Candidate's Answer Paper

European Patent Office
Munich

Dear Sirs

Re: European Patent Application: XXXXX-XXXX
In the name of XXXXXX

In response to the Communication of ..... under Art.96(2) and Rule 51(2) EPC in the above application, we are filing herewith, in triplicate, replacement claims 1 to 8. Corresponding amendments will be made to the description in due course, once the scope of the claims has been agreed with the Examiner.

In view of the Examiner's comments at paragraph 2 of the Communication, claim1 has been amended to distinguish its subject-matter over the disclosure of D2 (Document II).

The amendments to claim I are based on page 3, lines 13 to 18 and page 4 lines 8 to 15 of the application as filed, which disclose the two embodiments of the acoustic transducer, the essential features of which now form the characterising part of claim 1. In the passages mentioned above the "radiation conducting elements" of claim 1 are referred to as "light guides" or portions of light guides. However, it is clear from claim 1 as filed that the scope of the present invention is not limited to light as the electromagnetic radiation used. Thus, it is also the case that the radiation conducting elements in claim 1 need not be restricted to light guides. Furthermore, Document I which is referenced in the present application (both in the introduction and at the end of page 4) and sets out the state of the art from which the present applicants addressed the present invention discloses at page 1, line 21 that light guides are a specific example of radiation conducting elements. Thus the skilled person on reading the present application as filed would be aware that its subject matter was not limited to light as the electromagnetic radiation (from original claims 1 and 2) and would thus read into the disclosure of the preferred embodiments that light guides were described merely as an example of radiation conducting elements (to be used when the radiation is light), as they are in DI to which this application clearly refers.

New claim 2 is based on the embodiment of figure 2 and the associated text at page 3, lines 13 to 18. New claim 3 is based on the embodiment of figure 3 and the associated text at page 4, lines 8 to 15. New claim 4 is based on figure 1 and the description at page 3, lines 12 to 13, again using the fact "light" is given in the description of the preferred embodiment merely as an example of electromagnetic radiation, as is clear e.g. from original claim 2. New claim 5 is based on figure 1 and the description at page 3, lines 25 to 26.

New claim 6 is based on original claim 2. New claim 7 is based on the description at page 3, lines 13 to 18 and page 4, lines 8 to 15 and on the disclosure of original claims 1 and 2 that make it clear that light is only an example of one type of electromagnetic radiation that may be used with the invention. New claim 8 is based on original claim 3.

Turning now to the novelty of amended claim 1, the examiner raised no objections to the novelty of original claim 1 over the disclosure of document I and, indeed, the novelty of original claim 1 is clearly pointed out in the application as filed at page 1, lines 26 to page 2, line 3. New claim 1 is more limited in scope than original claim 1 and thus remains novel over the disclosure of DI.

With regard to document II (D2) the Examiner noted at paragraph 2 of the Communication that all features of original claim 1 were disclosed by D2. In view of this, claim1 has been amended to its current form which more clearly defines the features of the acoustic transducer of the invention. According to D2, the only acoustic transducer disclosed is microphone 8.

There is no disclosure of microphone 8 having radiation conducting elements or a membrane as required by new claim1, let alone the particular manner of varying the intensity of radiation required by that claim. DII does disclose light guides but only in the context of converting an electrical signal from

the microphone to an optical signal (page 2, column 2, lines 21 to 26). Thus there is no [illegible] of the characterising features of new claim 1 in DII and claim 1 is therefore novel over the dis[illegible] this document. Dependent claims 2 to 8 are more limited in scope than claim 1 and all [illegible] therefrom. Thus, these claims are also all novel over the disclosures of documents DI and DII.

Turning now to inventive step, as explained by the introduction to the present application the problem faced by the skilled person starting from the disclosure of DI is to produce a more sensitive detector than that of DI. The Examiner has pointed out that a solution to this problem is provided by the detection method of DII. However, DI relates to smoke detectors particularly for explosion-endangered environments (see page 1, lines 13 and 24) in which protective measures are required if voltage is supplied to smoke detectors, presumably to avoid electrical sparks which may cause an explosion.

Thus, the narrower problem to be addressed by the skilled person in view of DI and DII can be formulated as: "To produce a more accurate smoke detector than that of DI, which is also suitable for use in explosion-endangered environments".

Thus, even when the skilled person combines the teaching of DI and DII he does not arrive at the invention because DII discloses only electrical transducers. For example, at line 20 of column 1 of DII it is stated that "sound waves [can] be converted by means of an appropriate transducer into an ELECTRICAL signal for further processing.

