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Datasheet for the decision of 20 May 2021

Case Number: T 2607/17 - 3.4.03

Application Number: 11743324.3

Publication Number: 2577643

IPC: G09B19/24

Language of the proceedings: EN

Title of invention:
VIRTUAL TESTING AND INSPECTION OF A VIRTUAL WELDMENT

Applicant:
Lincoln Global, Inc.

Headword:

Relevant legal provisions:
EPC Art. 56

Keyword:
Inventive step - main and auxiliary request 1 (no) - obvious implementation of non-technical features

Decisions cited:
G 0001/19, T 0625/11

Catchword:

Europäisches Patentamt
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Beschwerdekammern

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Case Number: T 2607/17 - 3.4.03

D E C I S I O N
of Technical Board of Appeal 3.4.03
of 20 May 2021

Appellant: (Applicant)	Lincoln Global, Inc. 9160 Norwalk Boulevard Santa Fe Springs, CA 90670 (US)
Representative:	Grosse Schumacher Knauer von Hirschhausen Patent- und Rechtsanwälte Frühlingstrasse 43A 45133 Essen (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 7 July 2017 refusing European patent application No. 11743324.3 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	M. Stenger
Members:	M. Papastefanou
	W. Van der Eijk

Summary of Facts and Submissions

I. The appeal is against the decision of the examining division refusing the European patent application No. 11 743 324.3 (published as WO 2011/148258 A2) on the grounds that neither the Main Request nor the Auxiliary Request 1 before it involved an inventive step within the meaning of Article 56 EPC.

II. At the end of the oral proceedings before the board, the appellant's (applicant's) requests were that the decision under appeal be set aside and that a patent be granted on the basis of the Main Request or of Auxiliary Request 1, both requests corresponding to the respective requests which form the basis of the impugned decision.

III. Claim 1 of the **Main Request** is worded as follows:

A method of assessing the quality of a rendered baseline virtual weldment in virtual reality space, said method comprising:

Rendering (2110) a baseline virtual weldment;

Subjecting (2120) said baseline virtual weldment to a first computer-simulated test configured to test at least one characteristic of said baseline virtual weldment;

Rendering (2130) a first tested virtual weldment and generating first test data in response to said first test; and

Subjecting (2140) said first tested virtual weldment and said first test data to a computer-simulated analysis configured to determine at least one pass/fail condition of said first tested

virtual weldment with respect to said at least one characteristic,

wherein said first computer-simulated test simulates a real-world destructive test and/or a real-world non-destructive test.

IV. Independent Claim 5 of the **Main Request** has the following wording:

A system (100) for the virtual testing and inspecting of a virtual weldment, in particular according to the method of one of the claims 1 to 4, said system (100) comprising:

a programmable processor-based subsystem (110) operable to execute coded instructions, said coded instructions including:

a rendering engine configured to render a three-dimensional (3D) virtual weldment before simulated testing, and at least one of a 3D animation of a virtual weldment under simulated testing, and a 3D virtual weldment after simulated testing, and an analysis engine configured to perform simulated testing of a 3D virtual weldment, and further configured to perform inspection of at least one of a 3D virtual weldment before simulated testing, a 3D animation of a virtual weldment under simulated testing, and a 3D virtual weldment after simulated testing for at least one of pass/fail conditions and defect/ discontinuity characteristics;

at least one display device operatively connected to said programmable processor-based subsystem for displaying at least one of a 3D virtual weldment before simulated testing, a 3D animation of a

virtual weldment under simulated testing, and a 3D virtual weldment after simulated testing; and a user interface (130) operatively connected to said programmable processor-based subsystem (110) and configured for at least manipulating an orientation of at least one of a 3D virtual weldment before simulated testing, a 3D animation of a virtual weldment under simulated testing, and a 3D virtual weldment after simulated testing on said at least one display device;
wherein said simulated testing includes at least one of simulated destructive testing and simulated non-destructive testing.

V. Claim 1 of **Auxiliary Request 1** has the same wording as claim 5 of the Main Request with the additional feature at the end:

wherein said analysis engine includes a support vector machine (SVM) and/or an intelligent agent.

