

[54] **APPARATUS FOR DETERMINING THE CONCENTRATION OF COMBUSTIBLE GASES AND VAPORS**

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[58] **Field of Search**.....340/237; 73/27; 23/232 E, 254 E, 23/255 E

[56]

References Cited

UNITED STATES PATENTS

3,239,828	3/1966	Peterman	340/237 R
3,350,703	10/1967	Johnson	340/237 R
3,399,398	8/1968	Becker et al.	340/237 R

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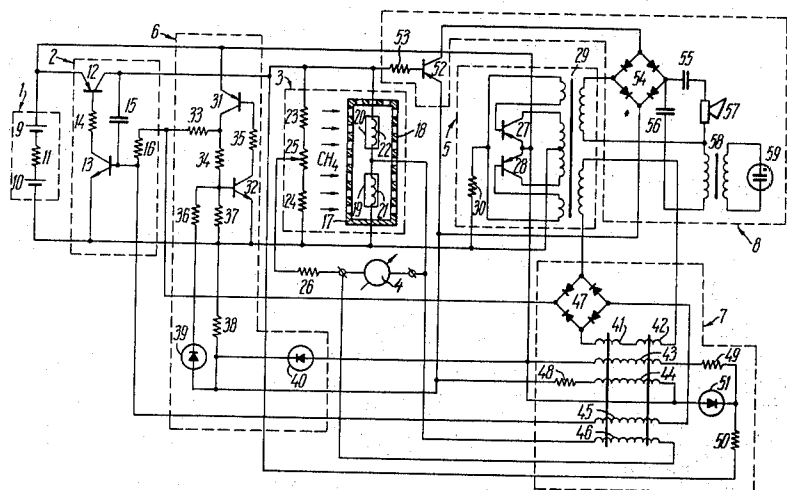
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[57]

ABSTRACT

An apparatus for determining the concentration of combustible gases and vapors in which there is a control relay which is electrically connected to an a.c. source and which accepts the signal proportional to the concentration of combustible gases and vapors from a catalytic-oxidation transducer and the output signal of which controls a single-shot multivibrator electrically connected to the catalytic-oxidation transducer and the self-contained d.c. voltage source in such a manner that at the critical concentration of combustible gases and vapors the single-shot multivibrator periodically disconnects the catalytic-oxidation transducer from the self-contained d.c. voltage source and at the same time turns on the alarm unit giving signals about the critical concentration of combustible gases and vapors.

