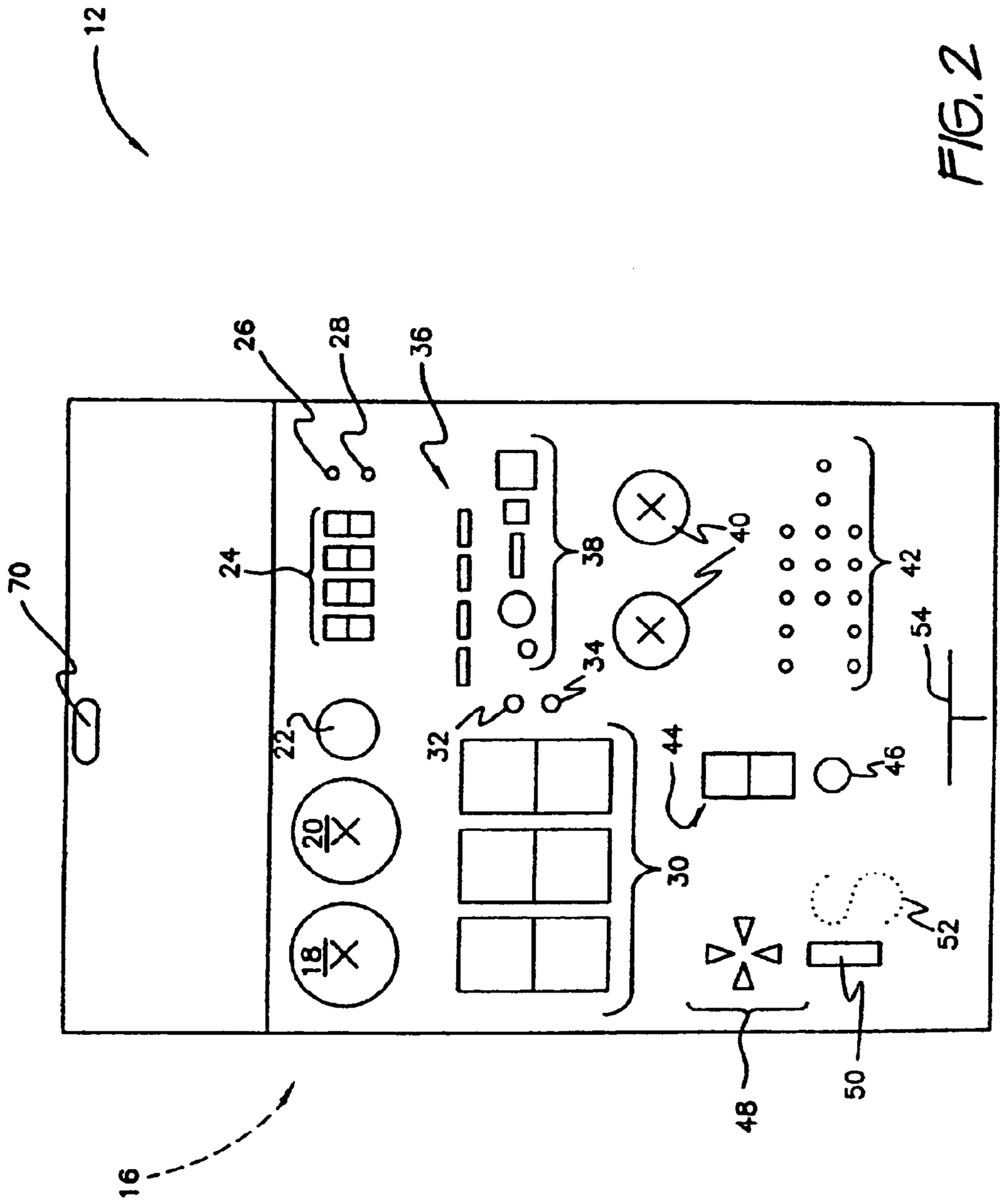


FIG. 2

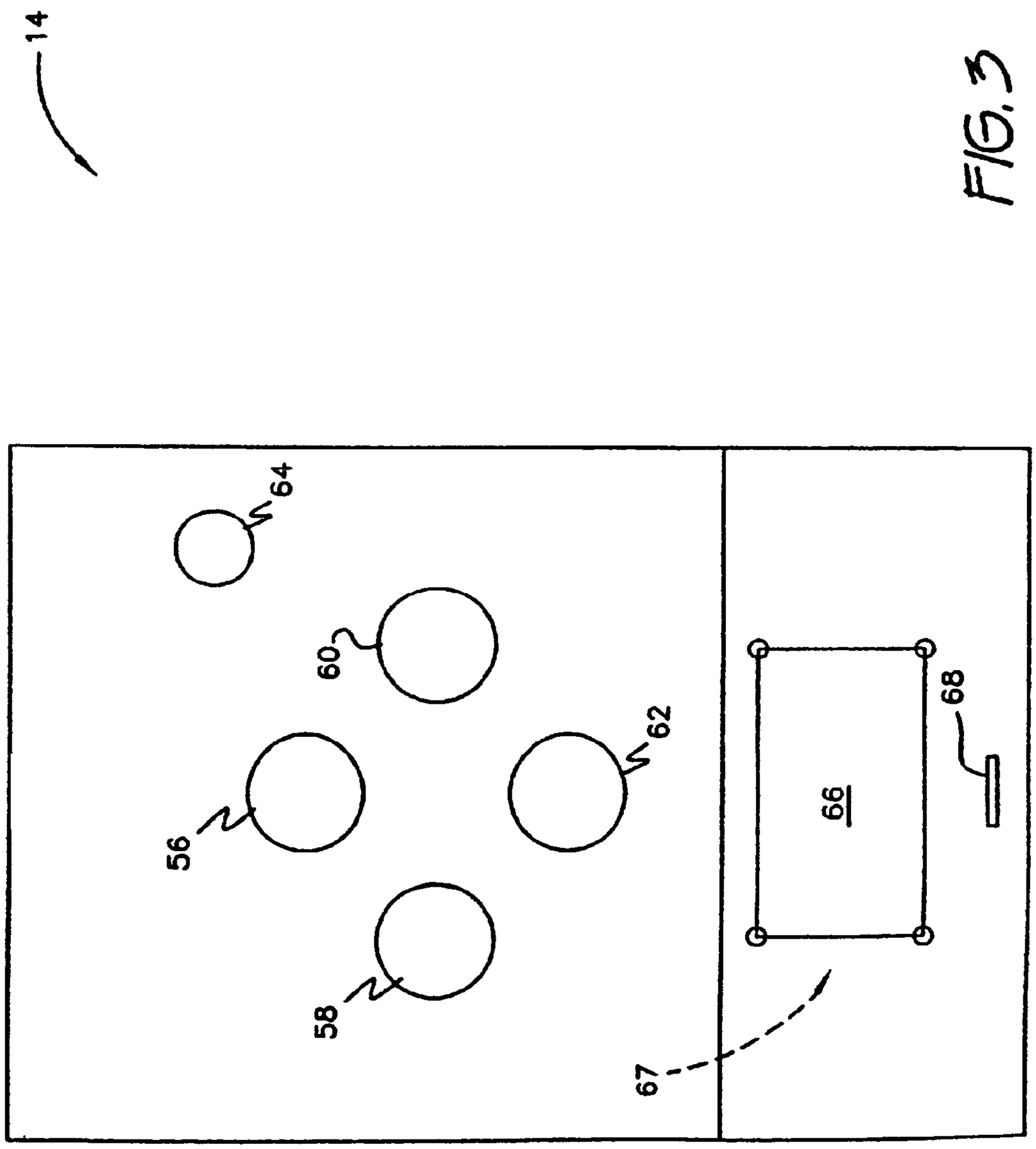


FIG. 3

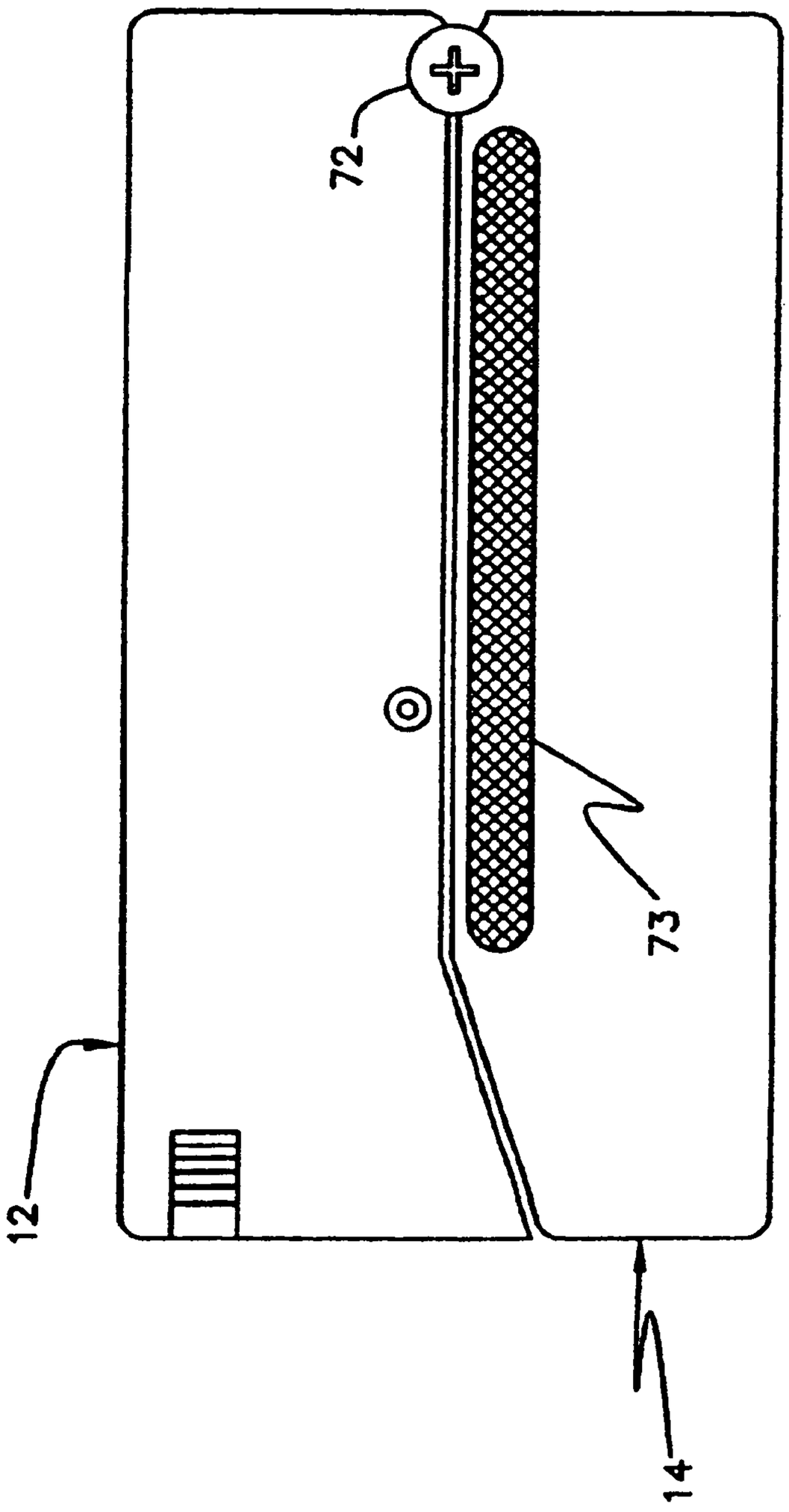


FIG. 4

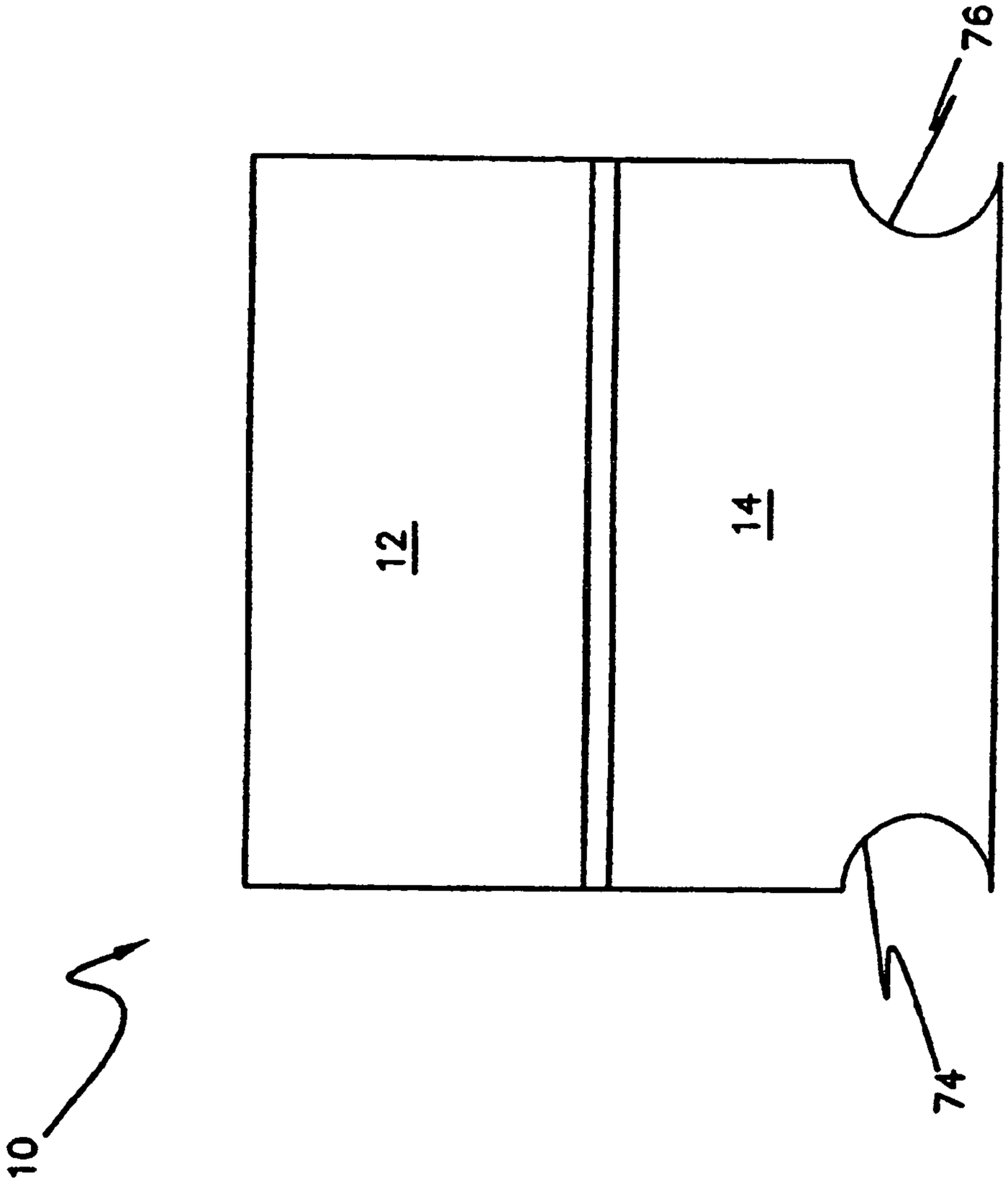


FIG. 5

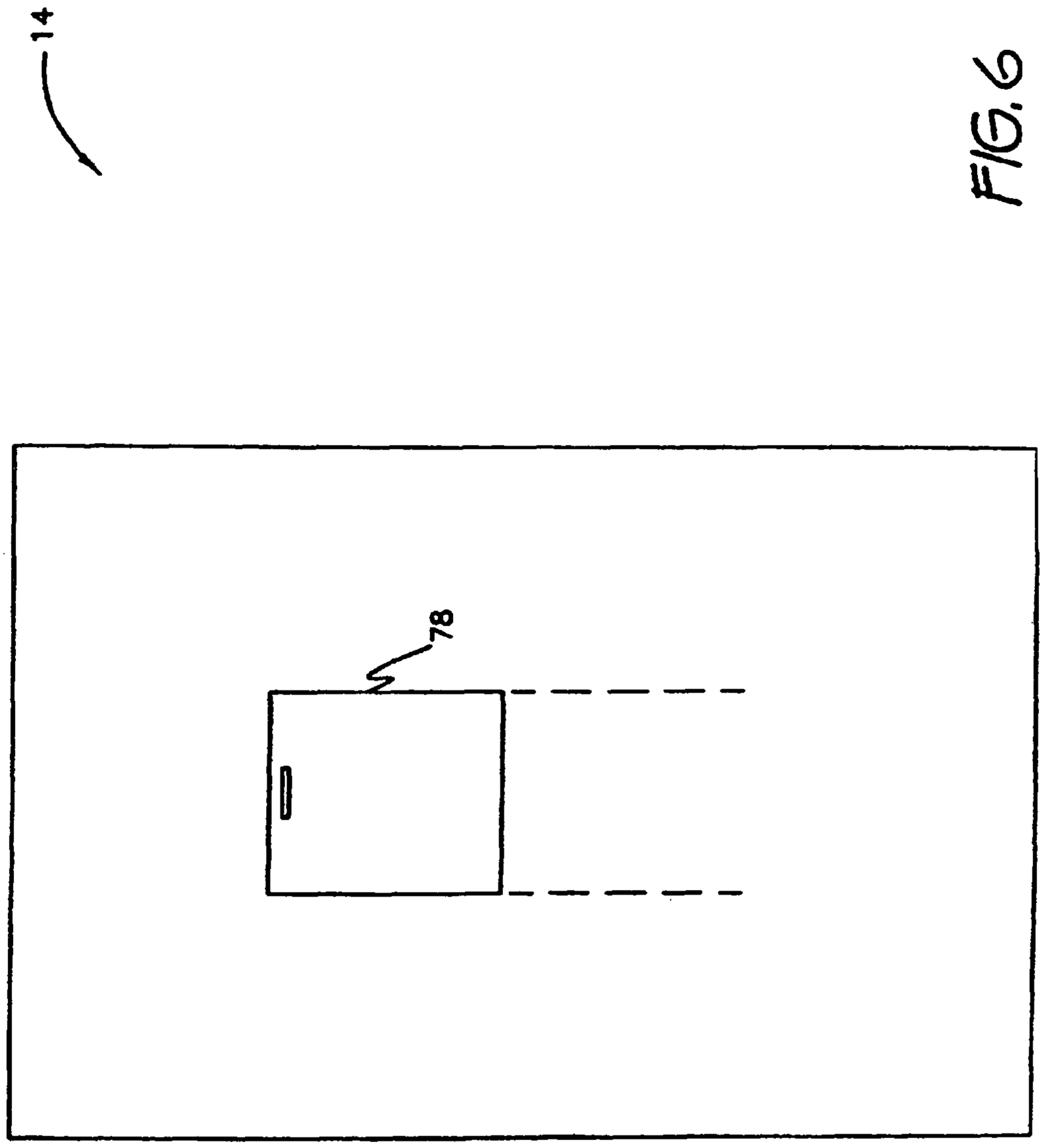


