TELEIDENTIFICATION SYSTEM FOR MONITORING A PLURALITY OF POINTS

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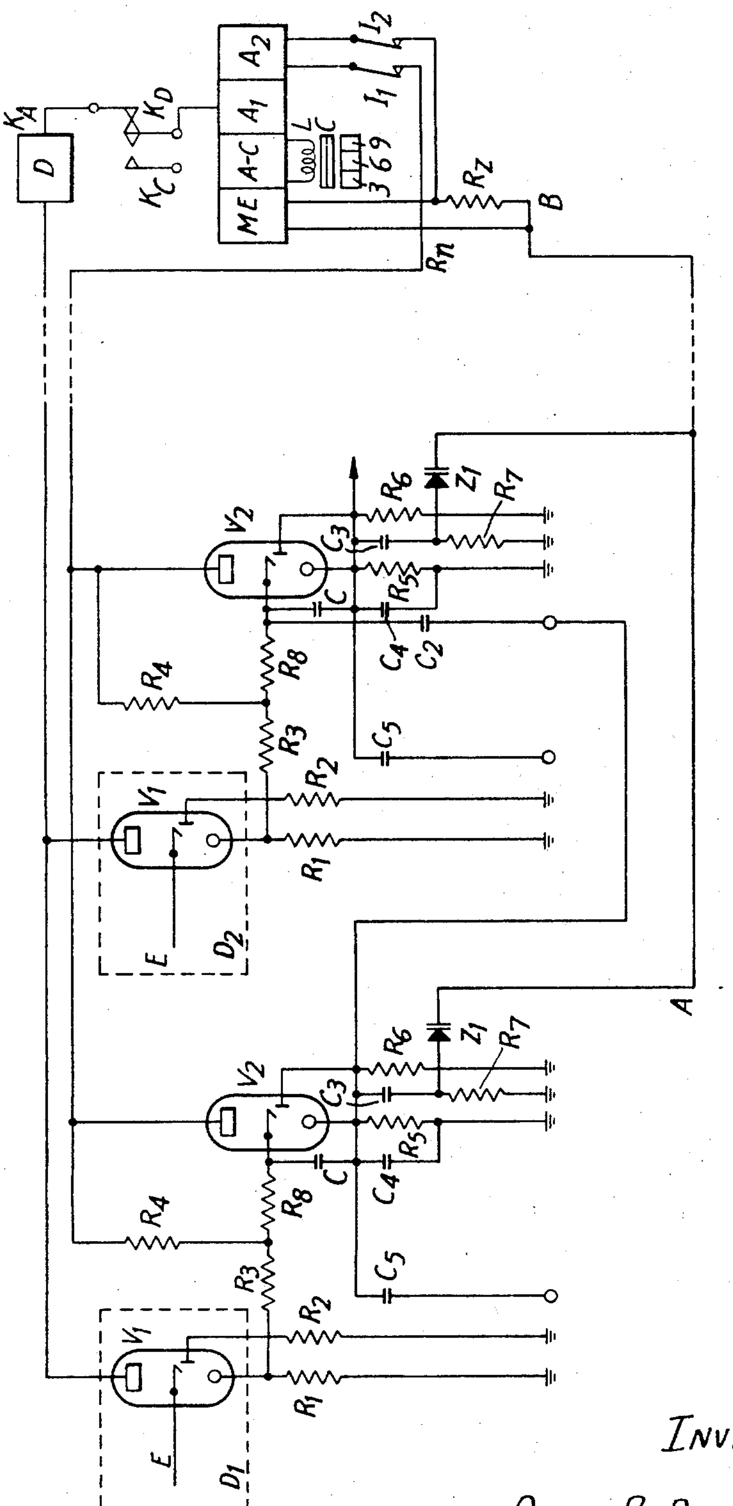

INVENTOR:-

ABEL B. AMIRAGOFF

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1

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TELEIDENTIFICATION SYSTEM FOR MONITORING A PLURALITY OF POINTS

Abel Boris Amiragoff, 21 Rue Vilain XIV, Brussels, 5, Belgium

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ABSTRACT OF THE DISCLOSURE

A remote identification system having a plurality of detectors, e.g., thermometers, each connected to an associated relay circuit, all of the relays being coupled to a common conductor terminating in a counter, each relay circuit causing actuation of the next following circuit, whereby the position in the series of an alerted detector can be ascertained from the signals counted.

