

12

EUROPEAN PATENT APPLICATION

21 Application number: **86308434.9**

51 Int. Cl.⁴: **G 08 B 17/10**

22 Date of filing: **29.10.86**

30 Priority: **31.10.85 GB 8526892**

43 Date of publication of application:
13.05.87 Bulletin 87/20

64 Designated Contracting States: **CH DE GB LI**

71 Applicant: **Gent Limited**
Temple Road
Leicester LE5 4JF (GB)

72 Inventor: **Ellwood, Stephen Henry**
95 Halstead Road
Mountsorrell Leicestershire, LE12 7HE (GB)

Appleby, David
5 School Walk Kibworth
Beauchamp Leicestershire (GB)

Brown, Stephen
6 Salcombe Close Wigston
Leicester Leicestershire (GB)

74 Representative: **Lightfoot, Robert Oscar et al**
Raworth, Moss & Cook 36 Sydenham Road
Croydon Surrey, CR0 2EF (GB)

54 Ionisation detection chamber.

57 An ionisation detection chamber for detecting the presence of small particulate solids, such as smoke particles, carried in a gaseous stream comprising an electrically insulating base, a first, measuring, electrode carried by the base, means for ionising gas associated with a central region of the measuring electrode, a second, negative, electrode comprising a metal grid disposed over the base and together with the base defining the chamber and a third, positive, electrode located in register with the ionisation means and nearer to the measuring electrode than to the negative electrode characterised in that the third electrode comprises at least one element extending generally parallel with the measuring electrode and carried by an electrically insulating member supported by the base.

Description

Ionisation Detection Chamber

This invention relates to an ionisation detection chamber for detecting the presence of small particulate solids, such as smoke particles, carried in a gaseous stream.

It is now commonplace to construct such chambers with three electrodes; an ionisation source being attached to one electrode and a second electrode being disposed nearer the ionisation source than the third electrode. Depending upon the detailed construction of the chamber the ionisation source may be attached to the measuring electrode or one of the other electrodes. In all such arrangements the chamber is effectively divided into two intercommunicating sub-chambers one of which provides much greater sensitivity of detection than the other and the likelihood of a spurious alarm is reduced as compensation for changes in temperature pressure and other non smoke conditions is provided. At regular intervals it is necessary to clean the electrodes and insulation spacers to ensure that a predetermined sensitivity is maintained. This sensitivity can be seriously affected by dirt and the bodies of insects.

In one prior construction a flat negative electrode is mounted on an insulated base with a wafer-like ionisation source disposed centrally thereon. A positive electrode in the form of a dome-like metal part which may be a grid or perforated sheet is disposed over the base to define the chamber and a measuring electrode in the form of an apertured disc is disposed above and nearer to the negative electrode than the grid with the aperture in the disc in register with the ionisation source. Such an arrangement is operationally satisfactory but when cleaning or servicing is required both the grid and the measuring electrode must be removed. Reassembly frequently results in a change of electrode spacing which affects sensitivity and reduces long term reliability.

In another arrangement typified in U.K. patent specifications 1581236 and 1603702, granted to predecessors of the present applicants, the positive electrode is in the form of a rod extending through an insulated mount carried by the grid which in this case is the negative electrode. A flat electrode, in this case the measuring electrode, is mounted on the base and carries the wafer-like ionisation source in register with the inner end of the positive electrode. Again this arrangement is operationally satisfactory and it has an advantage over the construction described above. Should the creep path between the flat electrode and the grid become spuriously conductive then because the flat electrode is the measuring electrode and the grid is negative it provides a decrease in signal level which makes it possible for an auxiliary alarm circuit to be activated to indicate that the particular chamber is faulty.

However, the arrangements of the U.K. specifications 1581236 and 1603702 are expensive to manufacture since the grid needs to be a structural

element carrying the mount and the positive electrode and there is also a requirement for carrying an electrical connection around the outside of the grid. Also during cleaning and maintenance, removal and replacement of the grid can modify the position of the inner end of the positive electrode relative to the ionisation source so altering the sensitivity of the chamber.

It is an object of the present invention to provide an improved ionisation detection chamber which is comparatively easy and inexpensive to manufacture; may readily be cleaned and maintained without alteration of electrode spacing and will fail safe.

According to the present invention there is provided an ionisation detection chamber for detecting the presence of small particulate solids, such as smoke particles, carried in a gaseous stream comprising an electrically insulating base, a first, measuring, electrode carried by the base, means for ionising gas associated with a central region of the measuring electrode, a second, negative, electrode comprising a metal grid disposed over the base and together with the base defining the chamber and a third, positive, electrode located in register with the ionisation means and nearer to the measuring electrode than to the negative electrode characterised in that the third electrode comprises at least one element extending generally parallel with the measuring electrode and carried by an electrically insulating member supported by the base.

One embodiment of the invention will now be described by way of example with reference to the accompanying drawings in which:-

Fig. 1 shows a vertical section through an ionisation detection chamber of a smoke detector and

Fig. 2 is a plan view of the chamber with the grid removed.