FIG. 6

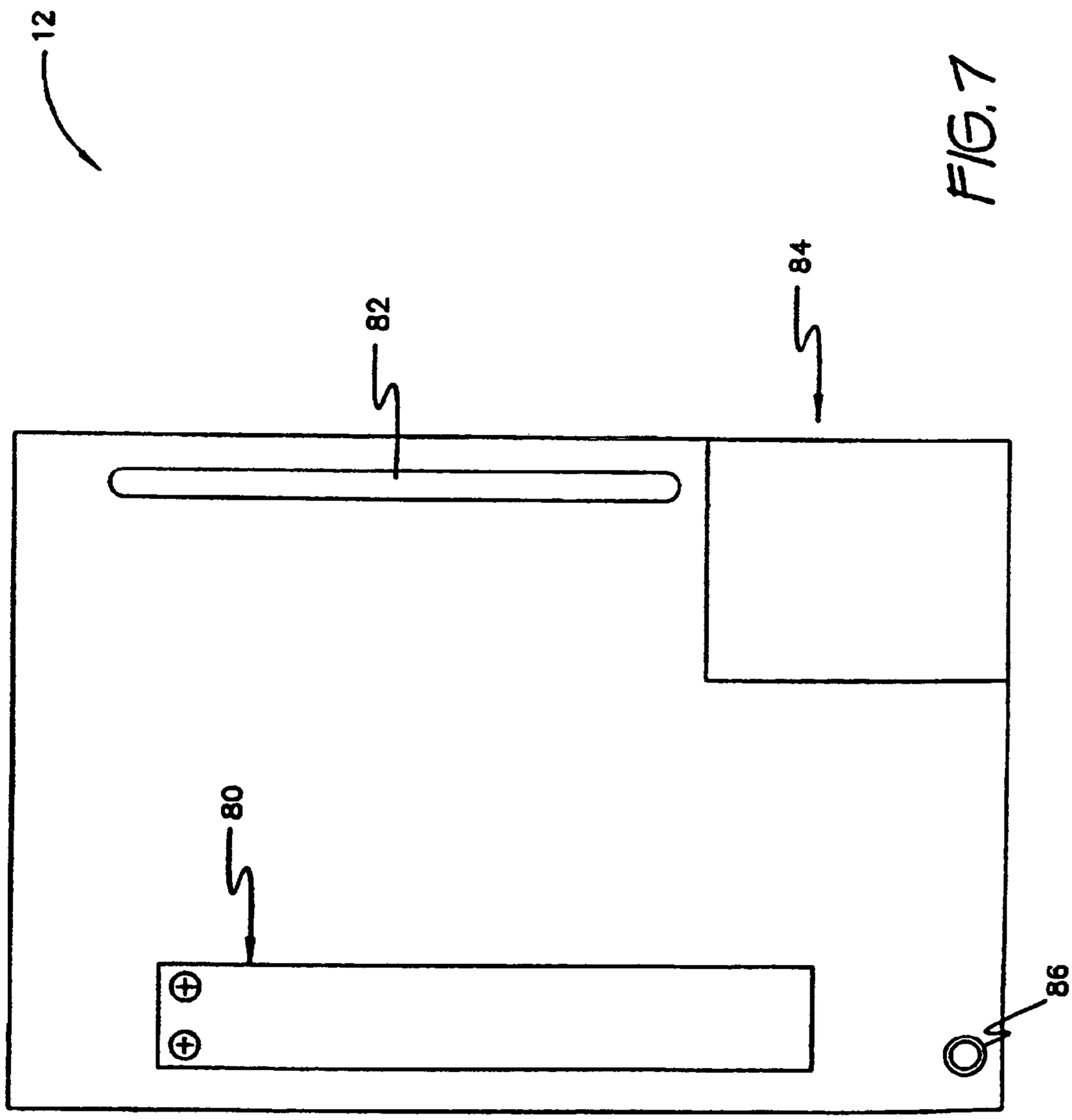


FIG. 7

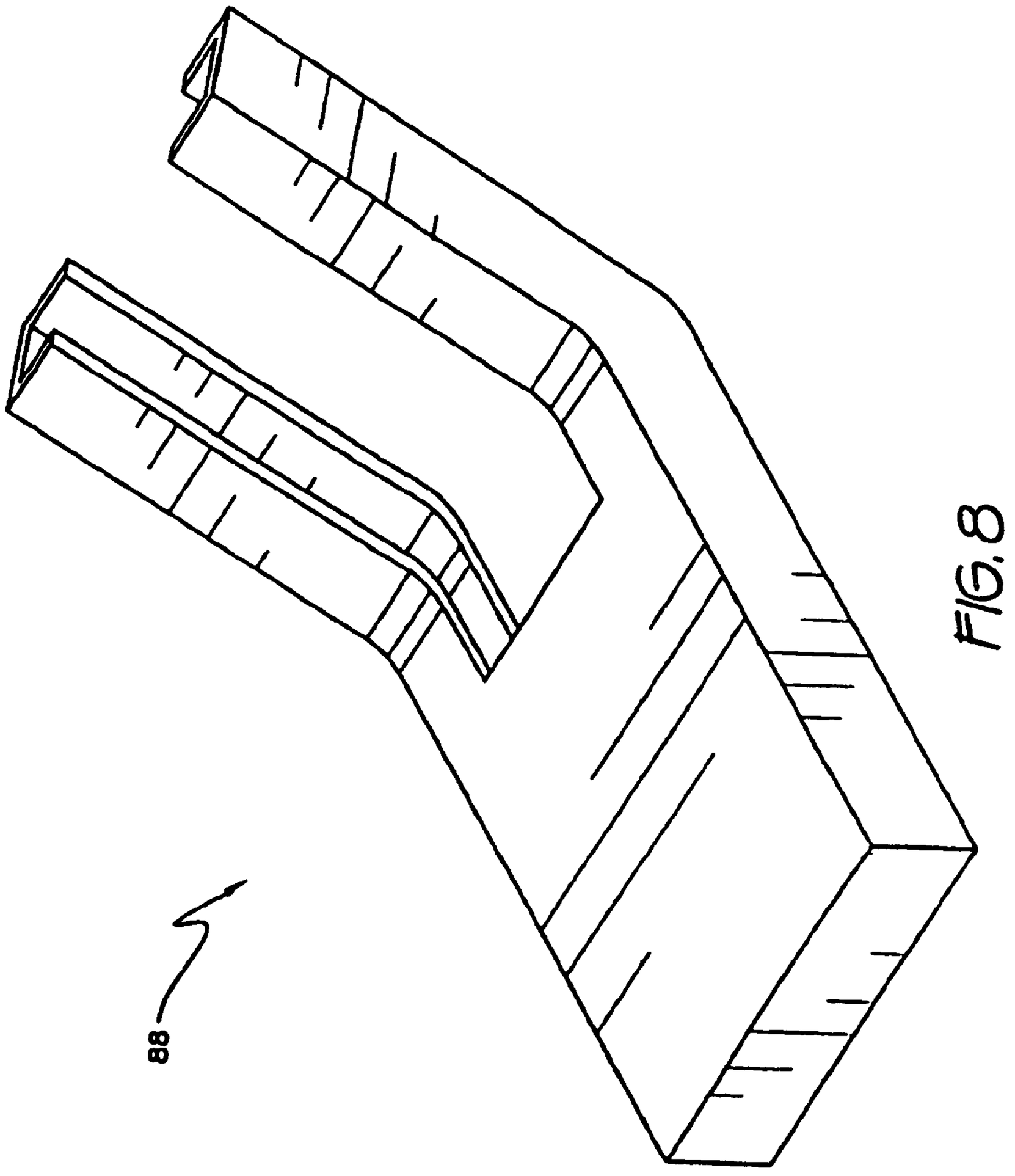


FIG. 8

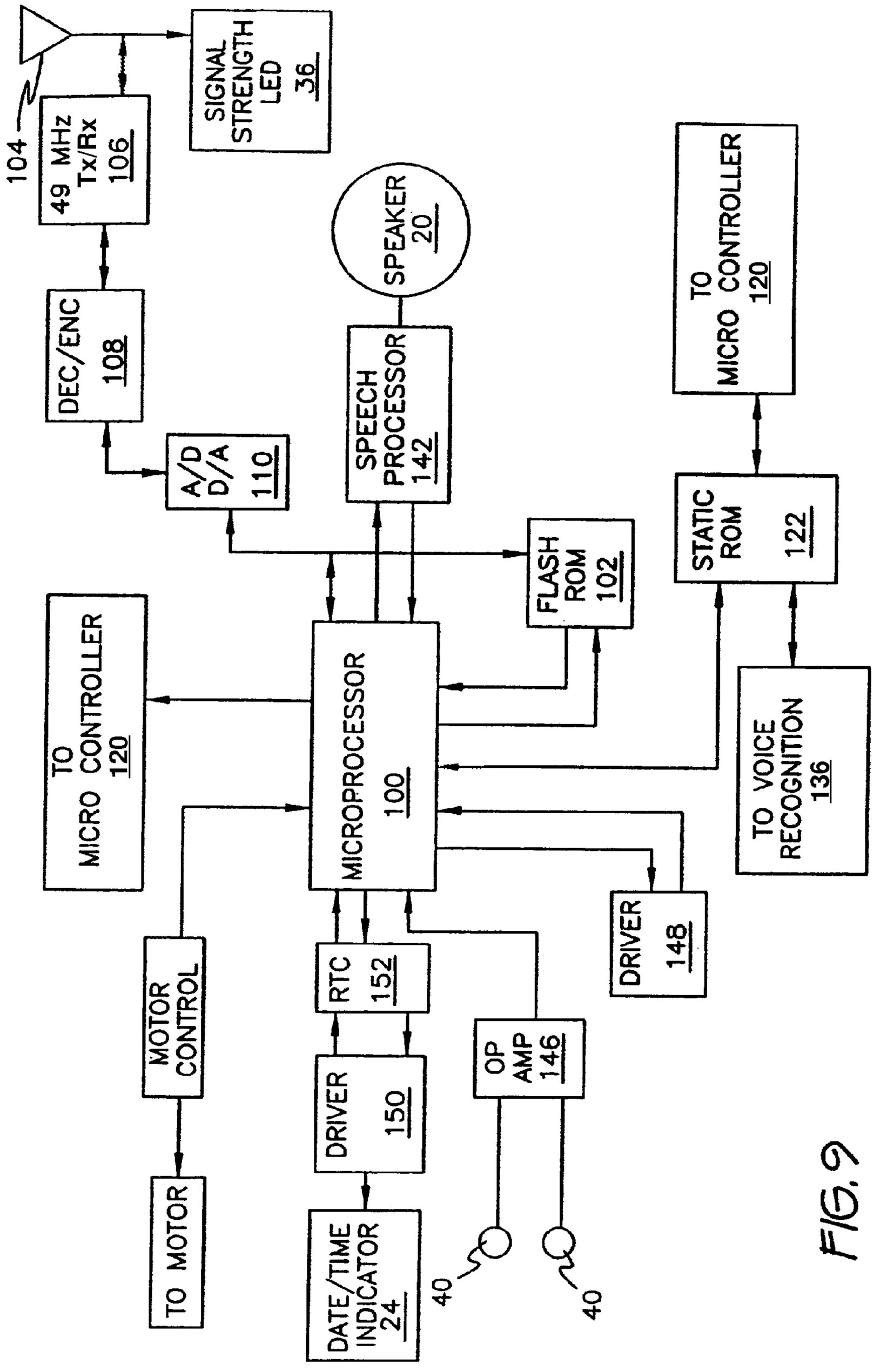

104
49 MHz Tx/Rx 106
SIGNAL STRENGTH LED 36
SPEAKER 20
DEC/ENC 108
A/D D/A 110
SPEECH PROCESSOR 142
TO MICRO CONTROLLER 120
FLASH ROM 102
STATIC ROM 122
TO MICRO CONTROLLER 120
MICROPROCESSOR 100
TO VOICE RECOGNITION 136
MOTOR CONTROL
RTC 152
DRIVER 150
OP AMP 146
DRIVER 148
TO MOTOR
DATE/TIME INDICATOR 24
40
40

