United States Patent

Friedman et al.

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[54] RADIOSONDE APPARATUS AND SWITCHING CIRCUITS SUITABLE FOR USE THEREIN

[72] Inventors: **Maurice Friedman,** Roslyn; **Edward Miller,** Philadelphia; **Anthony J. Pessiki,** Norristown, all of Pa.

[73] Assignee: **Viz Manufacturing Company,** Philadelphia, Pa.

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[52] **U.S. Cl.** .....**317/148.5 R,** 73/170 R, 73/DIG. 6, 307/99, 307/118, 324/113, 340/201

[51] **Int. Cl.** **H01h 47/26**

[58] **Field of Search** .....325/113; 217/148.5, 157; 340/201, 177, 345; 73/170, DIG. 6; 324/65 M, 71 NE; 307/98, 99, 112, 115, 116, 118

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Primary Examiner—Lee T. Hix
Assistant Examiner—Harry E. Moose, Jr.
Attorney—Howson and Howson

[57] **ABSTRACT**

A switching circuit suitable for use in a radiosonde of the type in which potential is to be supplied through at least three sensors, sequentially and independently, to a control terminal of a transmitter, to cause transmission of electrical signals representative of the contemporaneous resistance values of the sensors, and hence of the parameters which they sense. One of the sensors is connected between the potential source and the control terminal by normally closed contacts of a relay. One terminal of each of the other sensors is connected to said transmitter control terminal by the normally open contacts of said relay, and the second terminals of said other sensors are connected sequentially to the potential source by way of a baroswitch. Said second terminals of said other sensors are also connected through respective diode rectifiers to a common transistor amplifying stage, which drives the relay to open its normally closed contacts; the diode rectifiers are so poled that when said potential is supplied to any of said other sensors by the baroswitch, the corresponding rectifier conducts and causes a current to flow through the relay coil to open the normally closed relay contacts, thereby removing said one sensor from the circuit and connecting said one terminals of said other sensors to said control terminal of said transmitter. Preferably the diode rectifiers comprise the collector and base elements of reject transistors, the emitters of which are disconnected. The resultant switching circuit is of reduced weight, volume and expense.

16 Claims, 5 Drawing Figures

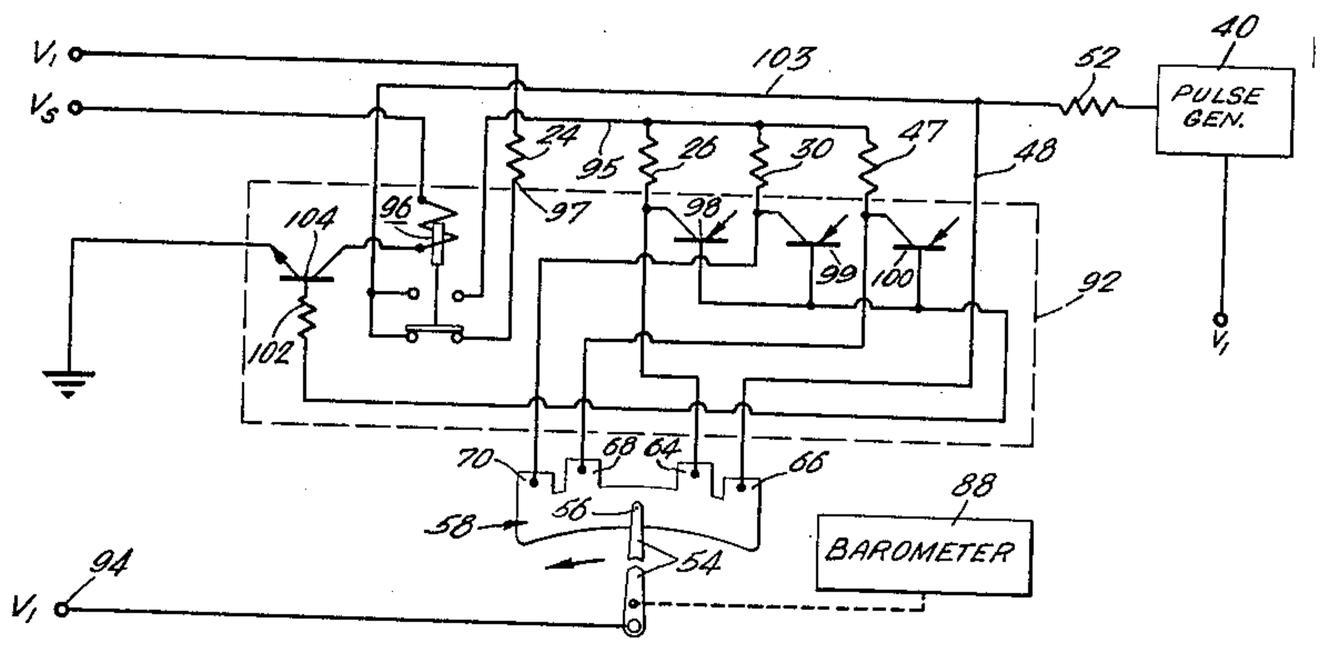


FIG. 1.

