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(54) **TEST SOURCE FOR FLAME DETECTORS**

TESTQUELLE FÜR FLAMMENDETEKTOR

SOURCE D'ESSAI POUR DETECTEURS DE FLAME

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Description

[0001] The present invention relates to a test source for flame detectors, and relates particularly, but not exclusively, to a source of infrared radiation for testing infrared flame detectors used for detecting hydrocarbon fires.

[0002] Infrared flame detectors for use in detecting hydrocarbon fires, such as on oil rigs, are designed to respond to a narrow band of flickering infrared emission at approximately 4.4 μm. Radiation outside of the band of interest around the wavelength 4.4 μm is rejected by means of narrow band pass optical filters and may, with the aid of additional processing, be used to identify false alarms and thermal sources.

[0003] In order to test such devices, efficient and convenient sources of modulated 4.4 μm radiation are required. Known test equipment such as US 4,864,146 uses incandescent or hot "black body" sources, which are repeatedly energised or mechanically modulated to simulate the flicker of a fire. However, such known sources suffer from the drawback that they have a significant thermal inertia, which limits the available modulation depth, which in turn restricts the effective range of the test equipment, typically to less than one metre. As a result, known test equipment suffers from the drawback that expensive scaffolding needs to be erected in inaccessible locations such as on oil rigs in order for the low energy test equipment to be used.

[0004] Preferred embodiments of the present invention seek to overcome the above disadvantages of the prior art.

[0005] According to an aspect of the present invention, there is provided an infrared radiation source comprising a discharge chamber containing a plurality of electrodes and a mixture of gases including carbon dioxide, wherein said source is adapted to emit infrared radiation in the wavelength range 4 μm to 5μm in response to application of a predetermined electrical signal between a plurality of said electrodes.

[0006] By providing an infrared radiation source in which a mixture of gases is adapted to emit radiation in the 4 μm to 5 μm wavelength range in response to electrical excitation, this provides the advantage that the source can be more rapidly and deeply modulated than prior art devices, which in turn extends the effective range of use of the device. The invention also has the further advantage that little radiation outside of the wavelength band of interest is produced.

[0007] The discharge chamber may further contain carbon monoxide and/or nitrogen gas.

[0008] The source may be adapted to emit infrared radiation in the wavelength range 4.2 μm to 4.5 μm.

[0009] The discharge chamber may be at least partially formed from material allowing at least partial passage of infrared radiation therethrough.

[0010] At least one said electrode may be adapted to resist changes in relative proportions of said mixture of gases.

[0011] At least one said electrode may.include nickel.

[0012] At least one said electrode may include copper.

[0013] At least one said electrode may include oxidised copper.

[0014] At least one said electrode may include cupro-nickel.

[0015] According to another aspect of the present invention, there is provided an apparatus for testing infrared flame detectors, the apparatus comprising:-

an infrared radiation source as defined above; and

control means for applying said predetermined electrical signal between a plurality of said electrodes.

[0016] According to a further aspect of the present invention, there is provided an infrared flame detector including an apparatus as defined above.

[0017] The detector may be adapted to reject repetitively modulated infrared radiation.

[0018] Preferred embodiments of the present invention will now be described, by way of example only and not in any limitative sense, with reference to the accompanying drawings in which:-

Figure 1 is a cross-sectional schematic view of an infrared discharge tube of a first embodiment of the present invention;

Figure 2 is a cross-sectional schematic view of an infrared discharge tube of a second embodiment of the present invention;

Figure 3 is a schematic view of the discharge tube of Figure 1, together with electrical circuitry necessary to excite the tube; and

Figure 4 is a cross-sectional schematic view of the discharge tube of Figure 1, together with optical components.