FIG. 9

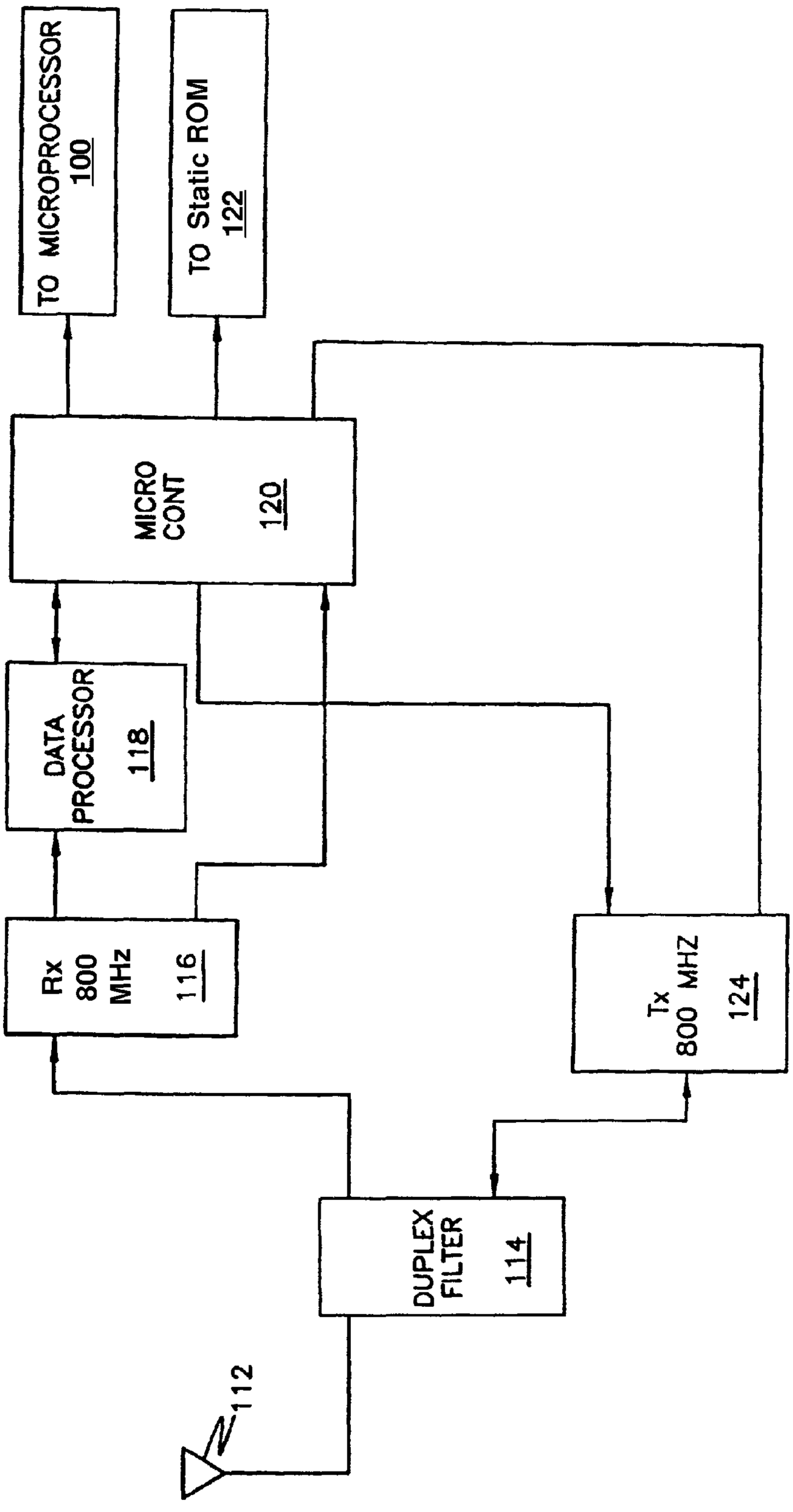

TO MICROPROCESSOR 100
TO Static ROM 122
MICRO CONT 120
DATA PROCESSOR 118
Rx 800 MHz 116
Tx 800 MHZ 124
DUPLEX FILTER 114
112