2 Claims, 4 Drawing Figures



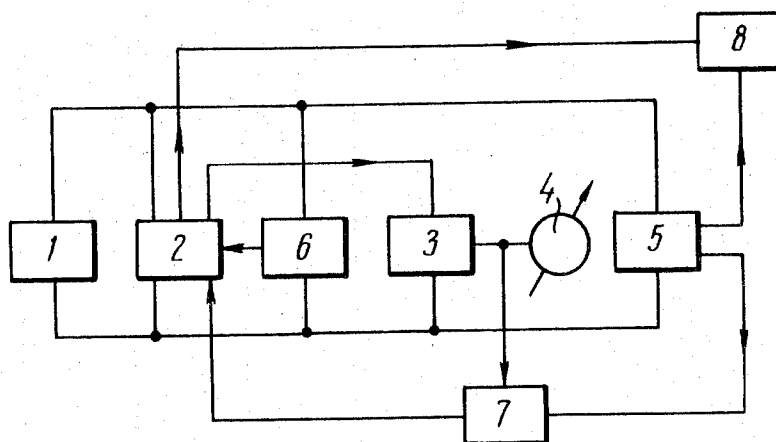


FIG. 1

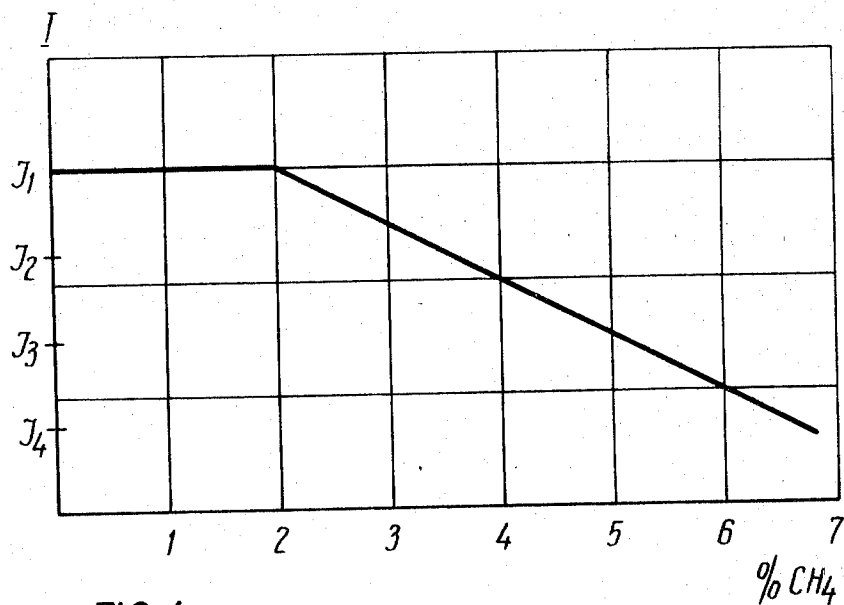


FIG. 4

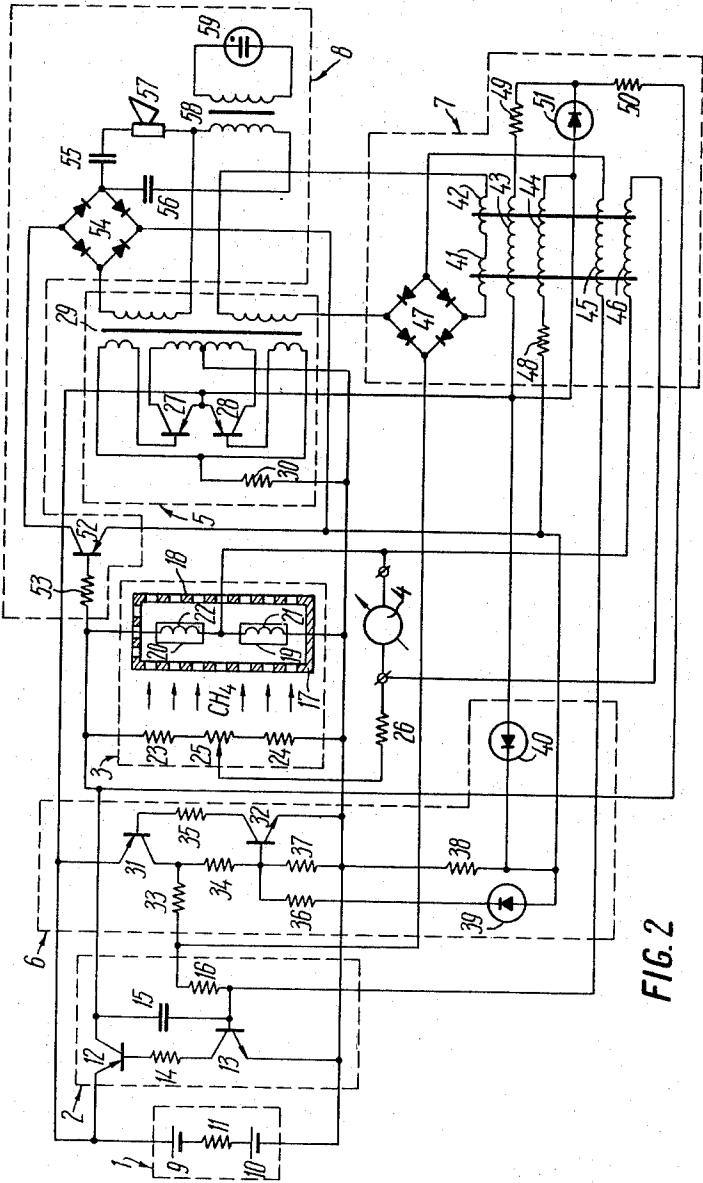


FIG. 2

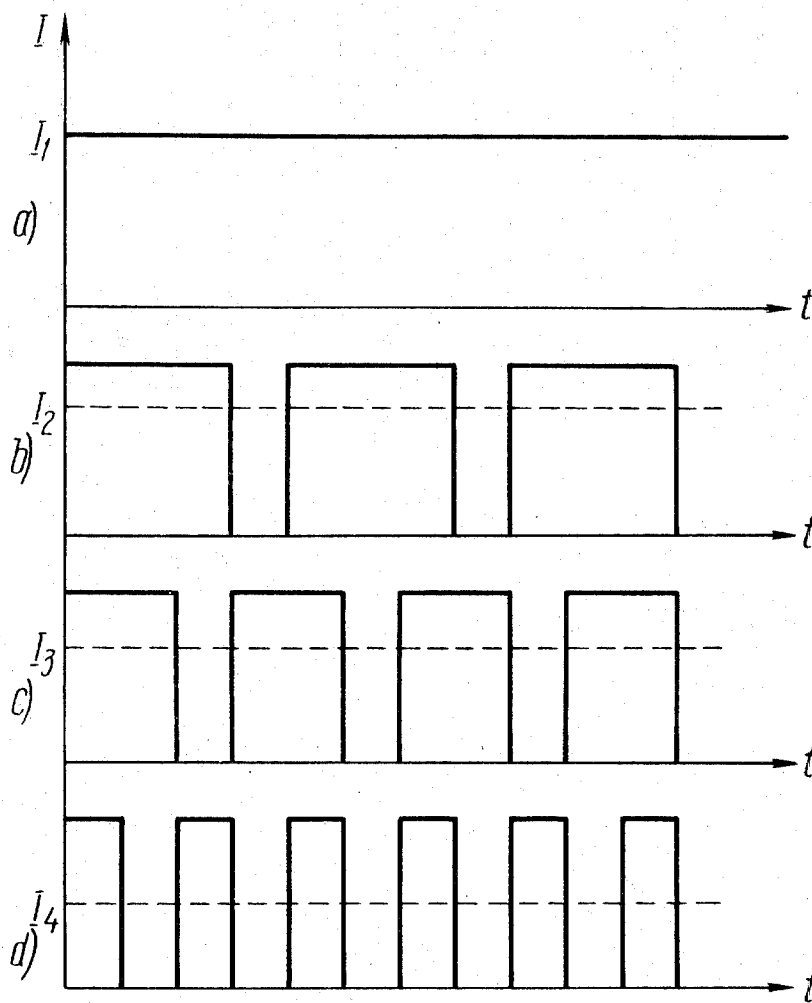


FIG. 3

APPARATUS FOR DETERMINING THE CONCENTRATION OF COMBUSTIBLE GASES AND VAPORS

The present invention relates to gas analyzers, and more specifically to apparatus for determining the concentration of combustible gases and vapors, predominantly firedamp (methane) in the atmosphere of collieries, and may be used in the chemical, oil-refining and other industries concerned with the production and utilization of combustible gases and vapors.

There exist instruments for determining the concentration of combustible gases and vapors, incorporating a self-contained d.c. voltage source electrically connected to a catalytic-oxidation transducer the output of which is connected to a meter, and an alarm to indicate the critical concentrations of combustible gases and vapors, powered by an a.c. source electrically connected to the self-contained d.c. voltage source.

In these instruments, the light and sound signals in the alarm unit are actuated by the contacts of the meter, which close just as the critical concentration of a gas or vapor has been reached. A check on the self-contained d.c. voltage source is provided by a separate contact voltmeter which, like the meter, has its contacts turn on the light and sound alarms in the same alarm unit when the source voltage drops below a preset value. In this way, the light and sound signals produced in both cases, that is, by the critical concentration of a gas or vapor and by the source voltage dropping below a preset value, are identical, that is, they cannot be discriminated visually or aurally.

Furthermore, these instruments have no provisions for protecting the heat-converting elements of the catalytic-oxidation transducer against overheating and, as a consequence destruction at the critical concentration of a gas or vapor in the measured atmosphere.

An object of the present invention is to provide an apparatus for determining the concentration of combustible gases and vapors which has provisions for automatically protecting the heat-converting elements of the catalytic-oxidation transducer against overheating at the critical concentration of combustible gases and vapors.