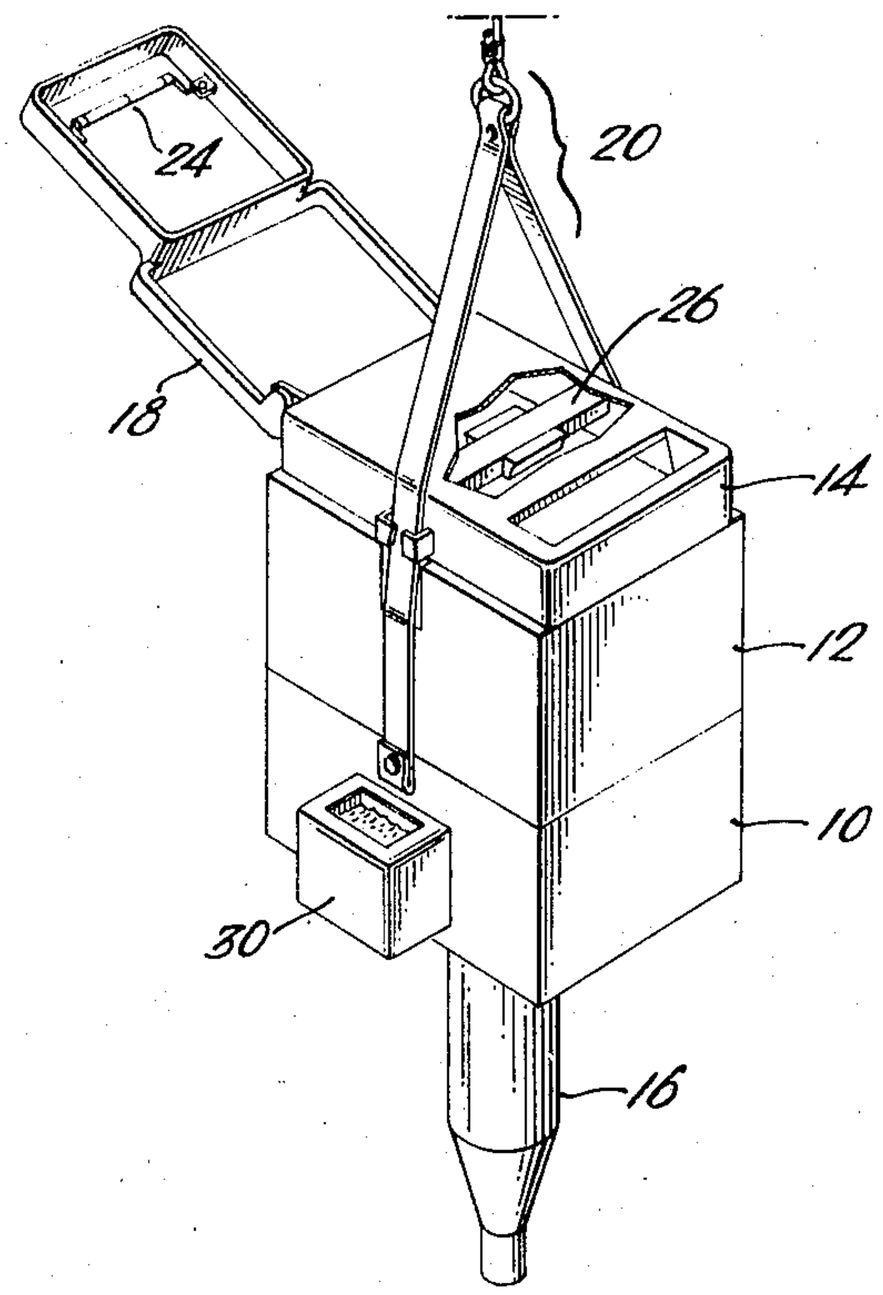
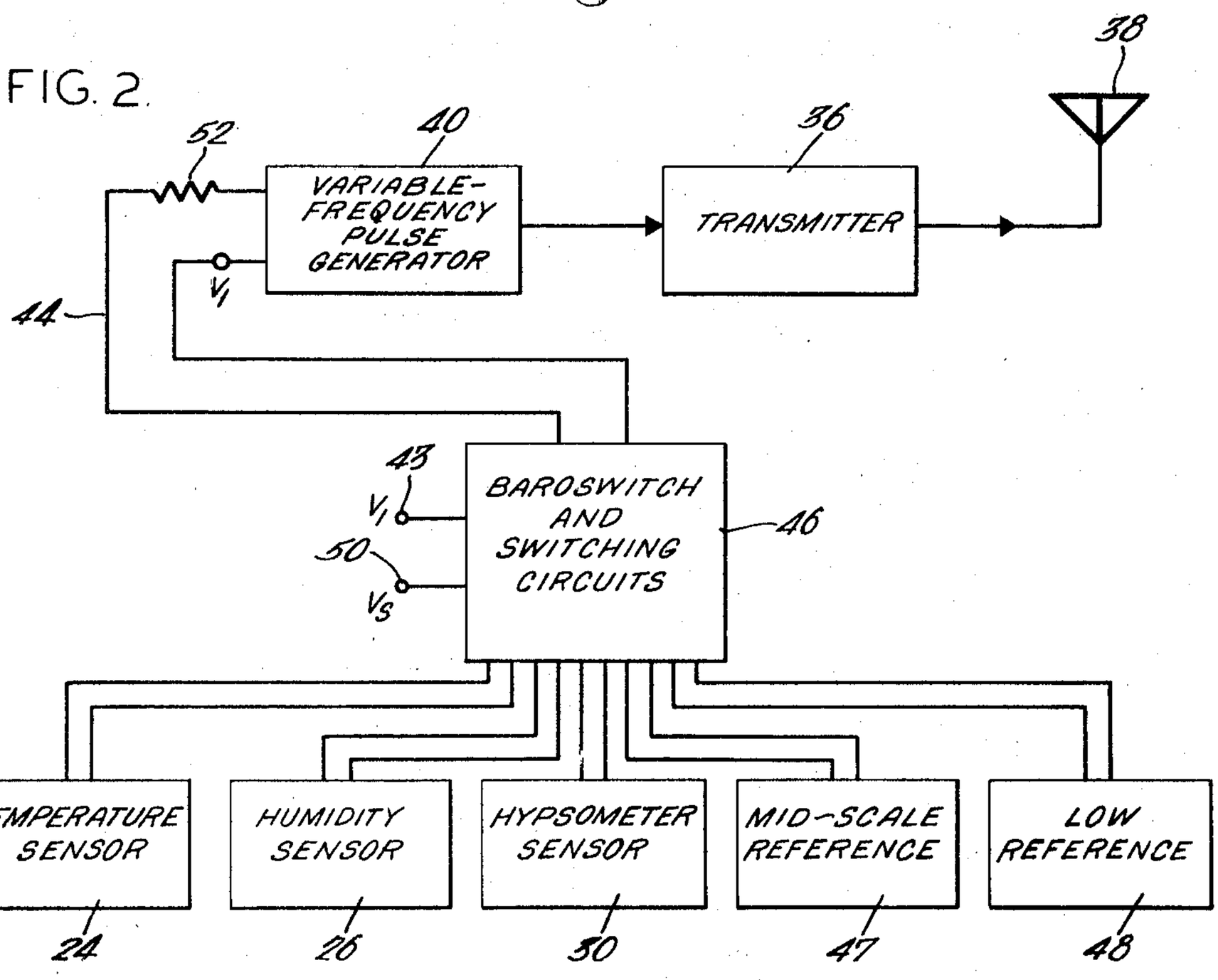


FIG. 2.



INVENTORS
MAURICE FRIEDMAN
EDWARD MILLER
ANTHONY J. PESSIKI

BY Howson & Howson

ATTYS.

FIG. 3.