FIG. 10

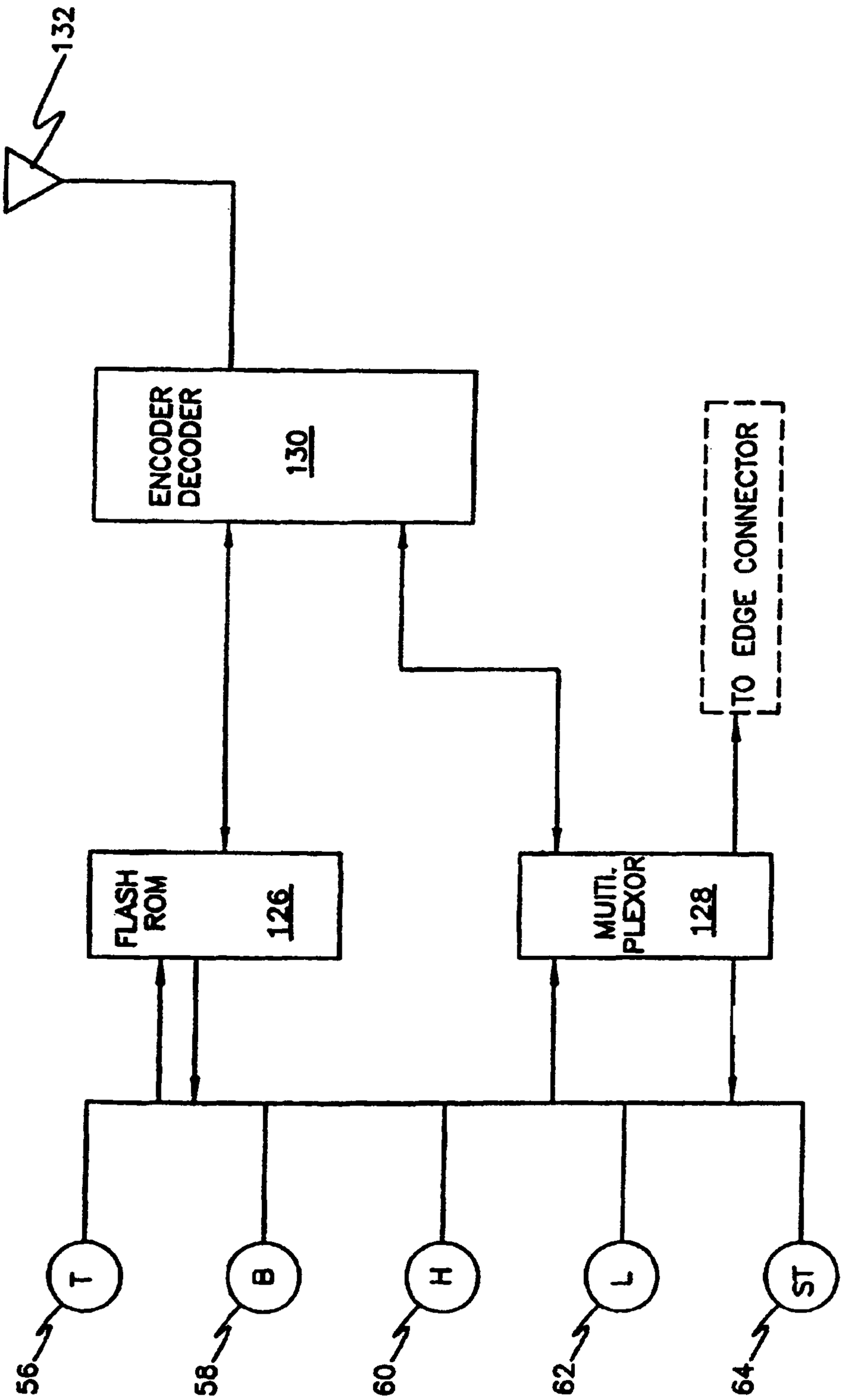

132
ENCODER DECODER
130
FLASH ROM
126
MUITI. PLEXOR
128
TO EDGE CONNECTOR
T
B
H
J
ST
56
58
60
62
64

FIG. 11

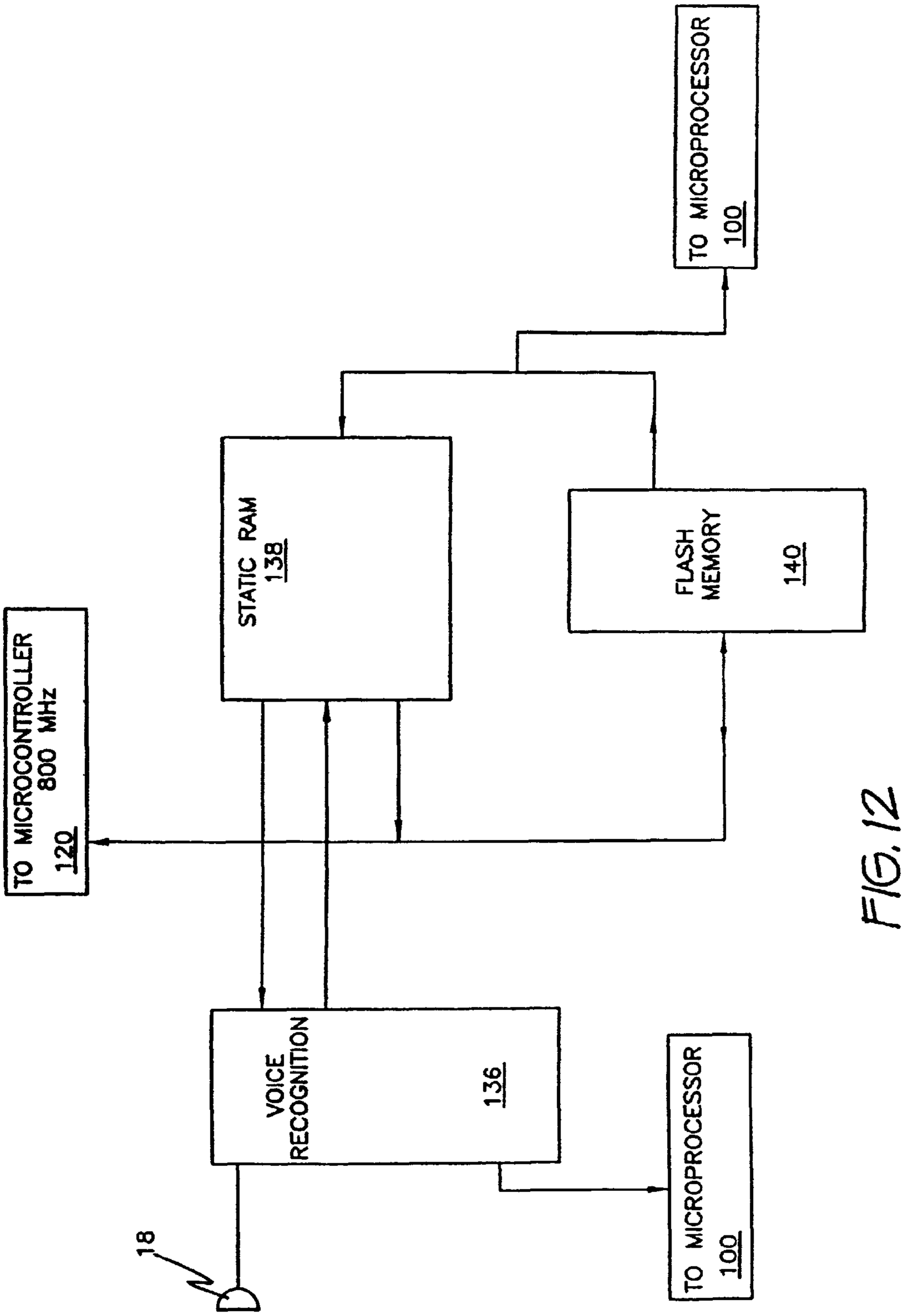
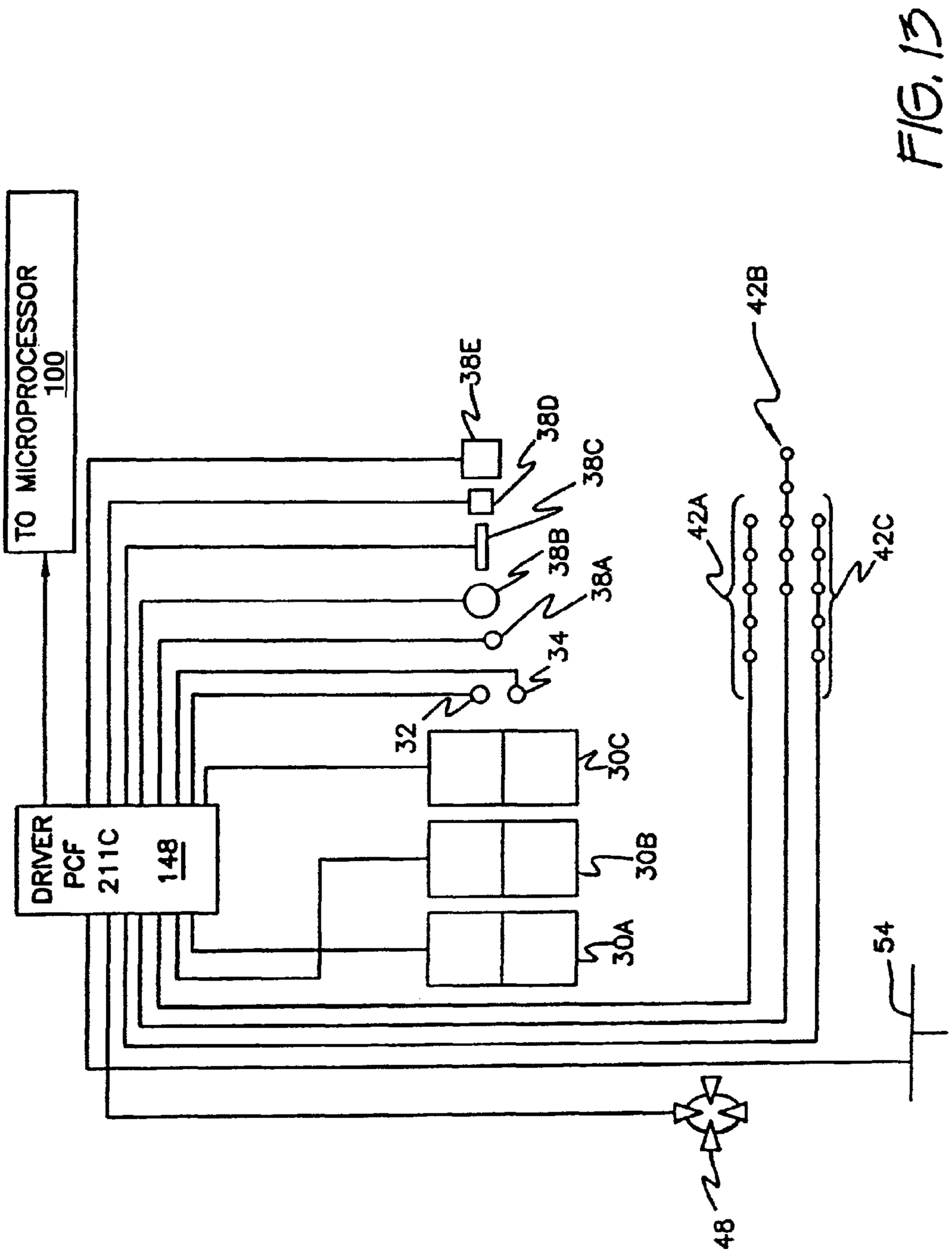

TO MICROPROCESSOR
100
STATIC RAM
138
FLASH
MEMORY
140
TO MICROCONTROLLER
800 MHz
120
VOICE
RECOGNITION
136
18
TO MICROPROCESSOR
100

FIG. 12

FIG. 13


TO MICROPROCESSOR 100
DRIVER PCF 211C 148
38E
38D
38C
38B
38A
34
32
30C
30B
30A
42B
42A
42C
54
48

SEVERE WEATHER DETECTOR AND ALARM

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

This application is a continuation of Ser. No. 09/246,784 filed Feb. 1, 1999 now U.S. Pat. No. 6,076,044, which is continuation of Ser. No. 08/799,838 filed Feb. 13, 1997, now U.S. Pat. No. 5,978,738.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an unmanned weather detecting and reporting station. More specifically, the novel station has apparatus for detecting severe weather conditions such as tornadoes and lightning. The station has sensors for sensing certain critical ambient characteristics, a microprocessor for comparing sensed data to a database, a radio for receiving weather data from remote broadcasting sources, and apparatus for broadcasting inferred and reported weather patterns.

2. Description of the Prior Art

Severe weather conditions can arise quite suddenly, with potentially great catastrophic consequences in financial and human cost. To avoid or minimize injury and damage from sudden, violent weather phenomena, it is desirable to be able to predict such occurrences. If weather conditions can be predicted, it is possible in many instances to take steps to mitigate undesirable consequences of the unleashed forces.

An example of a field of activity which could benefit greatly from such analysis and warning of weather conditions is that of aviation. Take off and landing are subject to disruption from extreme weather conditions. Aircraft may be rerouted or their departures and landings postponed if significant threats from weather are identified. Therefore, a need clearly exists for detection and annunciation of extreme weather conditions.

The prior art has suggested a number of weather analysis and warning systems. U.S. Pat. No. 5,105,191, issued to Edgar L. Keedy on Apr. 14, 1992, describes apparatus and method for detecting and indicating severe air disturbances such as shear winds and clear air turbulence. This invention does not address electrical phenomena, as it is primarily intended for providing information essential for take off and landing decisions for advising aircraft pilots. By contrast, the present invention considers different parameters, and detects electrical phenomena such as lightning.

Apparatus and method for identifying tornadoes are set forth in U.S. Pat. No. 5,355,350, issued to Henry E. Bass et al. on Oct. 11, 1994. The subject method employs detection and analysis of ambient sound for amplitude and frequency which may be associated with tornadoes. By contrast, the present invention considers other parameters of ambient conditions, and predicts both tornadoes and also electrical phenomena, such as lightning.

Another tornado detection scheme is seen in U.S. Pat. No. 5,379,025, issued to Frank B. Tatom et al. on Jan. 3, 1995. This invention monitors seismic waves generated by an impending tornado. By contrast, the present invention does not consider seismic phenomena, looking instead to airborne

phenomena. The present invention predicts electrical phenomena as well as tornadoes and the like.

U.S. Pat. No. 5,444,530, issued to Ting-I Wang on Aug. 22, 1995, describes a remote monitor for airfields which employs distortion of partially coherent light to detect precipitation and identify the same as rain or snow. By contrast, the present invention monitors different parameters of the atmosphere, notably temperature, humidity, barometric pressure, light, and static charge. The present invention infers presence of extreme weather conditions not analyzed by Wang, such as lightning and tornadoes.

None of the above inventions and patents, taken either singly or in combination, is seen to describe the instant invention as claimed.

SUMMARY OF THE INVENTION

The present invention combines weather detecting apparatus for detecting local conditions with communications apparatus for obtaining information relating to distant weather conditions. From this combination, a user may ascertain current local conditions which are not apparent to the senses and information regarding imminent or otherwise relevant conditions.

This combination of information enables a person to organize his or her activities appropriately. Detection of severe weather phenomena may cause a person to take actions to protect life and property in the immediate vicinity being monitored. Alternatively, a person may select an appropriate location for travel, if avoidance of local weather is required or if previous travel plans must be modified.

The novel weather station thus both analyzes and reports weather conditions. The communication apparatus enables selection of information from any selected location on the globe, and voice synthesizing apparatus for annunciating selected weather information in a selected language. The voice synthesizing apparatus further is capable of offering operating choice selection prompts in synthesized voice form and of responding to verbal selections by the user.