Referring to the drawings an electrically insulated base 1 carries a measuring electrode indicated generally at 2, a positive electrode indicated generally at 3 and a negative electrode 4 in the form of a dome-like metal grid removably carried on the base 1 and constituting an insect screen. The electrode 4, together with base 1 defines an ionisation chamber. It will be understood that the chamber will be mounted in a casing (not shown) incorporating suitable apertures for the passage of smoke into the chamber and extra wind baffles. Usually the chamber will be mounted on a ceiling so as to be upside down relative to the disposition shown in Fig. 1.

The base 1 is a high density polyethylene moulding on the lower surface 5 of which is a metal cover 6 which is at the same electrical potential as the grid 4 to act as an electrical screen. The cover 6 may be constituted by a conductive coating applied to the moulding.

The measuring electrode 2 comprises a stainless steel disc 7 fixed at 8 and 9 to the base 1 and formed with a central dished part 10 extending into a recess

11 in the base. A stainless steel cover disc 12 formed with a central aperture 13 is secured to the disc 7 in good electrical contact therewith. The aperture 13 is smaller than the dished part 10 and a wafer-like ionisation source comprising an Americium $^{241}\alpha$ particle emitter 14 is trapped within the recess. The disc 7 is formed with diametral apertures 15 and 16 in register with slots 17 and 18 formed in the edges of cover disc 12. A connector 19 extends through an aperture 20 in the base 1 and is soldered at 21 to the disc 12.

The positive electrode 3 comprises an electrically insulated cylindrical mount 22 with a moulded in electrode 23 the lower part 24 of which constitutes a connection to the circuit and the upper part 25 of which is the active positive electrode. This upper part 25 extends parallel with the electrode 2 diametrically in register with the emitter 14 and is nearer thereto than the nearest part of the negative electrode 4. The mount 22 has a cylindrical lower part 26 extending through an aperture 27 in the base. Above the part 26 the mount has an eccentric formation 28 to ensure precise orientation relative to the base.

An insulating wall 29 surrounds the mount 22, which acts to increase the insulating path between the upper part 25 of the positive electrode and the measuring electrode 2. This effectively reduces the effect of contamination on the sensor. The wall may be a separate PTFE or similar material ring which is moulded into the insulated base. Alternatively, it may be constituted by a raised feature on the moulding.

A small wall 30 surrounds the measuring electrode 2 and acts to increase the insulating path between the measuring electrode and the negative electrode 4. The wall 30 is moulded as part of the insulated base 1 and may be augmented by the addition of more concentric walls (not shown).

A larger wall 31 also acts to increase the insulating path between the measuring electrode 2 and the negative electrode 4. Its main purpose, however, is to act as a baffle and so reduce the effect of air flow across the sensor.

It has been found that the above arrangement operates in the same way as the construction described in U.K. specification 1581236 but provides greater flexibility in the arrangement of the positive electrode. Although this has been shown as a single rod extending diametrically of the emitter 14 it could have other configurations and could also be wholly or partly offset with respect to the emitter. More particularly, however, for cleaning and maintenance, upon removal of the negative electrode 4, access can be gained to the remaining electrodes without physical disturbance thereof. Furthermore the grid 4, constituting the negative electrode can be of light weight construction.

In addition the arrangement is "fail safe" as the shortest path from the emitter to another electrode is to the positive electrode causing an increase in signal level should the chamber become contaminated.

Claims

1. An ionisation detection chamber for detecting the presence of small particulate solids, such as smoke particles, carried in a gaseous stream comprising an electrically insulating base, a first, measuring, electrode carried by the base, means for ionising gas associated with a central region of the measuring electrode, a second, negative, electrode comprising a metal grid disposed over the base and together with the base defining the chamber and a third, positive, electrode located in register with the ionisation means and nearer to the measuring electrode than to the negative electrode characterised in that the third electrode comprises at least one element extending generally parallel with the measuring electrode and carried by an electrically insulating member supported by the base.

2. A chamber as described in claim 1 in which the third electrode is formed by at least one rod-like element.

3. A chamber according to claim 1 or claim 2 in which the insulating base has an electrical screen at the same potential as the grid.

4. A chamber according to any one of the preceding claims in which the measuring electrode has a dished part covered by a member having an aperture in register with the dished part, a wafer-like ionisation source being trapped within the recess below the member.

5. A chamber according to claim 4 in which the source is an Americium $^{241}\alpha$ particle emitter.

6. A chamber according to claim 4 or claim 5 in which the positive electrode extends parallel with the measuring electrode in register with the source and nearer thereto than the nearest part of the negative electrode.

7. An ionisation detection chamber substantially as herein described with reference to Fig. 1 and Fig. 2 of the accompanying drawing.

FIG. 2 is a top-down view of a circular device. It features several concentric rings. The outermost ring is labeled 1. Inside it is a ring labeled 2. Further inward is a ring labeled 30. The central area contains various components: a central circular element labeled 12, a horizontal bar labeled 13, and a circular element labeled 14. Other components include 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 31, and 32. The device is shown in a perspective view, with the rings appearing to curve upwards.

Notre document déposé