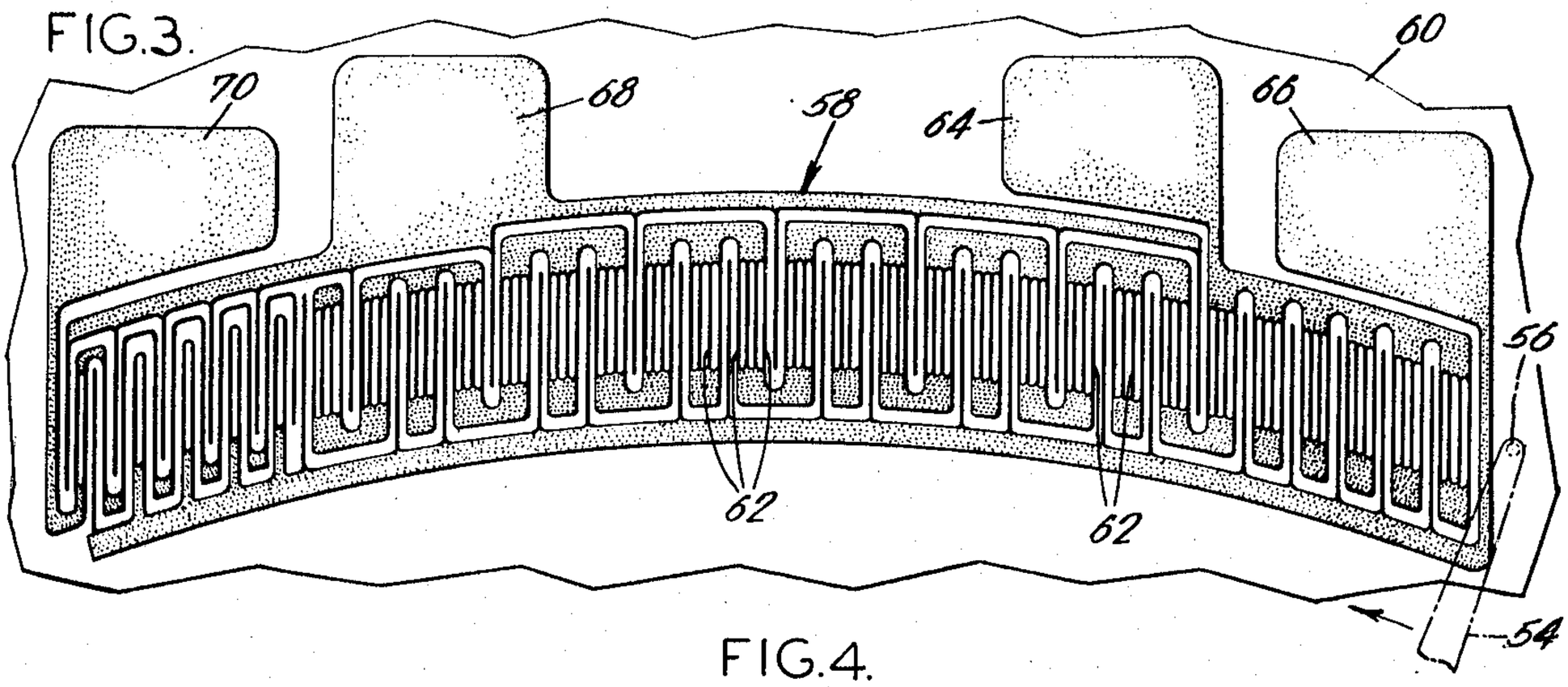


FIG. 4.

(PRIOR ART CIRCUIT)