Preferably, weather conditions being monitored by sensing or by gleaning information from remote radio broadcasts relate to violent or severe conditions most likely to threaten life and property. Ambient characteristics which may be sensed to infer imminent actual weather conditions include temperature, humidity, light intensity, barometric pressure, and potential of ambient static charges. These conditions may then be analyzed by a data processor integral with the weather station to predict imminent weather conditions. The results may be annunciated either by synthesized voice or by indicating lights or the like. In particular, the communications apparatus of the novel weather station is compatible with different international cellular protocols, so that data corresponding to distant weather conditions is obtained by receiving distant local weather condition broadcasts.

The actual apparatus is quite compact, and comprises two separably connected sections. For this reason, the novel weather station is readily portable and easily utilized. A receiver section includes cellular circuitry enabling communications with the external world. A sensor section contains sensors for determining local weather conditions and a microprocessor for accomplishing the various functions of the weather stations. Each of the two separably connected sections has a battery for providing power enabling operation independently of the other respective section.

Accordingly, it is a principal object of the invention to provide a portable weather station which can predict local severe weather conditions.

It is another object of the invention to provide a portable weather station which can obtain information relating to remote weather conditions.

It is a further object of the invention that the weather station be operated to a significant extent by vocalized prompts.

Still another object of the invention is that the weather station be compatible with a variety of languages.

An additional object of the invention is to cooperate with a variety of international cellular protocols.

It is again an object of the invention that the novel weather station comprise two manually separable sections.

Yet another object of the invention is that the novel weather station carry on board a source of power for its operation.

It is an object of the invention to provide improved elements and arrangements thereof in an apparatus for the purposes described which is inexpensive, dependable and fully effective in accomplishing its intended purposes.

These and other objects of the present invention will become readily apparent upon further review of the following specification and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Various other objects, features, and attendant advantages of the present invention will become more fully appreciated as the same becomes better understood when considered in conjunction with the accompanying drawings, in which like reference characters designate the same or similar parts throughout the several views, and wherein:

FIG. **1** is an environmental, diagrammatic view of the invention.

FIG. **2** is a front plan view of one of the two separable sections of the novel weather station, illustrating control and communications apparatus located on the exterior thereof, this section being referred to as a receiver section.

FIG. **3** is a front plan view of the other of the two separable sections of the novel weather station, illustrating components mounted on the exterior thereof, this section being referred to as a sensor section.

FIG. **4** is an end elevational view of the two sections of the novel weather station united.

FIG. **5** is a side elevational view of FIG. **4**.

FIG. **6** is a rear plan view of the sensor section.

FIG. **7** is a rear plan view of the receiver section.

FIG. **8** is a perspective view of an accessory for supporting the receiver section when disconnected from the sensor section.

FIG. **9** is a diagram of internal data and signal processing components of the receiver section and their interconnections.

FIG. **10** is a diagram of internal data and signal processing components relating to 800 MHz frequency communications, and is an extension of the diagram of FIG. **[10]** *9*.

FIG. **11** is a diagram of internal data and signal processing components and associated interconnections of the sensor section.

FIG. **12** is a diagram of voice recognition circuitry components and interconnections, and is an extension of the diagram of FIG. **[10]** *9*.

FIG. **13** is a diagram of a visual indicator driver and its driven indicators and interconnections therebetween, and is an extension of the diagram of FIG. **[10]** *9*.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. **1** of the drawings shows cooperation between the novel weather analyzing and reporting station **10** and a conventional communications system utilizing cellular technology. The conventional system includes weather satellites, represented by satellite **2**, radio receiving and broadcasting facilities, represented by towers **4**, and cellular transmission facilities, such as Mobile Telephone Switching Offices, represented by cells **6**. Satellite **4**, towers **6**, and cells **8** are conventional. The novel weather station **10** cooperates with these conventional facilities in gathering weather data.

Weather station **10** comprises two manually separable sections, including a receiver section **12** having radio communication apparatus therein for communicating with an external cellular radio frequency communication system, as represented by cells **6**, and a sensor section **14** containing sensors for sensing local ambient weather conditions. Receiver section **12** also contains a microprocessor **16** and a source of power for operating weather station **10**. Sections **12** and **14** are removably connected to one another by structure which will be further described hereinafter.

FIG. **2** shows the front panel of receiver section **12**, whereon controls, visual displays, and a microphone **18** are mounted. An omnidirectional speaker **20** and a volume control **22** are disposed proximate microphone **18**. A visual display **24** indicates date or time. Selector buttons **26**, **28** enable selection of date or time to be indicated on display **24**. A three digit display **30** is provided for indicating temperature. Selector buttons **32** and **34** select between Celsius and Fahrenheit scales. A display **36** indicates radio signal strength by progressive illumination of its individual illuminable elements.

A relative temperature display **38** indicates local temperature. A proximity sensor **40** detects whether the user is so close to weather station **10** as to interfere with reception of radio signals. An array **42** of light emitting diodes (LED) is utilized to display information regarding mode of operation. A master on-off switch **44** and a reset button **46** are provided. An emergency light **48** and a switch **50** for a purpose described hereinafter are disposed upon the front panel of receiver section **12**. Switch **50** is identified by a bas relief or raised symbol **52** for the benefit of the blind. A T-LED **54** is disposed at the bottom of the front panel.

FIG. **3** shows components mounted on the exterior of sensing section **14**. A temperature sensor **56**, such as model MTS102, manufactured by Motorola Corporation, is provided to sense ambient temperature. A barometric pressure sensor **58**, such as model MPX200A, manufactured by Motorola Corporation, senses ambient air pressure. A humidity sensor **60**, such as model Minicap 2/5, manufactured by Panametrics Corporation, senses ambient humidity. A light sensor **62**, which may be a model TSL235, as manufactured by Texas Instruments, senses visible light, and a static charge sensor **64**, which may be model KML10/B/2, as manufactured by Phillips Semiconductor, senses ambient static potential. Sensors **56**, **58**, **60**, **62**, and **64** each incorporate a transducer for generating a data signal indicative of values of their respective sensed weather characteristics.

A closure **66** affording access to a battery **67** (concealed in FIG. **3**) within sensor section **14** is also disposed upon the exterior of sensor section **14**. Battery **67** is preferably a 9 volt lithium battery. A snap **68** for removably connecting sensor section **14** to receiver section **12** is provided. A corresponding second snap **70** (see FIG. **2**) is located on receiver section **12**.

FIG. **4** shows sections **12** and **14** connected. A screw **72** passes journaled or similarly entrapped within section **12** passes through a bored boss (not shown) formed in section **14**. A screw (not shown) similar to screw **72** but oppositely directed is utilized at the opposite, concealed end of sections **12** and **14** to complement screw **72**. Sections **12** and **14** are separated or disconnected by removal of these screws. A gold

mesh protector **73** protects an antenna (further described hereinafter) serving sensor section **14**.

FIG. **5** shows sections **12** and **14** connected, and clearly shows grooves **74**, **76** formed in sensor section **14** for manually grasping sensor section **14**.

Referring now to FIG. **6**, when separated or disconnected, sensor section **14** may be suspended from a selected external or environmental object (not shown) by the following arrangement. Sensor section **14** has a closure **78** which may be opened to reveal a chamber (not shown) and a strip of hook and loop fastener (not shown). The strip of hook and loop fastener extends outside the chamber so that it may be removably mated with a corresponding patch of hook or loop material (not shown) which has been permanently mounted on the selected environmental object. This arrangement allows temporary support of sensor section **14** in a designated location when not connected to receiver section **12**. The chamber enclosing the strip of hook and loop material is sealed to prevent ingress of moisture into sensor section **14**.

As shown in FIG. **7**, receiver section **12** has an external antenna **80**, a stepper motor controller **82**, a power supply **84**, and a standard DC power connection port **86**. Power supply **84** comprises a converter for converting 120 volt AC power to nominal 12 volt DC power and a nominal 12 volt lithium battery. Port **86** is configured to accept any one of many well known connectors. Port **86** is electrically connected to power supply **84**, so that supply **84** may be recharged when connected to an external source of power. When not so connected, receiver section **12** derives power from power supply **84**.

FIG. **8** illustrates a holder **88** for holding receiver section **12** when separated from sensor section **14**. This feature enables receiver section **12** to be supported on any convenient horizontal surface (not shown) when detached or disconnected from sensor section **14**.

Externally visible or accessible components of weather station **10** have been described thus far. Internal components and circuitry will now be described, with reference first to FIG. **9**. A microprocessor **100** processes incoming data, stores historical data relating to weather, and manages the system by responding to control commands and issuing prompts where required and providing information to the user by visual and audible outputs. Historical data recorded for a selected immediate area of usage is stored in memory of a flash ROM **102**. Microprocessor **100** may be a model 386 microprocessor by Intel Corporation, and flash ROM **102** may be model 28F400BX-T, also by Intel. A voice recognition and simulation system enables bidirectional vocal communication between weather station **10** and the user.

Incoming data is received either from sensor section **14** or by radio transmission from remote, external weather data broadcasting sources, as summarized in FIG. **1**. Data derived by sensing is received by antenna **104** and communicated to conventional 49 MHz transmission and reception circuitry **106**. Incoming signals are processed by a decoder and encoder **108**, and are digitized within an analog-to-digital and digital-to-analog converter **110**. Decoder and encoder **108** may be model HT12E/HT12D, by Holtek Corporation. Digitized data is then communicated to microprocessor **100** and flash ROM **102**.

Incoming data received from external sources at 800 MHz frequency is processed as follows, referring now to FIG. **10**. 800 MHz signals are received by antenna **112** and communicated to a duplex filter **114** which switches between transmission and reception functions. Duplex filter **114** may be model DFY2R836CR881BTJ, by Phillips Semiconductor. Data then passes to an 800 MHz receiver **116** and subsequently to a data processor **118** and to a microcontroller **120**. Data processor **118** may be may be model UMA1000, as manufactured by Phillips Semiconductor, and microcontroller **120** may be model 8XC51RA, as manufactured by Intel. From microcontroller **120**, data is passed to a flash ROM *or static ROM* **122** (see FIG. **9**) and subsequently to microprocessor **100** (see FIG. **9**).

800 MHz transmissions by weather station **10** are enabled by a transmission module **124** incorporated into the 800 MHz circuitry shown in FIG. **10**. Transmission module **124** may be model BGY110D.