VI. The appellant essentially argued that the claimed invention should not be considered as an isolated general purpose computer (or a method running on such a computer) but as an extension of the virtual reality arc welding (VRAW) system described in the application. It provided feedback concerning the use of the VRAW system and enhanced its functionality. The appellant's arguments are dealt with in detail in the reasons for the decision.

Reasons for the Decision

1. The appeal is admissible.

2. The claimed invention

The claimed invention relates to virtual (computer-simulated) testing and inspection of virtual (computer-simulated) weldments.

As a start, 3D images of virtual weldments are rendered. It is to be noted that the virtual weldments are generated using a virtual reality arc welding system, which is described in detail in the application.

Once the 3D images of the weldments are rendered, one or more computer-simulated tests are carried out on them. These computer simulated tests correspond to tests carried out on "real-life" weldments in order to assess their quality and identify possible defects. Images and animations of the virtual weldments after the test are rendered and displayed. The user can then inspect the tested weldment(s) by moving the image(s) around in a display.

The invention is conceived for a training context, in which trainees generate virtual weldments, which are then tested and the result of the test can be used as criterion for passing or failing an examination.

3. Main Request

3.1 Claim 1 defines a method comprising a series of steps: rendering a weldment, subjecting the rendered weldment to a computer-simulated test, rendering the virtual weldment after the test and carrying out a computer-simulated analysis of the weldment and data related to the test so as to determine a pass/fail condition with respect to at least one characteristic. The board notes that claim 1 does not provide any details about how the defined method steps are to be carried out.

Independent claim 5 defines a system *"for the virtual testing and inspection of a virtual weldment, in particular according to the method of one of the claims 1 to 4"*. Although the method of claim 1 does not seem to relate to any inspection of the rendered virtual welding, the board's understanding is that claim 5 defines in more detail (compared to claim 1) the various parts of the system that are supposed to carry out the method of claim 1 (a rendering engine, an analysis engine, a display device, and a user interface).

The board is of the view that claim 5 provides more concrete details about the invention and, hence, it considers appropriate to use claim 5 as a basis for its assessment of the claimed subject-matter.

3.2 Closest prior art

3.2.1 The claimed system is presented in Figure 20 of the application (see also paragraph [0029] in the brief description of the drawings of the application as published). The system is described as a stand alone virtual weldment inspection (VWI) system. It imports virtual weldments which can be generated by a virtual reality arc welding system (VRAW) (paragraphs [00125] to [00127]). The VRAW system is described in the application but is not claimed, so that the claimed system does not comprise any features relating to tools/parts that are used to simulate a welding action.

3.2.2 According to the application, the claimed system comprises a processor unit ("programmable processor based subsystem" - PPS - 2010), a display ("observer display device" - ODD - 2050) and a user interface

consisting of a keyboard (2020) and a mouse (2030) operatively connected to the PPS 2010 (see Figure 20 and paragraph [00126]).

The PPS 2010 is similar to the PPS 110 (see Figure 10), which includes a central processing unit (CPU 111) and graphic processing units (GPU 115) (see paragraph [0079]). During the virtual testing and inspection, the GPUs act as a rendering engine to provide 3D (animated) renderings of a virtual weldment and the CPU acts as an analysis engine to provide testing analysis of the virtual weldment (see last sentence of paragraph [0080]).

3.2.3 The board concludes from the above that the claimed system is a general purpose personal computer configured to execute virtual testing and inspection of virtual weldments.

3.2.4 The board considers thus a notoriously well-known, general purpose, personal computer to be a suitable starting point for the skilled person.

3.3 Differences and technical problem

3.3.1 Compared to such a notoriously well-known personal computer, the system of claim 5 differs in that it can ("is operable to") execute coded instructions including a rendering engine configured to render a 3D virtual weldment and an analysis engine configured to perform simulated testing and inspection of the 3D virtual weldment for pass/fail conditions and/or defect/ discontinuity characteristics. In addition, the display device can display the 3D images of the weldment and the user interface allows the user to move the displayed images around ("manipulating an

orientation").