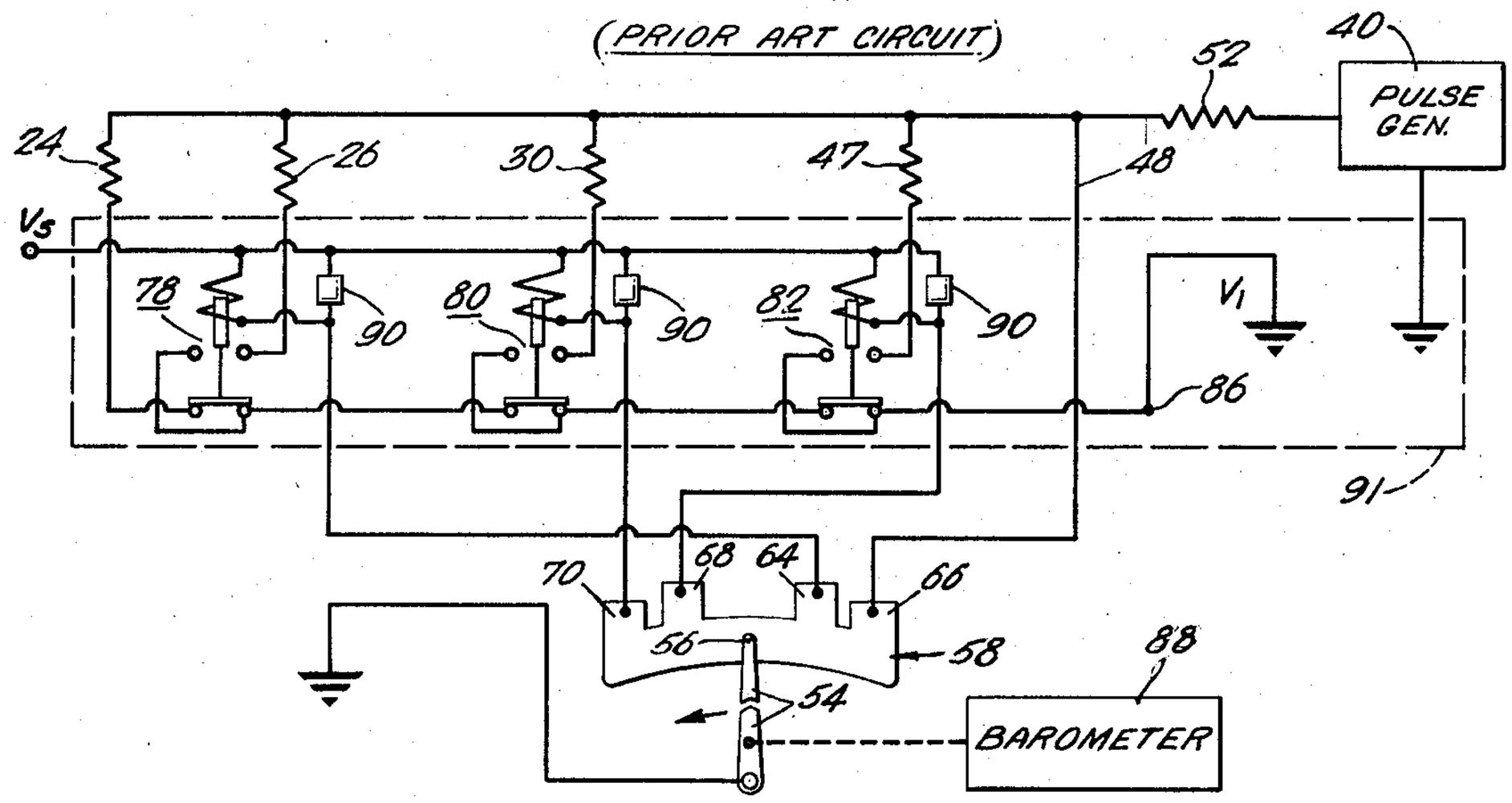
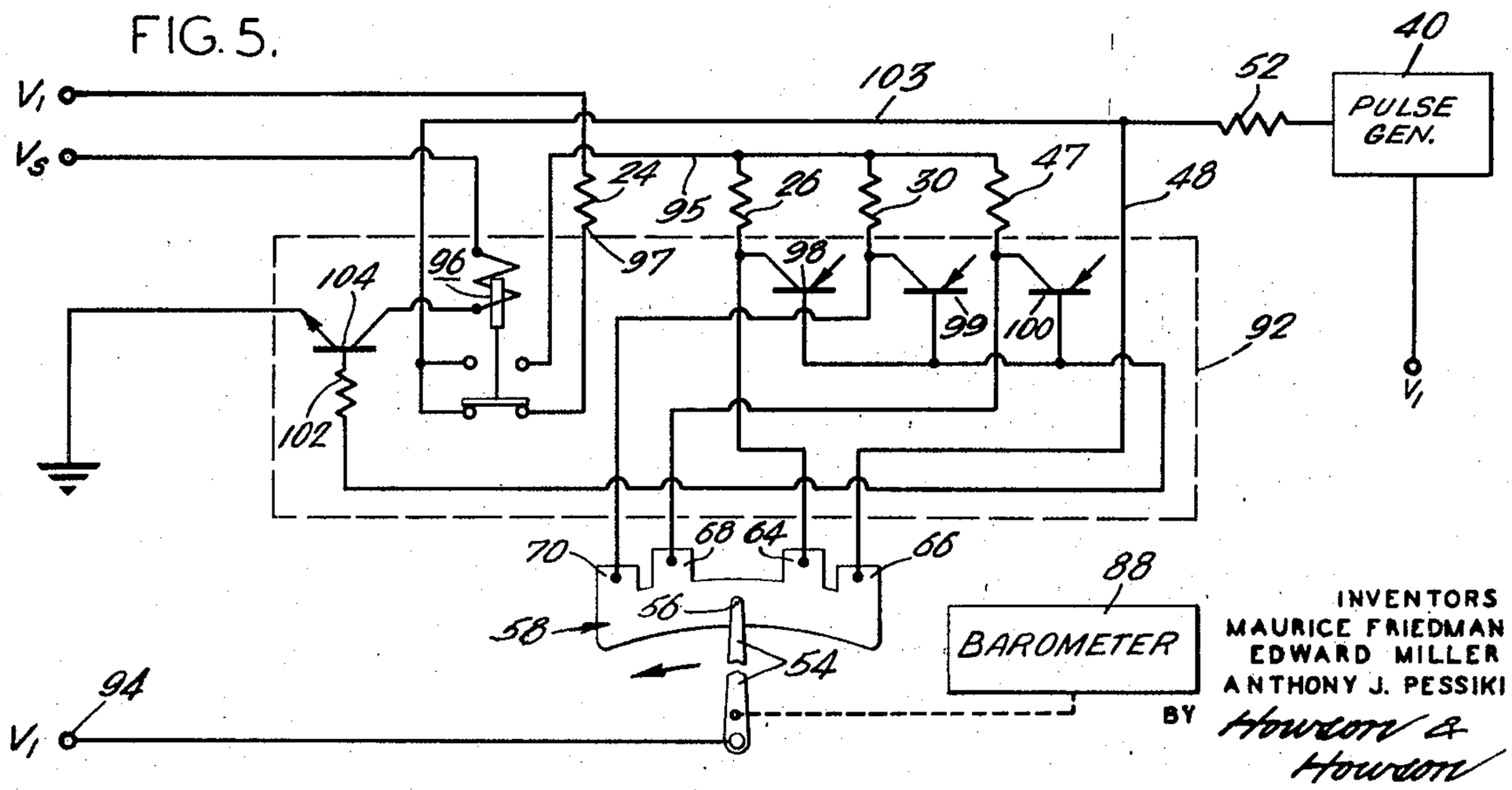


FIG. 5.



INVENTORS
MAURICE FRIEDMAN
EDWARD MILLER
ANTHONY J. PESSIKI
BY Howson & Howson
ATTYS.

RADIOSONDE APPARATUS AND SWITCHING CIRCUITS SUITABLE FOR USE THEREIN

BACKGROUND OF THE INVENTION

This invention relates to improved switching circuits, and especially to those suitable for use in a radiosonde or other telemetry apparatus to switch various electrical sensors in and out of a circuit.

There are a variety of applications known in the art in which it is desirable selectively to connect different ones of a plurality of electrical elements into a circuit automatically, for example in the telemetering of data from oceanographic, atmospheric or space stations, in the remote monitoring of test quantities in experimental procedures, in the automatic switching of communication links, in the monitoring of production processes, in logic or control circuits, and in many other applications. Such controlled automatic connection of different elements is of basic utility and importance.

One particularly useful and advantageous application of such switching circuits, with particular reference to which the present invention will be described in detail, is in the sequential switching of different sensors into the operative circuit of a radiosonde, so that signals representative of the values of the parameter measured by each sensor will be sequentially transmitted to a remote receiver for detection and analysis.