Specification

In practically all fields of human activity and in particular that of the conversion of materials for industrial purposes, it is very often necessary for a constant watch to be kept on the sudden presence or incidence of spontaneous or undesirable factors in the cycle of operation.

For example, even in the course of the preliminary manipulations for the stocking of essential materials, they have to be watched in order to prèvent fire or theft, the action of moisture or temperature, and, where perishable goods are concerned, the action of dust, aerosols, oxidising agents or corrosive media.

Supervision by staff allocated to this particular purpose being fallable and expensive, increasingly wide use is being made of the progress achieved in electronics, in order to entrust this task to automatic apparatus which effects permanent control and of which the function is to set an alarm device in operation as soon as the existence of a given physical factor is detected by a sensitive detector element or as soon as this same factor reaches a dangerous level, i.e., a magnitude necessitating the alarm.

Among the extremely numerous types of such detector there may be mentioned, by way of example and without any limitative effect, fire detectors, fire-damp detectors in mines, burglar alarms, the various types of thermostat and contact thermometer, thermoelectric detectors, dust dosimeters, moisture-limit dosimeters, etc.

The alarm supplied by most of these detector devices is generally transmitted to one or more centralisation boards where it operates either relay devices, visual signals, bells or other acoustic systems, recording devices or measuring devices and, in certain cases, sets in operation automatic remedial or correcting apparatus.

It is obvious that one of the essential desiderata in any automatic system for permanent supervision is the rapidity and reliability with which it must come into operation in the event of an abnormal situation, in addition to which it must unambiguously identify the exact place where the situation in question prevails.

It would appear that a simple method of fulfilling this condition is for each automatic unit to be connected individually to the central indicating panel. There is no objection to this method of wiring as long as the number of automatic units in question is relatively small and the distance between them and the central panel are short.

But if, on the other hand, the number of detector units is large, as is the case in large industrial concerns or on board ship for example, or if there are long distances to be covered in connecting the detector units to the central panel, the cost of this individual wiring system becomes prohibitive, and it is also impracticable owing to the necessity of providing extremely large central panels, thus increasing the expense of the installations.

2

The object of the present invention is to provide an improved construction of remote identification system wherein the use of individual wiring of each detector to control point is avoided, and wherein extremely rapid location of any one of a large number of detectors can be obtained.

According to the present invention a remote identification system comprises a plurality of detectors each adapted to actuate a respective electronic relay circuit capable of producing a signal by discharge of a condenser, the plurality of circuits being coupled in a series such that the actuation of each such circuit causes the actuation of the next circuit of the series, a signal counting device, and a comon line connecting all of the circuits to the counting device to convey to the counting device the signals produced in said circuits.

As the signals are produced by electronic means, as distinct from signal-forming means including electro-mechanical devices, the production of the series of signals can be extremely rapid, so that the system can be readily adapted for use with many hundreds or even thousands of detectors, and the location of the operated detector ascertained in a very short time. The counting means may incorporate an electromechanical counter, but for more rapid counting than can be obtained with such a counter, an electronic counter of conventional nature may be used.

In a preferred embodiment, each relay circuit comprises a first electronic relay triggered by a detector element, and a second electronic relay triggered by the first relay and arranged to cause discharge of the condenser to produce a signal.

In order to prevent disturbance of the train of signals, by the subsequent operation of another detector a very short time after the first, there may be provided means connected to the common line and arranged upon reception of a signal to prevent, for a duration at least equal to the time required for two successive signals to reach the counting means, the subsequent actuation of a relay circuit by its associated detector.