Another object of the present invention is to provide an apparatus for determining the concentration of combustible gases and vapors permitting subjective discrimination of the light and sound signals caused by a critical concentration or by a source voltage below a preset value.

Still another object of the present invention is to provide an apparatus for determining the concentration of combustible gases and vapors which permits also the identification of changes in the critical concentration of combustible gases and vapors that is, of its increase or decrease.

In view of these and other objects, the invention resides in that in an apparatus for determining the concentration of combustible gases and vapors, incorporating a self-contained d.c. voltage source electrically connected to a catalytic-oxidation transducer the output of which is connected to a meter, and an alarm unit giving signals at the critical concentration of combustible gases and vapors and powered by an a.c. voltage source electrically connected to the self-contained d.c. voltage source, there is, according to the invention, a control relay electrically connected to said a.c. voltage source and accepting the signal proportional to the concentration of combustible gases and vapors from the catalytic-oxidation transducer, and a single-shot multivibrator electrically connected to the catalytic-oxidation transducer and the self-contained d.c. voltage source and controlled by the output signal of the control relay in such a manner that at the critical concentration of combustible gases and vapors the single-shot multivibrator periodically disconnects the catalytic-oxidation transducer from the self-contained d.c. voltage source and simultaneously turns on the alarm unit.

It is preferable to provide in the apparatus disclosed herein an electronic relay electrically connected to the self-contained d.c. voltage source and acting upon the single-shot multivibra-

tor when the voltage of the self-contained d.c. source drops below a preset value in such a manner that the alarm unit is turned permanently on.

This arrangement of the apparatus disclosed herein enhances its reliability, portability, and service life.

Other objects and advantages of the present invention will be obvious from the following description of preferred embodiments when read in connection with the accompanying drawings wherein:

FIG. 1 is a block-diagram of an apparatus for determining the concentration of combustible gases and vapors, according to the invention;

FIG. 2 is a circuit schematic diagram of the same apparatus;

FIG. 3a, b, c, d are time waveforms of the current I through the catalytic-oxidation transducer of the apparatus disclosed herein, corresponding to various concentrations of combustible gases and vapors, methane in the case on hand;

FIG. 4 is a static characteristic of the current I through the catalytic-oxidation transducer of the apparatus disclosed herein, as a function of the concentration of the unknown gas (methane).

Referring to FIG. 1, there is an apparatus for determining the concentration of combustible gases and vapors, which, according to the invention, comprises a self-contained d.c. voltage source 1, a single-shot multivibrator 2, a catalytic-oxidation transducer 3 the output of which is connected to a meter 4, an a.c. voltage source 5, an electronic relay 6, a control relay 7, and an alarm unit 8 to produce signals at the critical concentration of combustible gases and vapors, in the case on hand methane.

At the same time, the catalytic-oxidation transducer 3 is electrically connected to the single-shot multivibrator 2 which is directly connected to the self-contained d.c. voltage source 1. The self-contained d.c. voltage source 1 is electrically connected to the a.c. voltage source 5 which powers the alarm unit 8 and the control relay 7 which accepts the signal proportional to the concentration of combustible gases and vapors from the catalytic-oxidation transducer 3. The output signal of the control relay 7 acts on the single-shot multivibrator 2 in such a manner that at the critical concentration of combustible gases and vapors the single-shot multivibrator 2 periodically disconnects the catalytic-oxidation transducer 3 from the self-contained d.c. voltage source 1 and at the same time turns on the alarm unit 8.

Furthermore, in the apparatus disclosed herein the self-contained d.c. voltage source 1 is electrically connected to the electronic relay 6 which, when the voltage of the self-contained d.c. source 1 drops below a preset value, acts on the single-shot multivibrator 2 in such a manner that the alarm unit 8 is turned permanently on.

The self-contained d.c. voltage source 1 (FIG. 2) comprises storage cells 9 and 10 series-connected via a resistor 11 which limits the current in the case of a short-circuit in the source.