3.3.2 In essence, the claimed system renders a 3D image, which can also be an animated 3D image (of a virtual weldment) and processes this image by simulating testing and inspection of the virtual 3D weldment. It then displays the processed image and allows the user to move it around.

3.3.3 As a first point the board notes that the claimed system carries out computer-simulated testing and inspection of a virtual weldment, i.e. of a computer-simulated weldment and not of a physical, i.e. "real life", weldment.

The application describes various types of destructive and non-destructive tests that can be carried out on a "real life" weldment (paragraphs [0039] to [0042]), but it is evident that none of these tests can be carried out without any adaptation on a virtual (computer-simulated) weldment.

The application does not provide any information as to how the "real life" tests are to be adapted for carrying them out on a virtual weldment.

3.3.4 Moreover, the claimed system does not simulate such tests carried out on a "real life" weldment. In other words, there is no particular "real life" weldment that needs to be tested (and inspected) and instead of carrying out "real life" tests on it, computer-simulated tests are carried out on a computer-simulated virtual representation of that particular "real life" weldment. As the application describes, only a virtual weldment is generated, mainly for training purposes, and without any link to a particular "real life"

weldment.

Hence, considerations such as that the claimed system may allow a computer-simulated destructive test to be carried out several times (on a virtual weldment) whereas a "real life" test can be carried out only once on a "real life" weldment or that multiple tests can be applied to the same virtual weldment without any damage to the weldment etc., do not apply in this case, since there is only a virtual weldment to be tested, anyway.

3.3.5 The board notes also that technical aspects relating to how weldment testing is performed, either in real life or in a virtual manner are not relevant to the claimed invention. Indeed, the role of weldment testing in the claimed invention is limited to constituting the content of the displayed images, i.e. to the information that is displayed.

3.3.6 In the board's opinion, therefore, the claimed system carries out image processing. Images of weldments are rendered, manipulated and displayed. That the images represent weldments or that the manipulations represent testing and/or inspection of those weldments is, in the general manner claimed and described in the application, the result of the cognitive content (information) of the displayed images. It is the user who perceives the images as weldments and the manipulation of those images as testing and/or inspection. Such cognitive information ("what" is displayed) is not related to any technical problem or technical constraints. This applies also to the type of tests (e.g. destructive or non-destructive) the system is able to simulate.

It is established case law that the cognitive content

of a displayed image ("what" is displayed) is in principle not a technical feature (*Case Law of the Boards of Appeal of the EPO*, 9th Edition, July 2019, I.A.2.6).

The board adheres to this case law and considers, therefore, that the display of 3D virtual weldments and the fact that the image processing carried out represents weldment testing and/or inspection cannot be seen as technical features of the claimed system which provide any technical effect.

3.3.7 The appellant argued that the board's interpretation was too narrow. The claimed system provided a computer-implemented simulation and it was not related to mere image processing. Moreover, features that appeared to be non-technical should still be taken into account for the assessment of inventive step, if they interacted with technical features and contributed to a technical effect. And this was the case with the features of claim 5.

3.3.8 According to the appellant, the invention had to be assessed as a whole. The system processed *virtual* weldments and this indicated that it was part of a virtual reality system. This virtual reality system was used for generating the virtual weldments (VRAW system) and was described in detail in the application. The claimed system was to be understood as part of this VRAW system and aimed at improving it.

The claimed system provided analysis, inspection, and testing of the virtual weldments in order to identify defects in the way the VRAW system was used in generating these virtual weldments. The claimed system should thus be considered as a feedback component of

the VRAW system, which contributed to the generation of virtual weldments of a better quality.

3.3.9 Moreover, the application described an embodiment where the claimed system was part of the VRAW system (see paragraph [0037]). It was undisputed that the VRAW system was a technical system with specific technical features used in generating a virtual weldment, and so going beyond a general purpose computer.