[0019] Referring to Figure 1, an infrared discharge tube has a body 1 formed from a material, typically sapphire, generally transparent to infrared radiation of between 4 μm and 5μm, and electrodes 2, 3 formed from a non-reactive or catalytic metal, such as nickel, cupro-nickel or oxidised copper. The body 1 forms a gas tight enclosure, and is evacuated of air and refilled with a mixture of carbon monoxide, carbon dioxide and nitrogen gas. The proportions and pressures of gases in the body 1 are adjusted depending upon the intended use of the source, but are generally in the order of 100mBar for a low energy source capable of stimulating a detector (for example in the case of optical integrity testing), and may be several tens of Bar for a high energy source suitable for use over several tens of metres. The tube is then sealed, and when a high voltage is applied between elec-

trodes 2, 3 an arc is generated across a spark gap 4 between electrodes 2, 3. The metal of the electrodes 2, 3 is chosen so as to resist changes in relative proportions of the constituent gases of the mixture of gases in the tube.

[0020] Referring to Figure 2, which shows a tube of a second embodiment of the invention, the bulk of the discharge containment is constructed from a material, such as the same material forming electrodes 6, 7, and not necessarily a material transparent to infrared radiation, but is provided with windows 5 of a material generally transparent to infrared radiation around the arc in spark gap 8.

[0021] Referring now to Figure 3, the discharge tube is excited by means of a high voltage AC or DC source 9 modulated by switching equipment and an oscillator 11. Where a pseudo random flicker is required, a programmable flame simulator 10 provides a stored programme of a typical fire signal. Once initiated, the discharge may be maintained either with a continuous high voltage or, after ignition, may be sustained with a low voltage high current supply. Power is supplied to the power supply 9 by means of a battery 12 in order to make the apparatus portable.

[0022] Referring now to Figure 4, infrared radiation emitted by the tube of Figure 1 when excited is collimated into a beam by means of a suitable parabolic reflector 13 and/or a lens system 14, to increase the effective range of the device for any given input power.

[0023] It will be appreciate by persons skilled in the art that the above embodiments have been described by way of example only and not in any limitative sense, and that various alterations and modifications are possible without departure from the scope of the invention as defined by the appended claims.

Claims

1. An infrared radiation source comprising a discharge chamber containing a plurality of electrodes and a mixture of gases including carbon dioxide, wherein said source is adapted to emit infrared radiation in the wavelength range 4 μm to 5μm in response to application of a predetermined electrical signal between a plurality of said electrodes.

2. A source according to claim 1, wherein the discharge chamber further contains carbon monoxide and/or nitrogen gas.

3. A source according to claim 1 or 2, wherein the source is adapted to emit infrared radiation in the wavelength range 4.2 μm to 4.5 μm.

4. A source according to any one of the preceding claims, wherein the discharge chamber is at least partially formed from material allowing at least partial passage of infrared radiation therethrough.

5. A source according to any one of the preceding claims, wherein at least one said electrode is adapted to resist changes in relative proportions of said mixture of gases

6. A source according to claim 5, wherein at least one said electrode includes nickel.

7. A source according to claim 5 or 6, wherein at least one said electrode includes copper.

8. A source according to claim 7, wherein at least one said electrode includes oxidised copper.

9. A source according to claims 6 and 7, wherein at least one said electrode includes cupro-nickel.

10. An apparatus for testing infrared flame detectors, the apparatus comprising:-

    an infrared radiation source according to any one of the preceding claims; and
    control means for applying said predetermined electrical signal between a plurality of said electrodes.

11. An infrared flame detector including an apparatus according to claim 10.

12. A detector according to claim 11, wherein the detector is adapted to reject repetitively modulated infrared radiation.

Patentansprüche

1. Eine Infrarotstrahlungsquelle, umfassend einen Entladungsraum, welcher eine Vielzahl von Elektroden und ein Gasgemisch aufweist, enthaltend Kohlendioxid, wobei die Quelle geeignet ist, um als Antwort auf ein Anlegen eines vorbestimmten elektrischen Signals zwischen einer Vielzahl der Elektroden Infrarotstrahlung in dem Wellenlängenbereich von 4 μm bis 5 μm zu emittieren.