Internal components of sensor section **14** are illustrated in FIG. **11**. Sensors **56**, **58**, **60**, **62**, **64** communicate with a flash ROM **126** and with a multiplexer **128**, which is connected to an encoder and decoder **130**. Output of encoder and decoder **130** is transmitted by antenna **132** for reception by antenna **104** of receiving unit **12** (see FIG. **9**). Antenna **132** is protected by gold mesh protector **73** shown in FIG. **4**. Flash ROM **126** may be model 28F010-15, as manufactured by Intel, and multiplexer **128** may be a model 74151. Encoder and decoder **130** may be a model HT12E/HT12D, as manufactured by Holtek.

Because sections **12** and **14** are separable, each has an internal antenna **104** (see FIG. **9**) or **132** for enabling mutual communication. With the exception of sensors **56**, **58**, **60**, **62**, **64**, antenna **132** and its associated circuitry, and battery **67**, all internal components described thus far are located in receiving section **12**.

Referring now to FIG. **12**, voice simulation and recognition apparatus is also contained within receiver section **12**. voice recognition apparatus includes microphone **18** which is connected to a voice recognition device **136**. Microphone **18** is located on receiver section **12** in any suitable location for receiving responses and commands spoken by the user. Device **136** is a model UPD 77501, as manufactured by NEC, and is a high quality speech recording and playback LSI. Device **136** communicates with a static RAM device **138** and a flash ROM memory device **140**. Static RAM device **138** is preferably a 1 meg, 8 byte 128×8 RAM device, model MCM 6726, as manufactured by Motorola. Flash ROM device **140** is preferably a model 28F400BX-T, as manufactured by Intel.

Voice simulation apparatus is shown in FIG. **9**, and includes a 1 Megabyte speech data ROM integrated chip, or digital speech processor **142**. Speech processor **142** is a stand alone masked ROM device, and is preferably a model 7758A, as manufactured by NEC. Output of speech processor **142** is projected from speaker **20**.

Also shown in FIG. **9** are operative connection of proximity sensors **40** to microprocessor **100** through an operational amplifier **146**, and drivers **148**, **150** for driving visual indicators and alarm. Driver **150** is associated with a real time clock **152**, and drives date and time indicator **24**.

Driver **148** drives many of the visual indicators disposed upon the front exterior surface of receiving section **12**. These connections are shown in detail in FIG. **13**. In FIG. **13**, it will be seen that display **30** comprises three independent display panels **30**A, **30**B, and **30**C, each capable of displaying a different symbol. Similarly, relative temperature display **38** indicates temperature in several individual steps or range increments by illuminating individual illuminable elements **38**A, **38**B, **38**C, **38**D, **38**E.

Array **42** of LEDs comprises three independent groups of LEDS **42**A, **42**B, **42**C. This array indicates mode of operation with respect to gathering of broadcast weather data relating to local weather (LEDs **42**A), local continent (LEDs **42**B), or international continent (LEDs **42**C).

Operation of weather station **10** will now be described. Weather station **10** may be operated in any one of three

modes. In a local reporting mode, weather station **10** reports conditions, either with sections **12** and **14** connected or separated. The local reporting mode is indicated by illumination of LEDs **42**A. A local continent or country reporting mode is signalled by illumination of LEDs **42**B. An international or global reporting mode is signalled by illumination of LEDs **42**C. Local reporting may proceed with or without connection of sensor section **14**. If connected and delivering data, LED **54** will illuminate.

To operate, it is required that switch **42** be on, that proximity sensors **40** detect a person disposed immediately in front of receiver section **12**, and that an appropriate voice command or radio frequency signal be received. When the first two conditions are satisfied, reception of a radio signal indicative of severe weather conditions will initiate operation. Microprocessor **100** (see FIG. **9**) is provided with a five year history of weather data for the geographic area selected to be monitored, and with algorithms for comparing input data to stored data to determine correlation to severe weather conditions. These weather conditions include tornadoes, high winds, lightning, high level of rainfall, among others. Correlation of input data with a severe weather condition will cause operation.

If no such correlation is received and the first two conditions for operation are present, a control algorithm will initiate a series of vocalized prompts generated by speech processor **142** and speaker **20** (see FIG. **9**). When a verbal response is received, recognized, and correlated to predetermined responses by microphone **18** and associated voice recognition circuitry shown in FIG. **12**, commands are executed and further verbal prompts, as appropriate, are generated.

One selection that is made by the user responsive to a prompt is the geographic area that is to be regarded as local. This information may be provided by the user verbally by responding with the latitude and longitude of the selected local area, or with a nearby city and state, according to initial programming of weather station **10**.

Certain verbal prompts occur only during initial preparation of weather station **10**, and are programmed such that once answered, they will not be repeated at each usage of weather station **10**. These prompts concern language selection, as will be discussed hereinafter, and intervals and nature of audible alarms which sound automatically when microprocessor **100** determines that there is a high probability of severe weather conditions. A value relating to threshold of probability of severe conditions may also be included in prompts for initially preparing weather station **10**.

When operating in the local reporting mode, sensors **56**, **58**, **60**, **62**, **64** periodically sense conditions and transmit collected data to microprocessor **100** for assessment of conditions and annunciation of the same. Routine information such as temperature is indicated on display **30** or relative temperature display **38**, which indicates a range rather than specific values, as indicated on display **30**. If severe conditions are calculated as probable, an audible alarm in the form of a high pitched tone or a simulated voice message in the selected language is sounded from speaker **20**. After the user responds to predetermined verbal prompts to assure that correct selections are made, sensing becomes dormant and will reactivate at predetermined intervals, such as every fifteen minutes.

Memory of weather station **10** is loaded with data corresponding to a selected historic base time period, such as the previous five years. Real time weather data received by antenna **104** is reconfigured by digital-to-analog converter **110** and is routed to microprocessor **100** and to flash ROM **102**. Analysis by comparison to known or pre-calculated conditions will generate outputs conducted to visual indicators shown in FIG. **2** and, if predetermined threshold values are met, sound an alarm as described above. In addition to an audible alarm, emergency indicator **48** will illuminate.

Voice recognition utilizes adaptive differential pulse code modulation (ADPCM). Speech processor **142** features low-pass filtering microphone amplifiers with a variable fixed gain ADPCM coder and decoder. Voice recognition device **136** receives a pulse code modulated signal from microphone **18**. The signal is low pass filtered, converted to a ten bit digital value and converted to ADPCM. After conversion by the analog-to-digital converter **110**, the signal is encoded to a shortened ADPCM code, such as two, three, or four bits. From the analysis circuit, the data is routed to external memory utilizing static RAM device **138** and associated flash ROM device **140**. Data is retrieved when microprocessor addresses the voice recognition circuitry.

In the local reporting mode, LEDs **42**A (see FIG. **13**) will be illuminated. LED **38**E is preferably red in color, and will indicate temperatures exceeding ninety degrees Fahrenheit. LED **38**D is preferably amber in color, and indicates temperatures in a range of seventy to ninety degrees. LED **38**C is preferably green in color, and indicates temperatures in a range of fifty to seventy degrees. LED **38**B is preferably blue in color, and indicates temperatures in a range of thirty to fifty degrees. LED **38**A is preferably red in color and indicates temperatures below thirty degrees Fahrenheit.

LED **54** will illuminate when the local reporting mode is in operation. This serves as warning that only local weather data is being reported.

To select a reporting mode, or to change an existing selection, switch **42** is switched to on, or switched to off followed by switching to on, if weather station **10** is already operating. Predetermined simulated voice prompts will request responses in a preselected code. This may comprise a letter or number corresponding to a particular selection, rather than a value or location being selected.

Language of communication is selected at this time. When a language prompt is answered in a preferred language, all responses by the user thereafter will be treated in the selected language, and all simulated voice prompts will be issued in the selected language. It is preferred that the memory of weather station **10** be loaded to include a range of languages for selection. Preferred languages include English, Spanish, German, French, Russian, Arabic, one or more Chinese dialects, Italian, and Japanese.

Within the U.S., NOAA Weather Radio is monitored for the standard 1050 Hz tone employed by the NOAA to indicate an emergency. Detection of this tone preferably triggers an appropriate alarm and may initiate a simulated vocal query to monitor specific severe conditions, such as identified existing hurricanes, tropical storms, and the like.

When selecting the international or global reporting mode, connection with the appropriate remote cellular protocol is arranged by prompts. Memory of weather station **10** is loaded with available international protocols to assure reception of the requested data.

After certain necessary selections have been made, weather station **10** will issue a general query as to other requirements not addressed by prompts. These may be specified by utilizing a prearranged code or signal.

When initial prompts have been satisfactorily answered, a vocal signal will be issued. Preferably, this signal will be a distinctive sound, such as the Boatswain's Whistle. The Boatswain's Whistle is a melody employed by the U.S. Naval Fleet.

It is to be understood that the present invention is not limited to the embodiments described above, but encompasses any and all embodiments within the scope of the following claims.

I claim:

[1. A weather station for monitoring weather conditions at at least one remote location comprising:

a detachable, portable, battery-powered and hand-holdable weather station unit situated at the at least one remote location including:

a microprocessor;

at least one data sensor coupled to the microprocessor for generating a data signal representative of weather conditions at the at least one remote location;

a transmitter coupled to the microprocessor for transmitting said data signal;

an antenna coupled to the transmitter, and

a detachable, portable, battery powered and hand holdable weather station receiver for receiving and displaying the weather conditions received from said weather station unit.]

[2. The weather station of claim 1 wherein the data sensor monitors the weather data and wherein the transmitter is configured to wirelessly transmit a data signal, said data signal being representative of the weather data monitored at the at least one location.]

[3. The weather station of claim 1 wherein the data sensor senses temperature.]

[4. The weather station of claim 1 wherein the data sensor senses wind speed.]

[5. The weather station of claim 1 wherein the data sensor senses rain.]

[6. The weather station of claim 1 wherein the data sensor senses barometric pressure.]

[7. The weather station of claim 1 wherein the data sensor senses ambient light.]

[8. The weather station of claim 1 wherein the data sensor senses static charge.]

[9. The weather station of claim 1 wherein the data sensor senses humidity.]

[10. The weather station of claim 1 wherein the receiver comprises an indicating circuit configured to indicate a temperature trend.]

[11. The weather station of claim 1 wherein the receiver further comprises an alarm configured to indicate an alarm condition responsive to a comparison of the data signal received by the receiver with a predetermined threshold value.]

[12. The weather station of claim 1 wherein the receiver further comprises an indicating circuit configured to indicate a signal strength of the data signal being received by the receiver.]