For example, in one typical type of such radiosonde apparatus, a plurality of sensors of parameters such as temperature, humidity, etc. are employed which have resistance values depending upon the corresponding values of the parameter sensed. These sensors are sequentially connected into a circuit which produces a signal representative of the resistance value of the sensor connected to it. More specifically, it is known to connect one terminal of each of the sensors to the data-transmitting apparatus, and to connect the other terminals of the sensors sequentially to a source of operating potential for the data transmitter, whereby the sensor thus connected is the one which determines the signal then transmitted; for example, it may determine the pulse repetition rate of the transmitted signal. In a typical form of such radiosonde apparatus, the element which determines which of the sensors shall be connected into the circuit at any given time is a so-called baroswitch, which in effect is an aneroid barometer mechanically coupled to a contacting arm so as to rotate or otherwise sweep the contacting arm along an array of conductive contacts as the barometric pressure drops with increasing altitude, and the normally disconnected terminals of the sensors are supplied with the operating potential in sequence, by means of a switching circuit connected to the baroswitch contacts.

One straightforward, conventional manner of achieving this operation is to provide a separate baroswitch contact, or set of contacts, for each sensor, to connect each set to its corresponding sensor, and to connect the potential source to this rotating baroswitch arm. However, it has been found that a saving in number of contacts and in compactness and ease of manufacture of the baroswitch can be provided by causing one of the sensors to be connected operatively into the circuit when the rotating contact arm is between successive contacts; that is, one of the sensors is normally connected to the source of potential externally of the baroswitch, in which case it becomes necessary to provide for removal of that sensor from the circuit when potential is to be applied solely to one of the other sensors.

As will be described in detail hereinafter, a circuit is known in the prior art which accomplishes this desired switching by means of relays equal in number to one less than the number of sensors or other elements to be connected in and out of the circuit. While functionally satisfactory and operative for some purposes, this prior art circuit requires an undesirably large number of relays, which are both expensive and bulky, and usually also requires some sort of arc suppressor element in parallel with each of the relays, for known purposes.

Accordingly it is an object of the invention to provide a new and useful switching circuit.

Another object is to provide such a switching circuit which is relatively compact, lightweight and inexpensive.

A further object is to provide such a switching circuit adapted to switch a plurality of elements in and out of a circuit automatically in response to closing and opening of a set of corresponding control contacts, wherein one of said elements is connected into said circuit when none of said control contacts is closed.

It is also an object to provide new and improved radiosonde system having at least three resistive sensors through which potential is to be supplied sequentially to a control terminal of a transmitting apparatus, all but one of said sensors being supplied sequentially with said potential by way of a baroswitch having a rotating arm and sets of contacts connected respectively to all but one of said sensors, the remaining sensor being directly connected between the source of said potential and said control terminal by normally closed relay contacts, so as to be operative in the circuit when said arm is not on any of said contacts and none of the other sensors is connected into the circuit.

SUMMARY OF THE INVENTION

These and other objects of the invention are achieved by the provision of a system in which a multiposition switch means having a plurality of output connections and an input connection is used to control the distribution of a potential from a source to a common terminal by way of different sequentially selected impedance elements, a first of said impedance elements being so connected by way of electrically controllable switch means and the other impedance elements being so connected through different ones of said output connections of said multiposition switch means, said system comprising means connecting each of said output connections to a different one of the first terminals of said impedance elements other than said first impedance element, means connecting said potential source to said input connection of the multiposition switch means thereby to apply said potential to said first terminals of said other impedance elements selectively as determined by the state of said multiposition switch means, and means responsive to application of said potential to any of said first terminals of said other impedance elements for actuating said electrically controllable switch means to open the circuit from said source to said first terminal through said first impedance element. Preferably said electrically controllable switch means comprises relay means having a pair of normally closed contacts for completing said circuit to supply said potential to said common terminal by way of said first impedance elements, and said means for actuating said electrically controllable switch means comprising a plurality of diode rectifier means, one for each of said impedance elements, each connected between one of said first terminals of said other impedance elements and said relay means, each of said rectifiers being so poled as to conduct when said potential is applied to the corresponding one of said first terminals and to be substantially nonconductive in the absence of said potential. Also, preferably said relay means has a pair of normally open contacts which are closed when said relay means is actuated to connect said common terminal to the other terminals of said other impedance elements.

BRIEF DESCRIPTION OF FIGURES

These and other objects and features of the invention will be more readily understood from a consideration of the following detailed description, taken with the accompanying drawings, in which:

FIG. 1 is a perspective view of a type of radiosonde in which the apparatus of the invention is useful;

FIG. 2 is a block diagram of an arrangement of electrical components which may be used in the radiosonde of FIG. 1;

FIG. 3 is a plan view of a baroswitch which may be used in connection with the invention in one form;

FIG. 4 is an electrical schematic diagram illustrating a circuit used in the prior art for providing some of the functions achieved by the circuit of the invention, and

FIG. 5 is an electrical schematic diagram illustrating one preferred form of embodiment of the invention.

DETAILED DESCRIPTION OF SPECIFIC EMBODIMENTS

Without thereby in any way limiting the scope of the invention, a representative embodiment and use thereof will now be described in detail.

FIG. 1 shows generally one form of a radiosonde to which the present invention is applicable, the physical and mechanical aspects of which are shown and described in more detail in U.S. Pat. No. 3,353,100 of J. N. Collins and Maurice Friedman, issued Nov. 14, 1967 and entitled "Package for Radiosonde," the disclosure of which patent is incorporated herein by reference. It comprises generally a base unit **10**, a baroswitch housing **12** containing a baroswitch, a top cover **14**, a transmitter unit **16**, and an outrigger **18**. A harness **20** is provided to suspend the entire radiosonde from the underside of a weather balloon, so that, when released, it will ascend progressively further into the atmosphere. The outrigger **18** supports a temperature sensor **24**, which may be a thermistor element, and inside the top of the cover **14** there is mounted a humidity sensor **26**. The temperature sensor **24** and the humidity sensor **26** are devices having values of electrical resistance which are functions of temperature and humidity, respectively, at the location of the radiosonde. The wires and various other mechanical details have been omitted from the showing of FIG. **1** in the interest of clarity.

In this example, the radiosonde of FIG. **1** differs from that in the above-mentioned Collins and Friedman patent in that it carries an additional sensor in the form of a hypsometer **30** for measuring atmospheric pressures of small values at the higher altitudes, and contains within it switching circuits constructed in accordance with the invention.

FIG. **2** illustrates in block form one possible general arrangement of electrical apparatus suitable for use in the radiosonde of FIG. **1**. A transmitter **36**, which may comprise a source of modulated carrier waves, is connected to supply signals to the antenna **38** for radiation to a remote receiver, these signals representing the values of the resistances of the sensors **24**, **26** and **30** at different times. The signal characteristic which represents the value of each such resistance may be the repetition rate, or frequency, of the modulating pulses applied to the transmitter by the variable-frequency pulse generator **40**. The latter generator in this case may be so constructed that the pulse frequency at any time depends upon the value of resistance which is then connected between a source **43** of electrical potential V_1 and the pulse generator, in series with line **44**.