2. Eine Quelle gemäß Anspruch 1, wobei der Entladungsraum des Weiteren Kohlenmonoxid und/oder Stickstoffgas enthält.

3. Eine Quelle gemäß Anspruch 1 oder 2, wobei die Quelle geeignet ist, um Infrarotstrahlung in dem Wellenlängenbereich von 4,2 μm bis 4,5 μm zu emittieren.

4. Eine Quelle gemäß einem der vorherigen Ansprüche, wobei der Entladungsraum zumindest teilweise

aus einem Material gefertigt ist, welches zumindest teilweise Durchtritt der Infrarotstrahlung zulässt.

5. Eine Quelle nach einem der vorherigen Ansprüche, wobei mindestens eine der Elektroden geeignet ist, um Änderungen der relativen Verhältnisse in dem Gasgemisch zu widerstehen.

6. Eine Quelle nach Anspruch 5, wobei mindestens eine der Elektroden Nickel enthält.

7. Eine Quelle nach Anspruch 5 oder 6, wobei mindestens eine der Elektroden Kupfer enthält.

8. Eine Quelle nach Anspruch 7, wobei mindestens eine der Elektroden oxidiertes Kupfer enthält.

9. Eine Quelle nach den Ansprüchen 6 und 7, wobei mindestens eine der Elektroden Kupfernickel enthält.

10. Eine Vorrichtung zum Testen von Infrarotflammendetektoren, wobei die Vorrichtung umfasst:

- eine Infrarotstrahlungsquelle gemäß einem der vorherigen Ansprüche; und
- Steuermittel, um das vorbestimmte elektrische Signal zwischen einer Vielzahl der Elektroden anzulegen.

11. Ein Infrarotflammendetektor, wobei eine Vorrichtung gemäß Anspruch 10 umfasst ist.

12. Ein Detektor gemäß Anspruch 11, wobei der Detektor geeignet ist, um sich wiederholende modulierte Infrarotstrahlung zurückzuweisen.

Revendications

1. Source de rayonnement infrarouge comprenant un tube de décharge contenant une pluralité d'électrodes et un mélange de gaz comprenant du dioxyde de carbone, la source étant adaptée à émettre un rayonnement infrarouge dans la gamme d'ondes allant de 4 μm à 5 μm en réponse à l'application d'un signal électrique prédéterminé entre une pluralité d'électrodes.

2. Source selon la revendication 1, dans laquelle le tube de décharge contient, en outre, du monoxyde de carbone et/ou de l'azote gazeux.

3. Source selon la revendication 1 ou 2, dans laquelle la source est adaptée à émettre un rayonnement infrarouge dans la gamme d'ondes allant de 4,2 μm à 4,5 μm.

4. Source selon l'une quelconque des revendications précédentes, dans laquelle le tube de décharge est au moins partiellement formé dans du matériau permettant un passage au moins partiel du rayonnement infrarouge à travers lui.

5. Source selon l'une quelconque des revendications précédentes, dans laquelle au moins une électrode est adaptée à résister aux variations des proportions relatives du mélange de gaz.

6. Source selon la revendication 5, dans laquelle au moins une électrode comprend du nickel.

7. Source selon la revendication 5 ou 6, dans laquelle au moins une électrode comprend du cuivre.

8. Source selon la revendication 7, dans laquelle au moins une électrode comprend du cuivre oxydé.

9. Source selon les revendications 6 et 7, dans laquelle au moins une électrode comprend du cupronickel.

10. Appareil de test de détecteurs de flammes à infrarouge, l'appareil comprenant :

une source de rayonnement infrarouge selon l'une quelconque des revendications précédentes ; et
des moyens de commande pour appliquer le signal électrique prédéterminé entre une pluralité d'électrodes.

11. Détecteur de flammes à infrarouge comprenant un appareil selon la revendication 10.

12. Détecteur selon la revendication 11, dans lequel le détecteur est adapté à rejeter un rayonnement infrarouge modulé de façon répétitive.

