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D E C I S I O N
of 1 July 1999

Case Number: T 0422/97 - 3.4.2
Application Number: 92912539.1
Publication Number: 0604428
IPC: G01N 21/85, G01N 33/24, G01V 9/04

Language of the proceedings: EN

Title of invention:

Device for measuring reflectance and fluorescence of in-situ soil

Applicant:

United States of America as represented by The Secretary of The Army

Opponent:

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Headword:

-

Relevant legal provisions:

EPC Art. 56

Keyword:

"Inventive step (main and auxiliary requests : no)"

Decisions cited:

T 0069/83

Catchword:

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Boards of Appeal

Chambres de recours

Case Number: T 0422/97 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 1 July 1999

Appellant: United States of America
as represented by The Secretary of The Army
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Decision under appeal: Decision of the Examining Division of the
European Patent Office posted 19 December 1996
refusing European patent application
No. 92 912 539.1 pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: E. Turrini
Members: R. Zottmann
M. Lewenton

Summary of Facts and Submissions

I. The Appellant (Applicant) lodged an appeal against the decision of the Examining Division to refuse European patent application No. 92 912 539.1 with the publication No. 0 604 428.

II. In a communication accompanying the summons to oral proceedings, the Appellant was informed that and why claim 1 - now main request - does not involve an inventive step with regard to documents

D1: US-A-5 065 019;

D4: DE-A-2 702 332; and

D5: WO-A-8 302 326.

Thereafter the Appellant submitted, as an auxiliary request, a further set of claims.

In a further communication, the Appellant was informed that document

D6: EP-A-0 461 321,

already cited in the Search Report, is relevant with regard to the additional feature of claim 1 auxiliary request by which feature said claim is distinguished from claim 1 main request.

III. Oral proceedings were held at the end of which the decision was announced.

IV. The Appellant requested that the decision under appeal be set aside and that the patent be granted on the basis of

claim 1 as filed with the letter dated 25 May 1999 and claims 2 to 14 as filed with the letter dated 2 April 1997, as a main request, or of

claims 1 to 10 as filed with the letter dated 25 May 1999, as an auxiliary request.

V. Claim 1 of the main request reads as follows:

"1. Apparatus (10) for producing on-site a record of contaminant distribution in unbored soil, the apparatus (10) comprising:

a probe (12) for boring into and penetrating the soil;

means (16) for driving the probe (12) into the soil;

a window (24) formed in the probe (12) for allowing transmission of light between the exterior and interior of the probe (12);

light means (26) disposed internally of the probe (12) for providing light which passes through the window (24) to irradiate the soil, the light means (26) providing light in the range from visible through ultra-violet, light collection and transmission means collecting reflected light or fluorescence passing back through the window (24) from the soil and disposed internally of the probe (12);
characterised in that:

the apparatus is arranged to produce the record continuously and in real time;

the window (24) is a single window having an external surface which is flush with the external surface of the probe (12), and the light is collected and transmitted through the single window (24) as the probe passes through the soil; and by:

analysis means (30) for receiving the reflected light or florescence from the light collection and transmission means (28) for analysing said reflected light or fluorescence to produce a spectral signature for each locus of the soil through which the probe (12) passes, said spectral signatures containing information on the contaminants present in the soil."

Claim 1 of the auxiliary request differs from claim 1 of the main request only in that between "the window (24)" and "is a single window" is inserted: "is made of sapphire and".

VI. The Appellant's arguing is summarized as follows:

Prior art document D1 discloses a hand-held heavy industrial equipment which is used near the surface and is not suitable for a deeper penetration. The wording of D1 is ambiguous in so far as continuous measurement is concerned. A continuous measurement is carried out in horizontal direction only. Such a measurement is not possible with the embodiment of Figure 3, where one window is used, since cleaning of the window would require a discontinuous measurement. Such measurements centimeter for centimeter down to 30 m are moreover not practical. The embodiment of Figure 1 comprising more windows is not constructed for a continuous measurement.

D4 and D5 relate to the entirely different art of measurements in pre-bored holes. Thus none of D1, D4 or D5 teaches the provision of a continuous and real-time measuring apparatus.

The device of the application-in-suit shows the unexpected effect that the window is self-cleaning when the apparatus is penetrating the soil.

The application-in-suit has real and commercially successful applications which is also demonstrated by a declaration from the inventor.