The single-shot multivibrator 2 consists of a regulating transistor 12, a control transistor 13 of an opposite type of conduction as compared with the transistor 12, a resistor 14, a capacitor 15, and a resistor 16. The emitter of the transistor 12 is connected to the positive terminal of the self-contained d.c. voltage source 1. The base of the transistor 12 is connected via the resistor 14 to the collector of the transistor 13, the emitter of which is connected to the negative terminal of the self-contained d.c. voltage source 1. The capacitor 15 is placed between the collector of the transistor 12 and the base of the transistor 13. Also connected to the base of the transistor 13 is the resistor 16.

The catalytic-oxidation transducer 3 comprises a catalytic oxidation chamber made up by a base 17 and a flame-control grille 18, inside which are arranged an active heat-converting element 19 and a compensating heat-converting element 20, which in this particular case are two identical cylinders, say, of aluminum oxide, enclosing platinum spirals 21 and 22, and there are also resistors 23 through 25 located outside the chamber. The active heat-converting element 19, in contrast

to the compensating element, carries a finely dispersed platinum-palladium catalyst. The platinum spirals 21 and 22 simultaneously act as the heaters of the heat-converting elements 19 and 20, raising them to the working temperature, and as resistance thermometers measuring the thermal effect of the catalytic oxidation of combustible gases and vapors over the heat-converting element 19. The platinum spirals 21 and 22 together with the resistors 23 through 25 make up a d.c. bridge the indicator arm of which contains the meter 4 connected in series with a calibration resistor 26. The catalytic-oxidation transducer 3 draws its power from the self-contained d.c. voltage source 1 via the emitter-collector junction of the transistor 12 in the single-shot multivibrator 2.

The a.c. voltage source 5 is an inverter which converts the d.c. voltage furnished by the self-contained source 1 into an alternating voltage, and consists of transistors 27 and 28 arranged into a common-emitter configuration, a transformer 29, and a resistor 30 placed between the center tap on the feedback winding of the transformer 29 and the negative terminal of the self-contained d.c. voltage source 1. The a.c. voltage source 5 draws its power directly from the self-contained d.c. voltage source 1.

The electronic relay 6 is a flip-flop circuit built around transistors 31 and 32 having complementary types of conduction, resistors 33 through 38, and Zener diodes 39 and 40. The series-connected Zener diodes 39 and 40, the resistors 36 and 37, and the resistor 38 placed between the common junction of the said Zener diodes and the negative terminal of the self-contained d.c. voltage source 1 operate as a non-linear divider of the voltage furnished by the source 1. The base of the transistor 31 is connected to the collector of the transistor 32 via a limiting resistor 35. Similarly, the base of the transistor 32 is connected to the collector of the transistor 31 via a feedback resistor 34. The collector of the transistor 31 is connected also to the resistor 33 series-connected with the resistor 16 of the single-shot multivibrator 2. The input of the transistor 32 is connected to the resistor 37. The electronic relay 6 draws its power directly from the self-contained d.c. voltage source 1.

In the apparatus disclosed herein, the control relay 7 is of the static type using magnetically soft cores with a rectangular B/H characteristic, on which are wound gate windings 41 and 42, an additional bias winding 43, a main bias winding 44, a feedback winding 45, and a control winding 46. The control relay 7 also comprises a diode bridge rectifier circuit 47, resistors 48 through 50, and a Zener diode 51. The series-connected gate windings 41 and 42 are energized through the a.c. arm of the diode bridge rectifier circuit 47 from one of the secondaries of the transformer 29 in the a.c. voltage source 5. On one side, the bias windings 43 and 44 are connected to the positive terminal of the self-contained d.c. voltage source 1, while the other side of the bias winding 43 is connected via the series combination of the resistors 49 and 50 to the collector of the transistor 12 in the single-shot multivibrator 2. The Zener diode 51 is placed between the common junction of the bias windings 43 and 44 and the common junction of the resistors 49 and 50. The other side of the bias winding 44 is connected via a resistor 48 to the common junction of the Zener diodes 39 and 40 and the resistor 38 in the electronic relay 6. The feedback winding 45 is series-connected with the d.c. arm of the diode bridge rectifier circuit 47 and the resistor 16 of the single-shot multivibrator 2. The control winding 46 is connected in parallel with the meter 4.