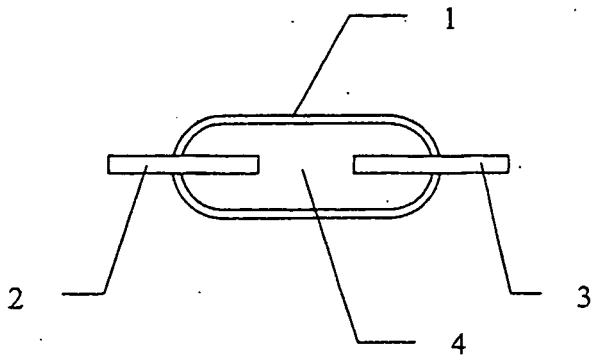


Figure 1

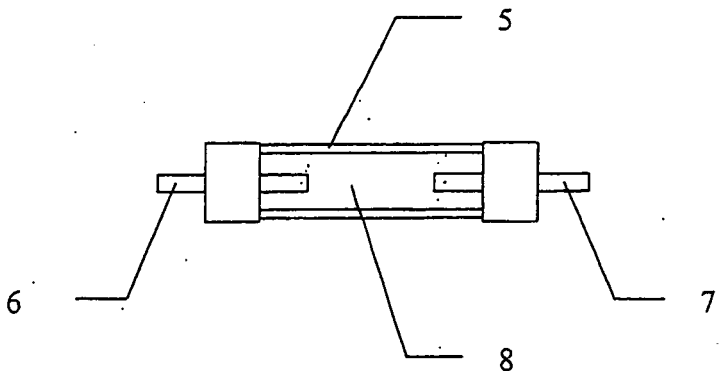
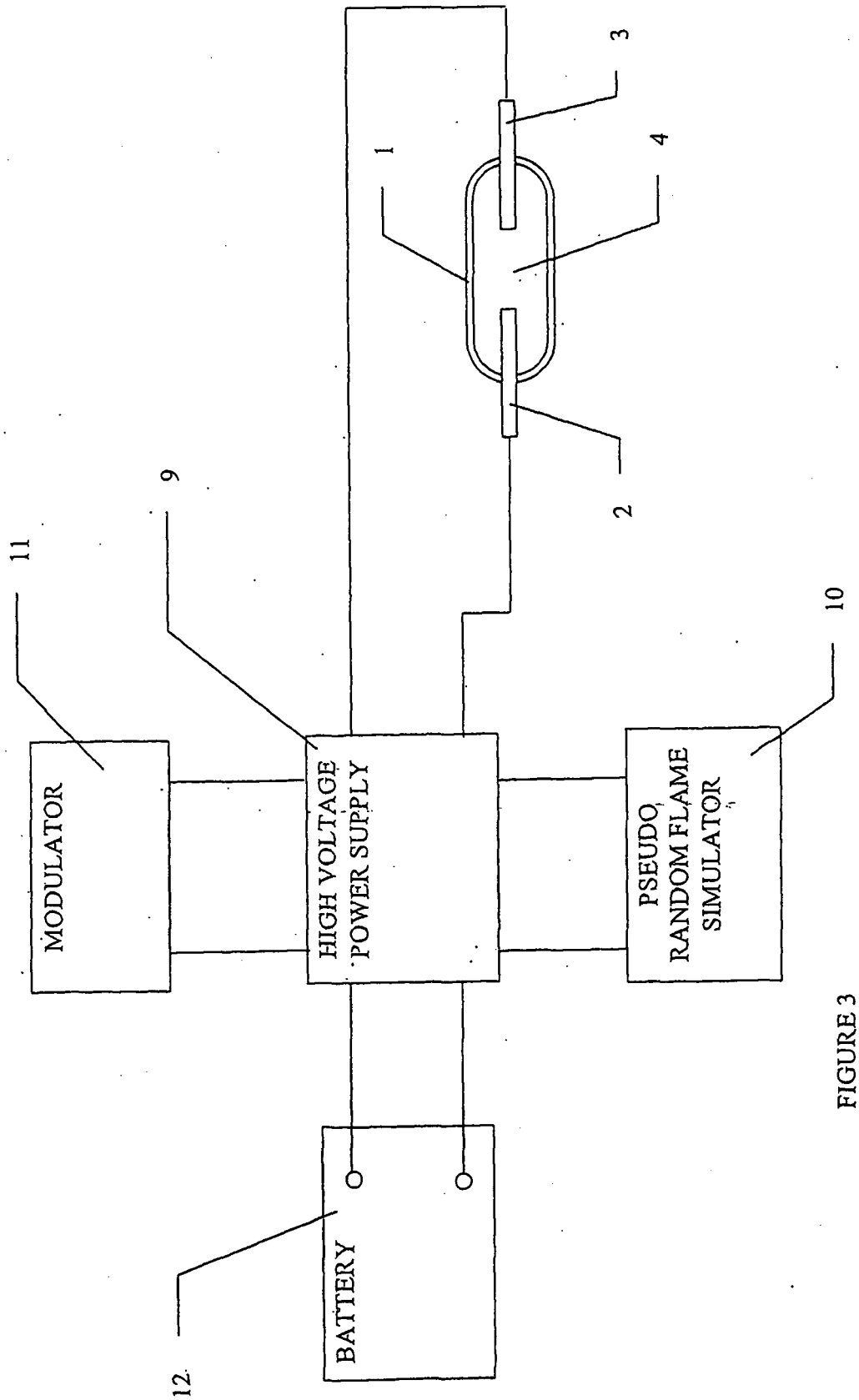