The potential V_1 from source **43** is applied to the baroswitch and switching circuits **46** for distribution at different times to any one of the temperature sensor **24**, the humidity sensor **26**, the hypsometer sensor **30**, the midscale reference element **47** and the low-reference element **48**, to produce current through them at different times, as will be described more fully hereinafter. The return lines for each of these impedance elements are connected through circuits **46** and then through a series resistor **52** to the pulse generator **40**. Accordingly, the value of resistance connected into the circuit of the pulse generator at any time is the sum of the resistance of the resistor **52** and the resistance of that one of the elements **24**, **26**, **30**, **47** or **48** to which the potential V_1 is supplied at that time by action of the baroswitch and switching circuits **46**. A control potential source **50** provides an operating supply voltage V_s to circuits **46** for purposes which will be described presently.

It is understood that a larger or smaller number of sensors or other elements may be used, and that the sensors may have any of a variety of forms.

FIG. **3** illustrates a typical known form of baroswitch suitable for use in connection with the present invention. It comprises the conductive rotating contacting arm **54**, which at high atmospheric pressures may occupy the angular position represented in FIG. **3** beyond the right-hand extreme of the baroswitch array of contacts, and which rotates progressively farther counterclockwise as the barometric pressure drops with increasing altitude of the radiosonde. The contacting arm **54** includes a contacting point **56**, and is spring biased so as to urge point **56** against the centerline of the baroswitch contact array **58**. The latter array may typically comprise an insulating and support substrate **60** on which the conductive metal pattern shown by stippled shading has been deposited, by known metal deposition techniques. The line-segment contacts such as **62** on the baroswitch are traversed or swept over successively by the contacting point **56** as arm **54** rotates, are spaced from each other along the direction of travel of point **56**, and are conductively continuous with the remainder of the metal deposited on the substrate.

The conductive deposit in this example also includes the four output connections **64**, **66**, **68** and **70**, each connected to a different set of the line-segment contacts of the baroswitch. More particularly, output connection **64** is connected directly to each line-segment contact whose cardinal number, measuring from the first contact at the right, is not an integral multiple of 5, up to the 124th such contact; thus contacts 1, 2, 3, 4, 6, 7, 8, 9, 11, etc. are connected directly to output connection **64**. Accordingly, when the contacting arm **56** touches any of these latter line-segment contacts, the potential on the arm will be applied to output connection **64**. Output connection **66** is directly connected to every fifth line segment contact, up to and including the 125th, except for the 30th, 45th, 60th, 75th, 90th, 105th and 120th, which instead are connected to output connection **68**. Above the 125th contact there is a repeating sequence of, first, two contacts connected to output connection **66**, then one connected to output connection **70**, and then one connected to output connection **68**. This continues until the 145th line segment contact, at which point one line-segment contact is connected to output connection **66**, the next two are connected to output connection **70**, and the last is connected to output connection **68**. It will be appreciated, then, that as the contact arm **54** rotates it distributes the potential on arm **54** in sequence to different ones of the output connections **64**, **66**, **68** and **70**, at the different times when the voltage V_1 is to be supplied to the corresponding element connected to the output connection.

In the prior art circuit shown in FIG. **4**, the pulse generator **40**, resistor **52**, the temperature-sensing resistance **24**, the humidity-sensing resistance **26**, the hypsometer sensor **30**, the mid-scale reference element **47**, and the low-reference element **48** are shown in an arrangement corresponding to that of FIG. **2**, the element **47** being a resistor used for reference calibration purposes, element **48** being essentially a short circuit, useful for calibration and counting purposes. In this case, ground potential is supplied to the rotating baroswitch contacting arm **54**. Three two-position relays **78**, **80** and **82** are provided, one terminal of the coil of each such relay being connected to the supply source V_s and the other terminal of each relay being connected to ground at different times by way of a different one of the output connections **64**, **70**, **66** and **68**, respectively of the baroswitch. Each such relay has two sets of contacts connected as a single-pole double-throw switch, the lower pair of contacts being normally closed as shown in the Figure when none of the relays is actuated. The operating electrical potential V_1 supplied to terminal **86** is connected through all of the normally closed relay contacts in series to the lower end of the temperature-sensing resistor **24**. Accordingly, when the contacting arm **54** is positioned so that none of the line-segment contacts on the baroswitch is contacted, i.e., when the arm is in a position between successive line-segment contacts, the potential V_1 will be supplied through the temperature-sensing resistor **24** to resistor **52** and pulse generator **40**.

The upper pair of contacts of relay **78** is connected so that when that relay is actuated by ground potential applied to baroswitch output connection **64**, the potential V_1 will be supplied through humidity-sensing resistor **26** to resistor **52** and generator **40**; the upper contacts of relays **80** and **82** are

similarly arranged so that, when actuated by grounding of the corresponding coil by the baroswitch, the potential V_1 is supplied respectively through the hypsometer resistor **30**, the mid-scale reference resistor **47** and the low-reference connection **48**, to resistor **52** and generator **40**. The arm **54** is rotated in response to mechanical motion of the barometer **88** as the atmospheric pressure changes. Arc-suppressing elements, such as a diode or resistor, designated by the numeral **90**, are connected across each of the relay coils to suppress arcing in known manner.

From the foregoing it will be apparent that in the prior art circuit arrangement of FIG. **4**, temperature-sensing resistor **24** will be connected in the circuit between the source of potential V_1 and resistor **52** when contact **56** is not on one of the line-segment contacts of the baroswitch, and that one of the other sensors or elements **26**, **30**, **47** or **48** will be so connected instead when the contact **54** contacts a corresponding different one of the line-segment contacts. Connection of any one of these other elements into the circuit by its corresponding relay opens the circuit normally supplying the potential V_1 to the temperature-sensing resistor **24**, removing it from the circuit, as required. Thus each of the elements is connected automatically into or disconnected from the circuit when desired. However, it is noted that three relays and associated arc-suppressing elements are required to perform these switching functions.