The alarm unit 8 giving signals at the critical concentration of combustible gases and vapors consists of a transistor 52, a resistor 53, a diode bridge rectifier circuit 54, capacitors 55 and 56, a siren 57, a transformer 58, and a neon lamp 59. The alarm unit 8 draws its power from the other secondary of the transformer 29 in the a.c. voltage source 5, connected to one junction of the a.c. arm of the diode bridge rectifier circuit 54 and to the common junction of the siren 57 and one side of the primary of the transformer 58. The other junction of the a.c. arm of the diode bridge rectifier circuit 54 is connected via the

capacitor 55 to the siren 57 and also via the capacitor 56 to the other side of the primary of the transformer 58. The secondary of the transformer 58 is connected to the neon lamp 59. The diode bridge rectifier circuit 54 together with the collector-emitter junction of the transistor 52 the base of which is connected via the resistor 53 to the collector of the transistor 12 in the single-shot multivibrator make up a static a.c. switch. The emitter of the transistor 52 is connected to the common junction of the Zener diodes 39 and 40 in the electronic relay 6.

Operation of the apparatus for determining the concentration of combustible gases and vapors disclosed herein consists in the following.

With the self-contained d.c. voltage source 1 connected to the apparatus disclosed herein, its voltage is impressed on the single-shot multivibrator 2, the a.c. voltage source 5, and the electronic relay 6 directly, and to the catalytic-oxidation transducer 3 via the collector-emitter junction of the transistor 12 in the single-shot multivibrator 2. If the d.c. voltage furnished by the self-contained source 1 exceeds a preset value, the electronic relay 6 will be in the ON state. At the same time, the bias voltage applied via the conducting transistor 31 of the electronic relay 6 and the resistors 33 and 16 drives the transistor 13 and, as a consequence, the transistor 12 into conduction, because its base circuit is traversed by the collector current of the transistor 13. Through the conducting collector-emitter junction of the transistor 12 practically all of the d.c. voltage furnished by the self-contained source 1 is applied across the supply arm of the catalytic-oxidation transducer 3.

The atmosphere surrounding the catalytic-oxidation transducer 3 and containing combustible gases and vapors, in the case on hand methane as already noted, flows around the heat-converting elements 19 and 20 owing to free convection through the grill 18.

In the detection mode of operation of the apparatus, that is, at a concentration of combustible gases and vapors (methane) in the surrounding atmosphere not exceeding its critical value (for example, equal to or less than 2 percent CH_4), the output signal of the catalytic-oxidation transducer 3 is insufficient to cause the control relay 7 to operate (in this case, the concentration of combustible gases and vapors is indicated by the meter 4).

At the critical concentration of combustible gases and vapors (in excess of 2 percent CH_4), the output signal of the catalytic-oxidation transducer 3 rises to a value sufficient to cause operation of the control relay 7 the output voltage of which, developed across the resistor 16, is applied to the input of the transistor 13. As a result, the transistor 13 and, as a consequence, the transistor 12 switch from saturation to amplification. The rise in negative potential at the collector of the transistor 12 caused by this transition is transferred via the capacitor 15 to the base of the transistor 13 and brings about a cumulative action which drives the two transistors to cut-off.

The duration of the OFF state of the transistors 12 and 13 is determined by the time constant of the capacitor 15 in discharge. During this span of time, the self-contained d.c. voltage source 1 is disconnected by the blocked collector-emitter junction of the transistor 12 from the catalytic-oxidation transducer 3 the output signal of which is therefore brought to zero, and the control relay 7 is de-energized.

After the capacitor 15 has discharged, the single-shot multivibrator 2 is restored to its starting condition, and the d.c. voltage furnished by the self-contained source 1 is again applied to the catalytic-oxidation transducer 3. If the concentration of combustible gases and vapors in the measured atmosphere still exceeds the critical value, the control relay 7 operates again, and the sequence just described is repeated all over again. The stabilization of the current in the bias winding 44 of the control relay, improving its accuracy of operation, is effected by the Zener diode 40 in the electronic relay 6. For this purpose, the bias winding 44 is connected via the resistor 48 in parallel with the Zener diode 40. The shunting action of

the bias winding 44 reduces the current flowing through the Zener diode 40 and might upset its stabilizing action (especially when the self-contained source 1 furnishes a reduced d.c. voltage). This is prevented from happening by the resistor 38 which maintains the current through the Zener diode 40 at a normal level.