Figure 2


1
2
3
4
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12
MODULATOR
HIGH VOLTAGE POWER SUPPLY
PSEUDO RANDOM FLAME SIMULATOR
BATTERY

FIGURE 3

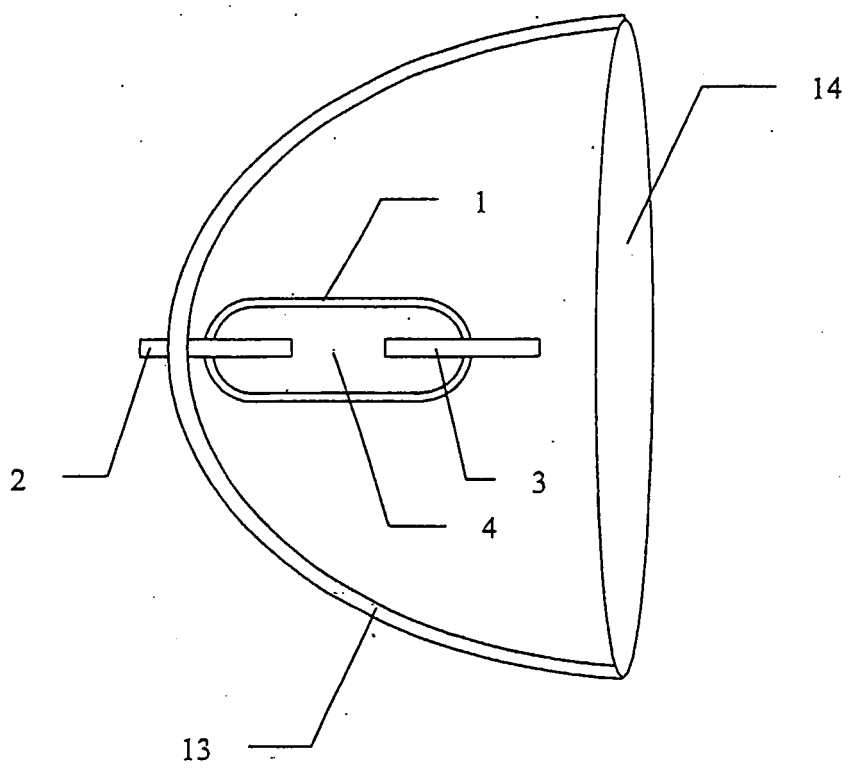

FIGURE 4