In the arrangement in accordance with the invention shown in FIG. **5**, the switching circuit shown at **91** in FIG. **4** has been replaced by the switching circuit **92**, and the operating electrical potential V_1 from source **94** is applied to the contacting arm **54** of the baroswitch. Each of the output connections **64**, **66**, **68** and **70** of the baroswitch is connected directly to one terminal of the sensor or element which it is to place into the circuit, namely, humidity-sensing resistor **26**, hypsometer resistor **30**, midscale reference resistor **47** or low-reference element **48**. The other terminal of element **48** is connected directly to resistor **52**, and the other terminals of resistors **26**, **30** and **47** are connected to an interconnecting line **95** and thence to resistor **52** only when the normally open contacts of relay **96** are closed by actuation of the relay. Temperature-sensing resistor **24** is normally connected into the circuit, i.e., when arm contact **56** is not contacting any of the line-segment contacts of the baroswitch, by means of the lower set of normally closed contacts of relay **96** which connect one terminal **97** of temperature-sensing resistor **24** directly to the resistor **52**. Depending thereupon the position of the contacting arm **54**, the potential V_1 is supplied to resistor **52** through different ones of the elements **24**, **26**, **30**, **47** or **48**.

Whenever any of the resistors **26**, **30** or **47** is supplied at its lower terminal with the potential V_1, this potential V_1 is also supplied, by a direct connection, to the collector of a corresponding transistor **98**, **99** or **100**, respectively; the bases of each of the latter transistors are connected together and then through a series current-limiting resistor **102** to the base of a transistor **104** of the NPN type having its emitter grounded and its collector connected to a source of operating voltage V_s by way of the coil of relay **96**. The emitter of each of the transistors **98**, **99** and **100** is disconnected, and therefore floating in potential, and the collector and base elements of these transistors are utilized as high-quality diodes of low reverse-leakage current. Whenever the voltage V_1 is supplied, for example, to the lower terminal of humidity-sensing resistor **26**, diode **98** will be rendered conductive, positive voltage will be applied to the base of transistor **104** to render it conductive, and current will pass through the coil of relay **96** to open its lower contacts and remove temperature-sensing resistor **24** from the circuit, as desired. Because of the high reverse resistance of the collectors of transistors **99** and **100**, the positive voltage thereby applied to their bases when transistor **98** conducts will be substantially completely isolated from the lower terminal of resistors **30** and **47**, so that the lower terminal of resistor **26** is thereby not only switched into the circuit but is also maintained isolated from the other sensors. Also, when relay **96** is actuated through diode **98**, its normally open contacts are closed to complete the circuit between the upper terminals of the resistors **26**, **30** and **47** and the line **103** leading to resistor **52**.

A similar action occurs when the baroswitch applies the voltage V_1 to the lower terminal of resistor **30** or resistor **47**. When the baroswitch applies potential to low-reference element **48**, substantially zero resistance is inserted in the circuit in series with resistor **52** to operate the pulse generator in a known reference condition and at a known reference frequency useful for calibration purposes; because element **48** constitutes substantially a zero-resistance connection, the resistance of resistor **24** in parallel with it has no effect, and it is not necessary at such times to remove the temperature-sensing resistor **24** from the circuit.

However, in the preferred embodiment of the invention shown in FIG. **5**, the upper terminals of resistors **26**, **30** and **47** are disconnected from line **103** leading to resistor **52**, by means of the normally open contacts of relay **96**; otherwise in many applications the potential V_1 when applied to lead **103** through resistor **24** may be sufficient, acting from line **103** through resistors **26**, **30** and **47**, to turn on one of the diode rectifiers and actuate relay **96**, after which it will close again and reopen repetitively in a chattering manner. The relay **96** disconnects the other resistors from line **103** when resistor **24** is connected to line **103**, preventing the above-described chattering.

Considering now various advantages of the circuit of FIG. **5**, it is noted that while the circuit of FIG. **4** required a number of relays one less than the number of elements to be switched, the circuit of FIG. **5** requires only one relay, but requires the additional transistors **98**, **99**, **100** and **104**. However, it is noted that the transistors **98**, **99** and **100** are merely utilized as diodes, and in fact high-quality special diodes can be used in their place, although it has been found very economical to utilize for this purpose reject transistors having faults associated with their emitters, since the emitters are not utilized in the circuit. In this way a very high quality, low reverse-leakage current diode is obtained at a very low price. The elimination of the extra relays reduces the cost, size and weight of the entire equipment, and furthermore the arc-suppressing elements **90** of FIG. **4** are not required in the circuit of FIG. **5**.

Also, in some cases the transistor amplifier **104** is not necessary, and the current from the diode-connected transistors **98**, **99** and **100** can be passed directly through the relay coil. However, in this event relatively heavy currents would be required to pass through the baroswitch contacts, producing across the contacts a corresponding substantial voltage drop which is usually subject to appreciable variation. It will be appreciated that in order to establish a proper reference condition when the baroswitch contact **56** contacts those line-segment contacts which supply potential to the low-reference **48**, the potential so supplied should be precisely that supplied to the resistors **24**, **26**, **30** and **47** when they are in the circuit. Accordingly, the least drop possible is desired across the baroswitch contacts in order to prevent variations in such drop. By using the transistor amplifying stage **104**, relatively small baroswitch currents are required, so that the corresponding voltage drop is small and variations in it insignificant.

It will be appreciated that in the arrangement of FIG. **5** the relay **96** and the amplifier stage **104** comprise relay means for removing or disconnecting the temperature-sensing resistor **24** from the circuit in response to voltage applied to the base of the transistor, the base constituting a control terminal for the relay means. Similarly, the transistors **98**, **99** and **100**, connected as diode rectifiers, comprise means for sensing the presence of the potential V_1 at the lower terminals of the sensor resistors **26**, **30** and **47** and for supplying voltage to the control terminal of transistor stage **104** to disconnect the sensor resistor **24** from the circuit, while maintaining electrical isolation between the lower terminals of the sensors **26**, **30** and **47**.

Accordingly, while the invention has been described in the interest of complete definiteness with particular regard to specific embodiments thereof, it will be understood that it may be embodied in a variety of forms diverse from those specifically shown and described without departing from the scope and spirit of the invention as defined by the appended claims.