Making reference to paragraph [0043] of the application, the appellant pointed out that simulated weldments generated using the VRAW system could be used beyond training. Such a simulated weldment could be integrated in a simulated bridge and the testing could involve simulations of the bridge over time in order to estimate whether the quality of the weldment would influence the life time of the bridge. In analogy to the reasoning of the decision T 625/11, where the deciding board had concluded that a simulation of a nuclear reactor was technical, the features relating to the simulation of the testing of the weldment were also to be seen as technical.

3.3.10 The board does not find these arguments convincing.

Firstly, the claims do not define or suggest any connection or relation of the claimed system with the VRAW system described in the application beyond importing virtual weldments that may have been generated by it. Despite the mention in paragraph [0037] that the inspection and testing system can be part of the VRAW system, the application describes in detail only an embodiment of such a system as a stand alone system (starting in paragraph [0125]).

Even if a relation to a VRAW system as described by the appellant were to be acknowledged, the board does not see the claimed system as a feedback component of the VRAW system. The result of the virtual inspection and testing carried out by the claimed system is presented to one or more users (i.e. persons). It is the user(s), who is supposed to understand the results of these tests and inspections and to draw conclusions as to how the tested and inspected virtual weldment was generated and if and how it could be possible to improve it. There is no direct link between the results of the testing and inspection and the operation of the VRAW system; it all depends on the users' understanding, knowledge and capabilities.

Moreover, the claimed system does not provide any specific information related to any defects in the virtual weldment that are identified by the testing. For example, there is no indication about an angle of the virtual welding rod that could be adjusted better or a wrong setting of (virtual) temperature that could be corrected. The user has to recognise what mistakes were possibly made and how they can be corrected.

Hence, the board cannot accept that the claimed system provides any feedback to the VRAW system or that it is related to it in any other way and adheres to its initial opinion that the claimed system is a suitably configured general purpose computer.

3.3.11 Secondly, regarding the technical character of the simulation, the board notes that the decision referred to by the appellant was cited in decision G 1/19 of the Enlarged Board of Appeal (EBoA) (see point 109 of the reasons), which relates to computer-implemented simulations. In G1/19 the EBoA concluded that, for the

purposes of assessing inventive step of a computer-implemented simulation, *it is not a sufficient condition that the simulation is based, in whole or in part, on technical principles underlying the simulated system or process* (see e.g. points 1 and 2 of the Headnote).

Hence, even if the computer-simulated testing of the virtual weldment were to be carried out within a computer-simulated simulation of a bridge (the bridge having incontestably sufficient technical character), this would not have any influence on the board's assessment of inventive step of the features of the claimed invention. Moreover, the board points out that in the system of claim 1 of the Main Request there is no mention of nor any suggestion to such a type of testing at all but only of testing used for training purposes, as the reference to the determination of a pass/fail condition indicates.

3.3.12 Summarising, the claimed system differs from a notoriously well-known general purpose computer in that it is configured to display images of virtual weldments, of virtual testing of those virtual weldments, and of the results of the virtual testing on those virtual weldments. It can also determine a pass/fail condition based on those results.

These differences relate only to the cognitive content of the images and the board does not consider them to be technical features (see point 3.3.6 above).

3.3.13 Following the established case law and practice in the formulation of the technical problem, these non-technical features will be given to the skilled person (a computer programmer expert in image processing) for

implementation. The objective technical problem can thus be formulated as how the skilled person would implement these non-technical features in the notoriously well-known general purpose computer. In other words, how the skilled person would configure the notoriously well-known general purpose computer to render, process, and display 3D images of the virtual weldment, before, during and after the virtual testing and determine a pass/fail condition based on them.

3.4 Solution and obviousness

3.4.1 The claimed system solves this problem by using a "rendering engine" and an "analysis engine". According to claim 5 of the Main Request both the rendering engine and the analysis engine of the claimed system are "coded instructions", i.e. computer programs, or parts of a computer program.

3.4.2 The application describes what the rendering and the analysis engines do but does not provide any information as to how they do it (see paragraphs [00127] to [00135]).

The rendering engine performs what its name suggests: it renders an image, in this case a 3D image or a 3D animated image. There is no information in the application about any particular technical constraints or considerations regarding the implementation (programming) of the rendering engine, so the board's conclusion is that a skilled person would be able to program such a rendering engine only applying their common general knowledge.