[13. The weather station of claim 1 wherein the receiver is configured to receive a telemetry signal from a NOAA weather radio.]

[14. The weather station of claim 1 further comprising an alarm.]

[15. The weather station of claim 14 wherein the alarm is triggered when a probability of a predetermined weather condition is detected.]

[16. A weather station for monitoring weather conditions at at least one remote location comprising:

a portable, battery-powered and hand-holdable weather station unit situated at the at least one remote location including:

a microprocessor;

at least one data sensor coupled to the microprocessor for sensing at least one weather condition and generating a data signal representative of the at least one weather condition condition at the at least one remote location;

a transmitter coupled to the at least one data sensor for transmitting said data signal; and

an antenna coupled to the transmitter,

a portable, battery powered and hand holdable receiver configured to receive the data signal comprising:

a storage device configured to store at least one of a plurality of measured remote weather conditions;

a processor configured to generate a prediction of a weather condition, the prediction being based on the data signal received by the receiver and at least one of the measured weather conditions stored in the storage device; and

an indicating circuit configured to indicate the prediction.]

[17. The weather station of claim 16 wherein the receiver further comprises an interface configured to receive a latitude coordinate.]

[18. The weather station of claim 16 wherein the receiver further comprises an interface configured to receive a longtitude coordinate.]

[19. The weather station of claim 16 wherein the receiver further comprises an interface configured to receive a geographic area latitude position.]

[20. The weather station of claim 16 wherein the receiver further comprises an interface configured to receive a geographic area longtitude position.]

[21. The weather station of claim 16 wherein the processor is coupled to the receiver and storage device and configured to generate a prediction of a potential remote weather condition, the prediction being based on the data signal received by the weather station receiver and at least one of the measured weather conditions compared to said stored data.]

[22. The weather station of claim 16 wherein the prediction of a weather condition is based on the received data signal and at least one of the measured weather conditions stored in the storage device.]

[23. The weather station of claim 16 wherein the indicating circuit is configured to indicate a temperature trend.]

[24. The weather station of claim 16 wherein the receiver further comprises an alarm configured to indicate an alarm condition responsive to a comparison of the data signal received by the receiver with a predetermined threshold value.]

[25. The weather station of claim 16 wherein the indicating circuit comprises a signal strength indicator configured to indicate a signal strength of the data signal being received by the receiver.]

[26. The weather station of claim 1 wherein the receiver is configured to receive a telemetry signal from a NOAA weather radio.]

[27. The weather station of claim 14 wherein the alarm is triggered when a predetermined weather condition is detected.]

[28. The weather station of claim 16 further comprising an alarm.]

[29. The weather station of claim 28 wherein the alarm is triggered when a predetermined weather condition is detected.]

[30. The weather station of claim 28 wherein the alarm is triggered when a probability of a predetermined weather condition is detected.]

31. An apparatus comprising:

a readily portable, battery-powered and hand-holdable weather display unit including:

a first receiver configured for receiving data via a first radio frequency signal from a source;

a second receiver configured for receiving a second radio frequency signal from a cellular telephone network and compatible with an international cellular protocol, wherein the cellular telephone network is different than the source;

a display, including a prompt, and configured to display a date and a time;

a processing device configured for a) enabling display of information based on received data of at least one of the first radio frequency signal and the second radio frequency signal via the prompt, b) selecting between a first mode of operation that displays first weather conditions including temperature at a first location and a second mode of operation that displays second weather conditions at a second location different than the first location, c) and displaying a prediction of a future weather condition.

32. The apparatus of claim 31, wherein displaying the prediction of a future weather condition occurs during the display of the first weather conditions.

33. The apparatus of claim 31, wherein the prompt enables a location to be selected, the first weather conditions are weather conditions for the location, and at least one of the first weather conditions is based on the received data of the first radio frequency signal.

34. The apparatus of claim 31, wherein the international cellular protocol operates about a fixed frequency.

35. The apparatus of claim 31, further comprising:

a readily portable, battery-powered and hand-holdable weather station unit including:

at least one data sensor for generating a data signal representative of weather conditions at the at least one remote location; and

a transmitter for transmitting said data signal via the first radio frequency signal.

36. A portable weather station comprising:

(a) a portable, battery powered sensor unit, said sensor unit comprising a hand-holdable housing on or in which is provided:

a sensor for detecting a local area weather condition;

sensor unit circuitry for periodically sampling and wirelessly transmitting digital data of the local area weather condition sensed by said sensor; and

a battery power source for powering said sensor unit circuitry; and

(b) a portable, battery-powered weather station receiver unit, for use with said sensor unit when positioned in a general local area of said sensor unit, said weather station receiver unit including a hand-holdable housing on or in which is provided:

first radio frequency receiving circuitry for receiving, from said portable, battery powered sensor unit, said periodically sampled and wirelessly transmitted digital data of said local area weather condition;

second radio frequency receiving circuitry for receiving a separate wireless transmission of further digital data transmitted by a remote source which is relatively remotely located in relation to said sensor unit and weather station receiver unit;

at least one data storage device;

at least one visual display, for displaying numeric and other information-conveying symbols or indications;

microprocessor circuitry coupled to the first and second receiving circuits and said at least one data storage device, for receiving said digital data of said local area weather condition and said further digital data, for storing, in said at least one data storage device, said digital data of said local weather condition and said further digital data, and for outputting to said at least one visual display information of said digital data of said local weather condition and said further digital data; and

a battery power source for powering said weather station receiver unit.

37. A portable weather station according to claim 36, wherein said separate wireless transmission receivable by said second radio frequency circuitry comprises a transmission over a wireless network.

38. A portable weather station according to claim 36, wherein said microprocessor circuitry is configured to receive and process weather related data from the separate wireless transmission using a protocol compatible with the transmission, and for selecting weather information from a selected region on the globe, the microprocessor being further configured to process encoded weather data.

39. A portable weather station according to claim 36, said weather station receiver unit further comprising a user interface for selecting a mode of operation from a plurality of modes of operation, each mode of operation in the plurality of modes of operation defining different operating characteristics for the weather station receiver unit.

40. An apparatus comprising:

a readily portable, battery-powered and hand-holdable weather display unit including:

a first receiver configured for receiving weather conditions from a weather station unit;

a second receiver configured for receiving a signal from a remote source that is different than the weather station unit;

a circuit configured for receiving data indicating presence of a user at the weather display unit;

a display; and

a processing device configured to:

receive the weather conditions from the first receiver,

receive data representative of the signal from the second receiver,

receive the data indicating presence of a user at the weather display unit,

based on the data indicating presence of a user at the weather display unit, determine that the weather display unit is to operate in a mode that displays the weather conditions, and

in response to the determination, display the weather conditions.

41. The apparatus of claim 40, wherein display of a prediction of a future weather condition occurs during the display of the weather conditions.

42. The apparatus of claim 40, further comprising:

the weather station unit, wherein the weather station unit is configured to be readily portable, battery-powered and hand-holdable, and the weather station unit includes:

at least one data sensor for sensing the weather conditions; and

a transmitter for transmitting the weather conditions to the weather display unit via a digital signal.

43. An apparatus comprising:

a readily portable, battery-powered and hand-holdable weather display unit including:

a first receiver configured for receiving weather conditions from a weather station unit;

a second receiver configured for receiving a signal from a remote source that is different than the weather station unit;

a display including a prompt; and

a processing device configured to:

receive data representative of the signal from the second receiver,

receive data from a user of the weather display unit via the prompt, the received data indicating a selection of a location by the user;

identify the location based on the received data;

receive the weather conditions from the first receiver; and

display a weather prediction for the location based on the received weather conditions and the location.

44. The apparatus of claim 43, wherein the display of the weather prediction occurs during display of the weather conditions.

45. The apparatus of claim 43, further comprising:

the weather station unit, wherein the weather station unit is configured to be readily portable, battery-powered and hand-holdable, and the weather station unit includes:

at least one data sensor for sensing the weather conditions; and

a transmitter for transmitting the weather conditions to the weather display unit via a digital signal.

46. An apparatus comprising:

a readily portable, battery-powered and hand-holdable weather display unit including:

a first receiver configured for receiving weather conditions from a weather station unit;

a second receiver configured for receiving a signal from a remote source that is different than the weather station unit;

a display, including a prompt; and

a processing device configured to:

receive data representative of the signal from the second receiver,

receive the weather conditions from the first receiver,

receive location data, via the prompt, identifying a location,

subsequent to receiving the location data, receive historical weather condition data corresponding to the location,

determine a predicted weather condition by performing a correlation of the weather conditions and the historical weather data, and

display the predicted weather condition and one or more of the weather conditions.

47. The apparatus of claim 46, wherein displaying the predicted weather condition occurs during the display of the one or more of the weather conditions.

48. The apparatus of claim 46, further comprising:

the weather station unit, wherein the weather station unit is configured to be readily portable, battery-powered and hand-holdable, and the weather station unit includes:

at least one data sensor for sensing the weather conditions; and

a transmitter for transmitting the weather conditions to the weather display unit via a digital signal.

49. An apparatus comprising:

a readily portable, battery-powered and hand-holdable weather display unit including:

a first receiver configured for receiving weather conditions from a weather station unit, the weather conditions representing sensed weather conditions of a first location;

a second receiver configured for receiving a signal from a remote source that is different than the weather station unit;

a display;

a processing device configured to:

receive the weather conditions from the first receiver,

receive data representative of the signal from the second receiver,

select between a first mode of operation that displays the weather conditions received from the weather station unit and a second mode of operation that displays second weather conditions representative of conditions at a second location that is different than the first location, and

based on the selected mode of operation, display one or more weather conditions from at least one of the weather conditions received from the weather station unit and the second weather conditions.

50. An apparatus comprising:

a readily portable, battery-powered and hand-holdable unit comprising:

a first receiver configured for receiving data via a first radio frequency signal from a source;

a second receiver configured for receiving a second radio frequency signal from a cellular telephone network, wherein the cellular telephone network is different than the source;

a display configured to display a date and a time;

a processing device configured for a) enabling display of information based on received data of at least one of the first radio frequency signal and the second radio frequency signal, b) selecting between a first mode of operation that displays first weather conditions including temperature at a first location and a second mode of operation that displays second weather conditions at a second location different than the first location, c) and displaying a prediction of a future weather condition.

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