What is claimed is:

1. In a system comprising a plurality of electrical impedance elements, a source of electrical potential to be connected to a first terminal of each of all but one of said impedance elements selectively and at different times, a first conductor and electrically controllable switch means having a first condition in which it completes a circuit from said source to said first conductor by way of said one impedance element and operative when actuated to its other condition to open said circuit, multiposition switch means having an input connection and a plurality of different output connections, said multiposition switch means having a plurality of different conductive states for which said input connection is internally connected to different ones of said output connections and at least one nonconductive state for which said input connection is internally connected to none of said output connections, each of said conductive states of said multiposition switch means serving to indicate which of said all but one impedance elements is to be connected to said source at a given time and said nonconductive state serving to indicate when said circuit is to be completed, and switching circuit means responsive to changes in said states of said multiposition switch means to connect said source to different ones of said first terminals of said all but one impedance elements and to complete said circuit at different times, the improvement according to which:

said switching circuit means comprises means connecting each of said output connections to a different one of said first terminals of said all but one impedance elements, means connecting said source to said input connection of said multiposition switch means thereby to apply said potential to said first terminals of said all but one impedance elements selectively as determined by the conductive state of said multiposition switch means, and means responsive to application of said potential to any of said first terminals of said all but one impedance elements for actuating said electrically controllable switch means to open said circuit.

2. A system in accordance with claim 1, in which said electrically controllable switch means comprises relay means having a pair of normally closed contacts for completing said circuit from said source to said conductor by way of said one impedance element.

3. A system according to claim 1, in which said electrically controllable switch means comprises a control electrode responsive to changes in voltage applied thereto to change the condition thereof, said system comprising a plurality of asymmetrically conductive means, one for each of said all but one impedance elements, connecting each of said first terminals of said all but one impedance elements to said control electrode, each of said asymmetrically conductive means being biased in its more conductive condition in response to application of said potential to the corresponding one of said first terminals of said all but one impedance elements and being in its less conductive condition when said potential is not so applied.

4. A system in accordance with claim 3, in which each of said asymmetrically conductive means comprises the collector and base elements of a transistor.

5. A system in accordance with claim 3, in which said electrically controllable means comprises a transistor amplifier stage and relay means driven thereby.

6. A system in accordance with claim 1, in which said electrically controllable switch means comprises a pair of normally open contacts for connecting the other terminals of each of said all but one impedance elements to said first conductor when said electrically controllable switch means is actuated.

7. A system in accordance with claim 6, in which said multiposition switch means comprises an additional output connection and has an additional state for which said input connection is internally connected to said additional output connection, and comprising a substantially short-circuiting connection between said additional output connection and said first conductor.

8. In a system comprising more than two resistive sensors each having a first terminal and a second terminal, said second terminals of all but one of said sensors being connected together and said first terminals thereof being electrically isolated from each other, air-pressure-responsive multiposition switch means having a plurality of spaced-apart conductive contacts, having at least two output terminals connected to different ones of said contacts, having an input terminal, and having a movable contacting arm responsive to changes in air pressure to cause said arm to connect said input terminal successively to different ones of said contacts, a source of electrical potential, a common conductive line, and a switching circuit for sequentially connecting different ones of said sensors between said source and said common line, the improvement according to which:

said switching circuit comprises relay means having a normally closed pair of contacts for supplying said potential to said common conductive line by way of said one sensor and having a control terminal responsive to a control voltage supplied thereto to open said normally closed contacts, means connecting said second terminals of said all but one sensors to said common conductive line when said potential is applied to any one of said first terminals of said all but one sensors, means connecting said output terminals of said multiposition switch means to different ones of said first terminals of said all but one sensors, means connecting said source of potential to said input terminal of said multiposition switch means to enable distribution of said potential sequentially to said first terminals of said all but one sensors, and a plurality of semiconductor rectifier means, one for each of said all but one sensors, connected between different ones of said first terminals of said all but one sensors and said control terminal of said relay means, each of said rectifier means being poled so as to conduct when said potential is supplied to its associated sensor terminal and to be blocked when said potential is not so supplied.

9. A system according to claim 8, in which each of said rectifier means comprises the collector and base elements of a transistor.

10. A system in accordance with claim 8, in which said relay means comprises a relay coil for operating said contacts thereof and a transistor amplifier stage connected between said control terminal of said relay means and said relay coil.

11. A system in accordance with claim 10, in which said relay means comprises a pair of normally open contacts which normally disconnect said second terminals of said all but one sensors from said common conductive line, and is responsive to said control voltage to close said normally open pair of contacts when said normally closed pair of contacts is opened.

12. In a radiosonde system for deriving and transmitting data as to at least three atmospheric parameters including temperature, humidity and at least one other parameter, all correlated with data as to barometric pressure at said radiosonde apparatus, the combination comprising:

at least three resistive sensors, one for each of said at least three parameters, each having a resistance value which varies in predetermined manner in accordance with variations in the corresponding one of said parameters;

a signal generating and transmitting apparatus, and a source of electrical potential connected to a terminal of said apparatus by way of different ones of said sensors at different times, the signal transmitted by said apparatus having identifiably different characteristics depending upon the resistance value of the one of said sensors by way of which said potential is so supplied;

a baroswitch having a contacting arm rotatable to successive different angular positions in response to changes in

barometric pressure, having an array of spaced-apart contacts positioned to be contacted successively by said contacting arm as it rotates, and having at least two output connections connected to different sets of said contacts;

means connecting each of said output connections to one terminal of a different one of said sensors other than a predetermined one thereof;

interconnecting means connecting together the other terminals of said other sensors;

relay means having a normally closed pair of relay contacts connecting said one sensor in series between said source of potential and said terminal of said signal generating and transmitting apparatus, having a normally open pair of contacts for connecting said terminal to said interconnecting means when said normally open pair of contacts are closed, and having a control terminal responsive to a control voltage to open said normally closed contacts and close said normally open contacts; and

means for effectively connecting each of said one terminals of said other sensors to said control terminal of said relay means when said potential is applied to said each one terminal of said other sensors, and for effectively disconnecting it therefrom when said potential is absent.

13. A system in accordance with claim **12**, in which said last-named means comprises diode rectifiers, one for each of said other sensors, each poled so as to become conductive in response to said applying of said potential to the corresponding associated one of said other terminals.

14. Apparatus in accordance with claim **13**, in which each of said diode rectifiers comprises the collector and base elements of a transistor, the emitter element of which is disconnected and floating in potential.

15. Apparatus in accordance with claim **14**, in which said relay means comprises a relay coil for operating said relay contacts and a transistor amplifier stage connected between said control terminal and said coil to drive said coil.

16. Apparatus in accordance with claim **12**, in which said baroswitch comprises at least one additional output connection connected to a corresponding set of said baroswitch contacts, and means connecting said additional connection directly to said terminal of said apparatus.

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