Reasons for the Decision

1. The appeal is admissible.

2. To facilitate reference to the features of claim 1, they are hereinafter listed separately and numbered:
 - (A) apparatus (10) for producing a record of contaminant distribution in unbored soil;
 - (A1) the apparatus is arranged to produce the record on-site;
 - (A2) the apparatus is arranged to produce the record continuously and in real time;
 - (B) the apparatus comprises a probe (12) for boring into and penetrating the soil;

- (C) the apparatus comprises means (16) for driving the probe into the soil;
- (D) the apparatus comprises a window (24) formed in the probe for allowing transmission of light between the exterior and interior of the probe;
 - (D1) the window is a single window;
 - (D2) the window has an external surface which is flush with the external surface of the probe;
- (E) the apparatus comprises light means (26) for providing light which passes through the window to irradiate the soil;
 - (E1) the light means providing light in the range from visible through UV;
 - (E2) the light means is disposed internally of the probe;
- (F) the apparatus comprises light collection and transmission means (28) collecting reflected light or fluorescence passing back through the window from the soil;
 - (F1) the light collection and transmission means is disposed internally of the probe;
 - (F2) the light being collected and transmitted through the window as the probe passes through the soil;
- (G) the apparatus comprises analysis means (30) for

receiving the reflected light or fluorescence from the light collection and transmission means for analysing said reflected light or fluorescence to produce a spectral signature, said spectral signatures containing information on the contaminants present in the soil; and

(G1) the spectral signature being produced for each locus of the soil through which the probe passes.

Claim 1 of the auxiliary request differs from claim 1 main request only in that feature (D3) that the window is made of sapphire is added.

3. The Board finds that none of the two versions of claim 1 introduces subject-matter not contained in the application as originally filed and thus none of them infringes Article 123(2) EPC.

4. *Novelty*

None of the available documents explicitly discloses an apparatus with all features of claim 1 of the main request or of claim 1 of the auxiliary request. Therefore, the subject-matters of said claims are considered to be novel within the meaning of Article 54 EPC.

5. *Inventive step*

5.1 Claim 1 of the main request

5.1.1 It is undisputed that document D1 discloses the nearest prior art with respect to the apparatus defined by

claim 1.

Said document discloses an apparatus for producing on-site a record of contaminant distribution in unbored soil (see Figure 1 and corresponding description, as to feature (A1), see particularly column 2 lines 5 to 9). The apparatus comprises a probe (17) for boring into and penetrating the soil, means (16) for driving the probe into the soil (see Figure 4), a window (35) formed in the probe for allowing transmission of light between the exterior and interior of the probe, light means (21) disposed internally of the probe for providing light which passes through the window to irradiate the soil (see Figures 2 and 3 and corresponding description), the light means providing UV light (see e. g. claim 1), light collection and transmission means (22) collecting reflected light or fluorescence passing back through the window from the soil and disposed internally of the probe (see Figure 2).

Claim 1 is characterized over prior art of D1 by the features of the second part of said claim and thus by features (A2), (D1), (D2), (F2), (G) and (G1) and in that the light means provides light also in the visible range (feature (E1) concerned).

Feature (A2) is at least implicitly disclosed and/or suggested by the teaching of D1, see particularly column 2 lines 5 to 9, column 3 lines 40 to 42, column 4 lines 1 to 10, column 4 lines 26 to 28 (the apparatus is useful as part of an automatic control system), column 3 lines 62 to 65 (immediate indication of the results), column 4 lines 34 to 41, column 5

lines 15 to 20 and 32 to 39 (continuous measurement). These passages indicate that the measurements are carried out continuously during penetration of the probe into the soil and not only in horizontal direction, as alleged by the Appellant.

Feature (F2) is a consequential feature of features (A1), (A2) and (D1).

Features (D1) and (D2) are realized in the embodiment described in column 3 lines 21 to 25 and shown in Figure 3, see particularly reference numeral 35.

- 5.1.2 The remaining differences between the apparatus according to claim 1 and that of D1 result simply from the different use of said apparatuses.