DII does teach how to produce suitable optical signals for transmission down light guides, such as those of DI (see column 4, lines 16 to 28). However, such optical signals are produced by amplifying and converting an electrical signal produced by the microphone into an optical signal using an amplifier "in the smoke detector" ... " powered by means of a battery in the smoke detector."

Thus by applying the teaching of DII to DI, either only electrical signals are produced as an output of the smoke detector, which leads to a risk of sparks in explosion-endangered environments or the smoke detector has on board electronics with its own power supply (battery) which also leads to a danger of sparks.

The present invention on the other hand solves this problem by the characterising features of claim 1 which provide a direct sound to electromagnetic radiation signal transducer such that no electrical signal is produced and no electrical components are required. Thus this detector can be used quite safely in explosion-endangered environments, as indicated at page 4, lines 18 to 19 of the application as filed.

Looked at the other way, the problem facing the skilled person in view of the disclosure of DII is how to adapt the detector of DII to be electrically passive and therefore suitable for explosion-endangered environments. Turning to DI as the only other available art, the skilled person is taught that "It is important ....that no light... from light guide 6 can reach the light guide 7 directly." (page 2, line19). Thus, the skilled person is directed in the exact opposite direction to the solution of the present invention wherein two radiation conducting elements are arranged such that light does pass directly from one to the other. The present invention solves this problem by means of the characterising features of claim 1, as described above.

Claim I is thus clearly inventively distinguished over the disclosure of both DI and DII, as are therefore claims 2 to 8 which depend therefrom. We trust that in view of the above, the Examining Division will now accept the above application subject to appropriate amendments to the description. However, in the event that the Examining Division intends to refuse the application at any stage in the proceeding we hereby make a precautionary request for Oral Proceedings.

EPO form1037 is enclosed for acknowledgement purposes.

Yours faithfully

Patent A. Turney - Professional Representative

Amended claims

1. A smoke detector for detecting smoke particles (8) in ambient air, the smoke detector comprising a source of radiation (6) which emits electromagnetic radiation into a detecting chamber (3) open to the ambient air, ~~characterized in that~~ wherein the source of radiation emits the electromagnetic radiation in the form of pulses, and ~~in that~~ the smoke detector is provided with an acoustic transducer (9) for converting pressure waves, which are generated when electromagnetic radiation pulses are absorbed by smoke particles, into a smoke detector output signal indicative of the presence of smoke in the detecting chamber, characterised in that the acoustic transducer (9) comprises a first radiation-conducting element (12) and a second radiation conducting element (14) in radiation communication with said first radiation conducting element and a membrane (11) between said radiation conducting elements, and in that said membrane vibrates in response to said pressure waves and said vibration causes a variation in the intensity of radiation communicated from said first radiation conducting element (12) to said second radiation conducting element.

2. A smoke detector as claimed in claim 1, wherein said first and second radiation-conducting elements (12,14) are connected by a third radiation conducting element (13) to form a continuous radiation conducting element and said third radiation conducting element (13) is connected to said membrane (11), such that vibration of said membrane causes variation in the optical transmissibility of said third radiation-conducting element.

3. A smoke detector as claimed in claim 1, wherein one side of said membrane (11) is provided with a reflective coating and the first and second radiation conducting elements face said coating in a tilted manner such that light emitted by said first element (12) is reflected into said second element (14).

4. A smoke detector according to any of claims 1 to 3, wherein the first radiation conducting element (12) is connected to said source of radiation (6).

5. A smoke detector according to any of claims 1 to 4, wherein the second radiation conducting element (14) is connected to a central alarm unit (5).

6. A smoke detector according to any preceding Claim ~~1~~, in which the electromagnetic radiation is light.

7. A smoke detector according to claim 6, wherein the radiation conducting elements (12,14) are light guides

8. A smoke detector according to any preceding Claim ~~1 or 2~~, in which the pulses have a frequency between 1 kHz and 20 kHz.

Notes to the client:

1. Document D2 refers to pending patent applications, it is possible that they will result in patents cover the client's smoke detector - we should check on a database for published applications wi the authors as inventors.

2. It will be necessary to delete the "electrical embodiment" as it is no longer covered by the claims. There does not seem much scope for divisional applications in view of the disclosure of D2.

3. A divisional application could be filed with claims to the acoustic transducer per se as a sound to light convertor outside of the context of a smoke detector, if the client is interested in this kind of broad protection.