In one form the counting device comprises a pulse-forming unit for actuation by the signals received from the common line, and an electromechanical counter actuated by the pulses of the pulse-forming unit.

In another form, the counting device comprises an electronic counter for actuation by the signals.

An embodiment of apparatus in accordance with the invention is hereinafter particularly described with reference to the accompanying drawing, which is a circuit diagram in which only the first two of a series of detector elements are shown schematically.

In this diagram, D_1, D_2 are the first two of a series of automatic supervision or detection devices, such as fire-, theft- or proximity-detectors, or any general supervision devices.

Each of these detectors operates a relay in the form of a cold cathode tube V_1, which is normally non-conductive.

The electrical circuit of each detector is fed from a voltage source A_1 via a relay contact K_A.

Each detector is associated with a respective electronic relay including a cold cathode tube V_2.

A voltage source A_2 feeds the anodes of V_2 of all the units via a switch I_1 and I_2, and M–E represents a pulse-shaping amplifier.

This amplifier is characterised by the fact that impulses of variable duration or amplitude, applied to its input, emerge with standardised amplitude, duration and form from its final stage, in order to act on a meter-amplifier unit A–C.

This amplifier supplies the power required for the operation of the numerical counter relay I_c and the relay actuating the contact K_A.

When an impulse supplied by M–E reaches meter-amplifier unit A–C, the relay I_c counts one unit, while the relay operating K_A opens, disconnecting the voltage source A_1 from all of the detectors, for a period equal to the duration of the impulse plus an additional period such that the total period is at least equal to the time required for two successive impulses to occur at the input of A–C.

It will now be supposed that the detector D_1 enters into operation.

V_1 is a first cold cathode tube, of which the starter E is connected to the sensitive element of the detector.

When the voltage between E and earth reaches a critical level, because the anode of V_1 is connected to a suitable potential originating in voltage source A_1 the tube V_1 ignites and a current passes through the resistance R_1, between cathode and earth of V_1, producing a voltage drop.

The second cold cathode tube V_2 is fed from the independent voltage source A_2. The anode of V_2 is directly connected to this second supply unit, while the starter of this same tube is connected to a voltage divider consisting of the resistances R_4, R_3 and R_1, in such a way that the permanent voltage present in the starter of V_2 is defined by the following equation:

$$V_{st}=\frac{V_{s1}(R_1+R_3)}{R_1+R_3+R_4}$$

wherein V_{st} is the voltage in the starter, in the absence of any signal on E of V_1, and V_{s1} is the rated feed voltage supplied by A_2.

Under these conditions, the starter voltage of V_2 is insufficient to ignite this tube.

If V_1 is now energised, the voltage drop across R_1 modifies the distribution of the voltages in the potentiometer chain R_1, R_3 and R_4, the voltage of the starter of V_2 suddenly increases and the tube ignites.

A voltage, the product of the current flowing in V_2 and the resistance R_5, occurs between the cathode of this tube and earth, and is in turn applied via a condenser C_2 to the starter of the tube V_2 of the next unit of the series and causes its ignition; this in turn causes ignition of the tube V_2 of the next tube, and so on for the whole series.

To provide impulses, each tube V_2 is associated with a condenser C_3, a resistance R_7 and a diode Z_1, and the impulses from all the units are fed along a common line A–B to a resistance R_z preceding the impulse-forming stage M–E.

It should be noted that the tube V_2 can be connected to V_1 by means of a capacitative coupling.

In this case the resistance R_3 is returned to earth and the cathode of V_1 connected to the starter of V_2 by a suitably dimensioned condenser.

The same applies to the connections between the tubes V_2 et seq., but the galvanic coupling indicated between V_1 and V_2 is generally preferred to this, as the inclusion of the starter current limiting resistance R_8 also enables the starter to be acted on through a second channel, this latter having a capacitative connection, and this enables a second signal to be conveyed to the starter, for verification purposes or for the sake of a second control action, for example.