The aim of the device described in D1 is to measure the depth of crude oil (one contaminant) in a subsurface of a shoreline, that is the detection of low concentrations of crude oil, down to a limited depth in granulated solid, preferably sandy soil. The apparatus should be portable for use in manual probes (see e. g. column 1 lines 6 to 9 and column 1 line 50 to column 2 line 9 and column 5 lines 65 to 66). The construction of the measuring device is adapted for this purpose, namely the choice of the wavelength range of the light source (UV) to cause fluorescence of a characteristic component of the single contaminant to be detected and the sensibility of the light detector in the visible range (wavelength of the emitted fluorescence).

The problem underlying the solution according to claim 1 of the application-in-suit, when starting from

the nearest prior art, is to adapt the apparatus of D1 to the use as indicated in the application-in-suit, that is for producing a profile of the presence or concentration of *several* contaminants in a soil down to a greater depth, e.g. 30 m or more, without delay, whereby the soil is not necessarily as easily displaceable as the soil of D1, but not even a rocky soil requiring heavy drilling equipment.

When the skilled person tries to solve said problem, he would proceed in the following manner: In view of the fact that a huge number of data have to be taken up and the results have to be produced without considerable delay, the record has to be produced continuously and in real time with the further consequence that the light has to be collected and transmitted through the window as the probe passes through the soil (features (A2) and (F2)). Variation of the wavelength range(s) of the light source(s) and analysis of the light using a spectral characteristic for each of the contaminants to be detected and for each locus of the soil through which the probe passes and modified wavelength ranges corresponding to the contaminants to be detected are self-evident (features (E1), (G) and (G1) are concerned). Since the probe has to penetrate (also) soil which is less displaceable than sandy soil, recesses and protrusions have to be omitted to reduce the danger of destruction and residues in the recess which could block the light path (feature (D2) concerned).

5.1.3 The Appellant alleges that the embodiment of Figure 3 using only one window (35) cannot be used in a continuous operation of the apparatus, since the window

has to be frequently cleaned. First, this applies only to certain types of soil; however, claim 1 of the application-in-suit - being a claim of the *device* type - is not restricted to a particular type of soil. Second, according to column 3 lines 29 to 42 of D1 the configuration of the viewports is to depend on the application suggesting a variation of the window(s). Third, the further prior art documents D4 and D5 disclose probes with a single window flush with the outer surface of the probe. The different use of said probes, that is penetration into pre-bored rocky soil and/or detection of other ingredients than contaminants, would not hinder the skilled person to transfer features of elements of such probes to the probe known from D1, above all when the features are not closely related to said different use.

The Appellant alleges that the effect of self-cleaning of the window during penetration of the probe into the soil is surprising. It seems, however, that at least for certain kinds of soils said effect is not unexpected. Moreover, if, having regard to the prior art and the abilities of the skilled person, it would be already obvious for said person to arrive at the subject-matter of the claim, such a claim lacks inventive step, irrespective of the circumstance that an extra effect - possibly unforeseen - is obtained (see e.g. decision T 0069/83, OJ EPO 1984, 357).

Commercial success and technical progress are no requirements for patentability under the EPC and cannot be a substitute for a demonstration of inventive step with regard to the relevant prior art.

5.1.4 To summarize, in view of the cited prior art and the abilities of the person skilled in the art the subject-matter of claim 1 main request does not involve an inventive step in the sense of Article 56 EPC.

5.2 Claim 1 of the auxiliary request

Claim 1 of the auxiliary request differs from claim 1 of the main request only in that feature (D3) (the window is made of sapphire) is added.

D1 does not disclose any material for the window. Thus when starting from D1 as nearest prior art, the skilled person has to select a suitable material. The window has to be transparent to visible and UV light and to resist abrasion. Sapphire and quartz are preferred in the art for said purpose. Moreover, sapphire is well known as a suitable material for borehole apparatus windows or the like, is substantially transparent to IR, visible and UV light and is much harder than quartz and therefore resists better abrasion. Reference is made also to document D6 (see there in particular column 1 lines 39 to 51, column 3 lines 20 to 24, column 4 lines 35 to 38, column 6 lines 1 to 11, column 9 lines 34 to 35 and column 10 lines 14 to 29). Thus the skilled person would preferably consider sapphire for said purpose.

Hence, feature (D3) adds nothing inventive to the subject-matter of claim 1 of the main request, such that claim 1 of the auxiliary request does not involve an inventive step in the meaning of Article 56 EPC.

6. Since neither claim 1 of the main request nor claim 1

of the auxiliary request is allowable, none of the requests is allowable.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

P. Martorana

E. Turrini