3.4.3 Similar considerations apply to the analysis engine. The analysis engine processes the displayed 3D image/

animation of the virtual weldment. What this processing constitutes, e.g. a simulation of destructive or non-destructive testing, is a decision that is taken by the designer of the system. The designer of the system decides which tests will be implemented in the claimed system and this decision seems to be arbitrary from a technical point of view, i.e. it does not solve any particular technical problem or involve any technical considerations. In the board's view the type(s) of tests that will be implemented is not a technical feature and will be given as a constraint to the skilled person for implementation (programming).

3.4.4 Regarding the implementation of this image processing, the application mentions that parameters for the processing of the images and animation may be provided by expert systems with rules, vector machines, a neural network and/or intelligent agents (see paragraph [00134]). The application, however, merely lists these possibilities without any further details that might indicate a particular technical problem that has to be solved or any technical constraints that have to be met. The board considers thus that the implementation of the analysis engine also lies within the common general knowledge of the skilled person.

3.4.5 Finally, the board does not consider the determination of a pass/fail condition to be a technical feature, either. It is rather a non-technical feature related to administrative (i.e. non-technical considerations) that will also be given to the skilled person for implementation.

3.4.6 The rendered and processed images are displayed on a display allowing the user to move them around ("manipulating an orientation" according to claim 5)

through the user interface. In the board's opinion allowing a user to move images around on a display is a standard feature of any general purpose computer (and was so at the priority date of the application).

3.4.7 Summarising, the board considers that the skilled person, starting from a notoriously well-known general purpose computer, will be tasked with the implementation of the display and processing of images representing 3D weldments, their testing and inspection. They will implement this by programming the computer to carry out these tasks using only their common general knowledge, arriving thus at the claimed system in an obvious manner.

3.4.8 The board's conclusion is, hence, that the subject-matter of claim 5 of the Main Request does not involve an inventive step in the sense of Article 56 EPC.

4. Auxiliary Request 1

4.1 Compared to claim 5 of the Main Request, claim 1 of the Auxiliary Request 1 defines additionally that the analysis engine includes a support vector machine (SVM) and/or an intelligent agent.

4.2 The claims do not provide any information about the support vector machine or the intelligent agent.

4.3 The application mentions them only briefly. Paragraph [0046] describes what a support vector machine does in the context of the described invention. In particular, the support vector machine is an algorithm that builds a model which can predict whether a particular example falls within a specific category, such as a pass or fail category. The application does not provide any

further details about the support vector machine and the board's opinion is that such mathematical tools (algorithms) were generally known at the priority date of the application.

As stated above (point 3.4.5) the board does not consider at this point that the determination of a pass/fail condition relates to solving any technical problem or involving any technical considerations. Hence, the use of a mathematical algorithm such as a support vector machine for the implementation of a non-technical feature cannot support an inventive step. Moreover, in the absence of any relevant details, the implementation of this mathematical algorithm within the claimed system is considered an obvious programming step for the skilled person.

4.4 Similar considerations apply to the intelligent agent. As paragraphs [0048] and [0057] briefly explain, the intelligent agents are implemented in software and are used to provide feedback to a student concerning areas where the student needs more practice or to an instructor/educator as to how to modify the teaching curriculum to improve student learning. The application does not provide any further information as to how the intelligent agents are to be implemented. Their use in the context of training (which is a non-technical activity) also indicates that they do not relate to solving any particular technical problem or involve any particular technical considerations. Their implementation within the claimed system amounts to programming the system accordingly so that it can carry out the stated functions. In the board's view, this would be an obvious step for the skilled person.

4.5 The appellant did not provide any arguments against the board's opinion on Auxiliary Request 1.

4.6 The board's conclusion is that the subject-matter of claim 1 of Auxiliary Request 1 does not involve an inventive step, either.

5. Since none of the requests on file is allowable, the appeal must fail.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

S. Sánchez Chiquero M. Stenger

Decision electronically authenticated