To speed up operation, the control relay 7 comprises, as already noted, the additional bias winding 43 which, when the single-shot multivibrator is in the OFF state, draws its power from the self-contained d.c. voltage source 1 via the resistors 50 and 49.

When the single-shot multivibrator 2 is in the initial state, the alarm unit 8 is OFF, because a cut-off voltage is applied to the base-emitter junction of the transistor 52 in the a.c. static switch via the resistor 53, and the blocked collector-emitter junction of this transistor disconnects the siren 57 and the transformer 58 of the neon lamp 59 (the light and sound signals) from the a.c. voltage source.

As the single-shot multivibrator 2 operates, the polarity of the voltage applied to the base-emitter junction of the transistor 52 is reversed, the a.c. static switch is driven to conduction, the light and sound signals are actuated.

In this way, when the concentration of combustible gases and vapors (methane) exceeds its critical value, the single-shot multivibrator 2 is periodically turned off, and at the same time the catalytic-oxidation transducer 3 is disconnected from its supply source and the alarm unit 8 is turned on. Since the control relay 7 is subject to a time lag, its operate time, with the time constant of the control circuit remaining unchanged, depends on how much the control signal coming from the catalytic-oxidation transducer 3 exceeds the actuating signal corresponding to the critical concentration of combustible gases and vapors. Therefore, as the output signal of the catalytic-oxidation transducer 3 grows in magnitude, that is, as the concentration of combustible gases and vapors (methane) increases, the separation between two consecutive OFF states of the single-shot multivibrator 2 decreases, and the light and sound signals are turned on and off at a higher rate.

The relationships described above are illustrated by the time waveforms of the current $I = f(t)$ flowing in the catalytic-oxidation transducer 3 and varying with the concentration of combustible gases and vapors, shown in FIG. 3 where the time t is laid off as abscissa and the current I of the catalytic-oxidation transducer 3 is laid off as ordinate. As is seen, at concentrations of combustible gases and vapors not exceeding the critical value and current in the catalytic-oxidation transducer 3 flows continuously, as shown by the time waveform ($I_1 = \text{constant}$) in FIG. 3a. In this case, the effective and amplitude values of the current flowing the catalytic-oxidation transducer 3 are the same and equal to I_1 . FIGS. 3b, c and d show time waveforms of the current flowing through the catalytic-oxidation transducer 3 at concentrations of combustible gases and vapors exceeding the critical value (I_2 , I_3 , and I_4 , respectively). The waveforms are arranged in increasing order of concentrations, namely, a applies to the detection range (for example, not over 2 per cent CH_4), while b, c and d) apply to the range of critical concentrations, that is, those which exceed the said detection range.

As follows from the above-quoted time waveforms, in the alarm range the current in the catalytic-oxidation transducer 3 flows intermittently and in such a manner that as the concentration of combustible gases and vapors increases the separation between consecutive ON periods of the current remains constant, the rate at which the light and sound signals are actuated increases (as shown in FIGS. 3b, c and d), and the effective value of the current flowing through the catalytic-oxidation transducer 3 decreases in proportion ($I_4 < I_3 < I_2 < I_1$).

This decrease in the effective value of the current flowing through the catalytic-oxidation transducer 3 at above-critical concentrations of combustible gases and vapors ensures a reliable protection of the heat-converting elements 19 and 20 against overheating due to the increased catalytic yield of heat and, at the same time, improves the utilization of the self-con-

tained d.c. voltage source 1. This prevents the premature wear of the heat-converting elements 19 and 20 and related departures from the calibration curve of the apparatus.

The manner in which the effective value of the current flowing through the catalytic-oxidation transducer 3 varies with increasing concentrations of combustible gases and vapors (methane) is illustrated by the static characteristic plot of FIG. 4 where the concentration of methane (CH_4) in per cent (by volume) is laid off as abscissa, and the effective component of the current I flowing through the catalytic-oxidation transducer 3 at the concentrations of methane in the detection range (less than or equal to 2 percent CH_4) and at the concentrations within the critical range (greater than 2 percent CH_4) is laid off as ordinate.