Furthermore, the insertion of the condenser C between the starter and cathode of each of the series of tubes V_2 makes it possible to produce at these cathodes an alternating voltage which is superimposed on the direct voltage between cathode and earth of these tubes in the ignition state, and to obtain, in addition to the identification impulse, an alternating signal which can be used for all amplification purposes and for other control and verification purposes.

This alternating signal can be fed in through a condenser C_5, or via a transformer, not shown.

It should be noted that in place of the cold cathode tubes V_1 and V_2 use can be made of other types of relay such as thyratrons in a gaseous or solid state, four-layer diodes, transistors, parametric amplifiers or diodes of the tunnel-type, etc.

The system shown contains an electro-mechanical counting relay and an electromagnetic relay having the contact E_A.

The system can be rendered entirely non-mechanical by using cold cathode electronic meters, for example, in which the number of impulses received can be indicated by neon tubes, digital counting electronic tubes, dekatrons, trochotrons or strobotrons.

These counting devices, in general use in nuclear physics, can reach extremely high metering speeds, far beyond those required for the identification of a detection operation.

Facilities may be provided for precounting, i.e., for closing secondary circuits when a preselected quantity has been counted, which, in cases such as the detection of fire, enables automatic fire extinguishing devices to be put into operation.

The first detection impulse may be used for the blocking of hot cathode thyratrons or cold cathode gas relays, or of solid thyratrons (controlled rectifiers, as they are termed in English-speaking countries), which eliminates the feed voltage of the detectors.

It will be seen that:

(i) The number of signals counted immediately idenifies which of the detectors has been operated;

(ii) the detectors of the series are all placed out of action immediately a first detector has been operated, so that there cannot be any interference to the succession of signals by the subsequent operation of another detector very shortly after the operation of the first detector;

(iii) only a single common line is required to connect all of the detector and relay units to a central control point;

(iv) an alarm can be operated immediately upon formation of the first signal, e.g., by adding another pair of contacts on the relay K_A.

(v) as the relay circuits are entirely electronc and do not include electromechanical items, the production of the series of signals can be extremely rapid, which is of particular importance when many hundreds or even thousands of detectors may be connected to a single common line; this is of course particularly the case where the counting device is also an electronic device rather than an electromechanical device.

I claim:

1. A remote identification system comprising a plurality of electronic relay circuits capable upon actuation of producing a signal by discharge of a condenser, said plurality of circuits being coupled each to the next in a series such that actuation of any one of said circuits causes the actuation of the next following circuit of the series, a plurality of detectors each coupled electrically to a respective one of the relay circuits for actuation thereof when the detector operates, a common conductor connected to all of the relay circuits, and a counting device connected to said conductor for counting the number of signals received as a result of actuation of any relay circuit by the associated detector.

2. A remote identification system, as claimed in claim 1, wherein each relay circuit comprises a first electronic relay coupled to the associated detector so as to be triggered when the detector operates, a condenser and an associated charging circuit, and a second electronic relay coupled to the first relay and to the condenser for causing discharge of the condenser when triggered by the first relay.

3. A remote identification system, as claimed in claim 1, comprising means connected to the common conductor and to the plurality of electronic relay circuits and adapted upon reception of a signal to prevent, for a duration at least equal to the time required for two successive signals

to be generated, the subsequent actuation of an electronic relay circuit by its associated detector.

4. A remote identification system, as claimed in claim 1, wherein the counting device comprises a pulse-forming unit coupled to the common conductor for actuation by signals received from the plurality of electronic relay circuits, and an electro-mechanical counter coupled to the pulse unit for counting the pulses emitted by said unit.

5. A remote identification system, as claimed in claim 1, wherein the counting device is an electronic counter coupled to the common conductor.

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DONALD J. YUSKO, *Primary Examiner.*