The apparatus disclosed herein is designed to operate continuously during ten hours. After this span of time, the d.c. voltage furnished by the self-contained source 1 will have dropped to an intolerably low level. In such a case, the catalytic-oxidation transducer 3 will automatically be disconnected from its supply source, and the alarm unit 8 will remain permanently on, thereby indicating that the voltage of the self-contained source 1 has dropped below a preset value. This purpose is served by the electronic relay 6 the state of which is controlled by the non-linear divider of the voltage furnished by the self-contained source 1. The difference between the d.c. voltage of the self-contained source 1, varying in the course of operation, and the fixed sum of the reference voltages furnished by the Zener diodes 39 and 40 is applied to the series-connected resistors 36 and 37. At the same time, the relative change in the voltage drop across the resistor 37 greatly exceeds the relative change in the d.c. voltage furnished by the self-contained source 1, and this improves the accuracy of operation of the electronic relay 6 when the d.c. voltage of the self-contained source drops below a preset value.

The electronic relay 6 operates as follows. When the self-contained source 1 furnishes the normal d.c. voltage, the voltage drop across the resistor 37 is sufficient to keep the transistors 31 and 32 conducting. At the same time, the bias voltage applied through the conducting transistor 31 and the resistors 33 and 16 drives the transistor 13 and, as a consequence, the transistor 12 into conduction, with the collector current of the transistor 13 flowing in the base circuit of the transistor 12. As a result, the d.c. voltage of the self-contained source 1 is applied through the unblocked collector-emitter junction of the transistor 12 to the supply arm of the catalytic-oxidation transducer 3, and the apparatus disclosed herein operates as already described.

Should the d.c. voltage of the self-contained source 1 drops below a preset value, the voltage drop across the resistor 37 suddenly decreases, and the transistors 31 and 32 are driven to cut-off at a very high rate, thereby removing the bias voltage from the transistor 13. As a result, the transistors 12 and 13 are driven to cut-off, disconnecting the self-contained d.c. voltage source 1 from the catalytic-oxidation transducer 3. At the same time, the light and sound signals are turned permanently on, indicating that the d.c. voltage of the self-contained source 1 has dropped below a preset value.

The light and sound signals are turned permanently on by the control relay 7 also when the catalytic-oxidation transducer 3 and some other elements of the apparatus have been damaged, thereby providing an effective self-check on its serviceability.

The apparatus disclosed herein is made fully static and ensures reliable protection of the heat-converting elements of the catalytic-oxidation transducer against overheating at concentrations of combustible gases and vapors exceeding the critical value. In this way, the premature wear of the heat-converting elements and the related departures from the calibration characteristic of the apparatus are prevented.

The apparatus disclosed herein provides a means for subjective identification of changes in the critical concentration of combustible gases and vapors (its increase or decrease) on the

basis of variations in the rate at which the light and sound signals are turned on and off according to the amount by which the critical concentration has been exceeded.

The sparing utilization of the self-contained d.c. voltage source in the alarm mode of operation makes it possible to design the apparatus disclosed herein as a portable one.

What is claimed is:

1. An apparatus for determining the concentration of combustible gases and vapors, comprising: a self-contained d.c. voltage source; an a.c. voltage source electrically connected to said self-contained d.c. voltage source; a catalytic-oxidation transducer electrically connected to said self-contained d.c. voltage source; a meter connected to the output of said catalytic-oxidation transducer; a control relay electrically connected to said a.c. voltage source and accepting the signal proportional to the concentration of said combustible gases and vapors from said catalytic-oxidation transducer; an alarm unit

which gives signals at the critical concentration of said combustible gases and vapors; a single-shot multivibrator electrically connected to said catalytic-oxidation unit and said self-contained d.c. voltage source and controlled by the output signal of said control relay in such a manner that at the critical concentration of said combustible gases and vapors said single-shot multivibrator periodically disconnects said catalytic-oxidation transducer from said self-contained d.c. voltage source and at the same time turns on said alarm unit.

2. An apparatus, as claimed in claim 1, which has an electronic relay which is electrical connected to said self-contained d.c. voltage source and which acts upon said single-shot multivibrator when the voltage of said self-contained d.c. voltage source has dropped below a preset value in such a manner that said alarm unit is turned permanently on.

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