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Datasheet for the decision of 7 February 2020

Case Number: T 0968/14 - 3.5.04

Application Number: 02025035.3

Publication Number: 1311117

IPC: H04N5/232

Language of the proceedings: EN

Title of invention:
Programmable and reconfigurable camera control unit for video systems

Applicant:
Karl Storz Imaging, Inc.

Headword:

Relevant legal provisions:
EPC 1973 Art. 56

Keyword:
Inventive step - (no)

Decisions cited:

Catchword:

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Beschwerdekammern

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Case Number: T 0968/14 - 3.5.04

D E C I S I O N
of Technical Board of Appeal 3.5.04
of 7 February 2020

Appellant: (Applicant)	Karl Storz Imaging, Inc. 1 S. Los Carneros Road Goleta, CA 93117 (US)
Representative:	Witte, Weller & Partner Patentanwälte mbB Postfach 10 54 62 70047 Stuttgart (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 20 November 2013 refusing European patent application No. 02025035.3 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chair	T. Karamanli
Members:	M. Paci
	A. Seeger

Summary of Facts and Submissions

I. The appeal is against the decision of the examining division refusing European patent application No. 02025035.3, published as European patent application EP 1311117 A2.

II. The documents cited in the decision under appeal included the following:

D1: US 5,627,583 A.

III. The decision under appeal was based on the grounds that the subject-matter of the independent claims according to each of the main request and first to third auxiliary requests then on file did not involve an inventive step (Article 56 EPC) in view of prior-art document D1 and common general knowledge.

IV. With the statement of grounds of appeal, the appellant re-filed the sets of claims according to the main and first to third auxiliary requests underlying the decision under appeal.

V. The board issued a summons to oral proceedings, together with a communication under Article 15(1) of the Rules of Procedure of the Boards of Appeal (RPBA 2007, OJ EPO 2007, 536) in which it gave the provisional opinion that the subject-matter of the independent claims according to each of the main request and first to third auxiliary requests did not involve an inventive step (Article 56 EPC 1973) in view of prior-art document D1 and common general knowledge.

VI. The board held oral proceedings on 7 February 2020.

The appellant's final requests were that the decision under appeal be set aside and that a European patent be granted on the basis of the claims of the main request or, in the alternative, of one of the first to third auxiliary requests, all requests filed with the statement of grounds of appeal.

At the end of the oral proceedings, the Chair announced the board's decision.

VII. Claim 1 according to the appellant's **main request** reads as follows:

"Video imaging system, comprising:
a camera (12) for acquiring image data and having a storage device (40) positioned within said camera (12);
a camera control unit (20) coupled to said camera (12) and receiving the image data, said camera control unit (20) having a processor (64) and at least one configurable hardware device (62); and
said configurable hardware device (62) processing said image data received from said camera (12),
characterized by the storage device (40) having stored a program (42) adapted to be executed on the processor (64) for enabling the camera control unit (20) to be compatible with the camera (12), and the video system having a further program executing on said camera control unit (20) for overwriting a pre-existing application on said camera control unit (20)."

VIII. Claim 1 according to the appellant's **first auxiliary request** reads as follows:

"Video imaging system, comprising:

a camera (12) for acquiring image data and having a storage device (40) positioned within said camera (12);

a camera control unit (20) coupled to said camera (12) and receiving the image data, said camera control unit (20) having a processor (64) and at least one configurable hardware device (62); and

said configurable hardware device (62) processing said image data received from said camera (12),

characterized by the storage device (40) having stored a program (42) adapted to be executed on the processor (64) for enabling the camera control unit (20) to be compatible with the camera (12), and the video system having a further program executing on said camera control unit (20) for overwriting a pre-existing application on said camera control unit (20), and said configurable hardware device (62) further comprises a non-overwritable portion for requesting said program (42), wherein said non-overwritable portion is adapted to load said program (42)."

IX. Claim 1 according to the appellant's **second auxiliary request** reads as follows:

"Video imaging system, comprising:

a camera (12) for acquiring image data and having a storage device (40) positioned within said camera (12);

a camera control unit (20) coupled to said camera (12) and receiving the image data, said camera control unit (20) having a processor (64) and at least one configurable hardware device (62); and

said configurable hardware device (62) processing said image data received from said camera (12),

characterized by the storage device (40) having stored a program (42) adapted to be executed on the processor (64) for enabling the camera control unit (20) to be compatible with the camera (12), and the

video system having a further program executing on said camera control unit (20) for overwriting a pre-existing application on said camera control unit (20), wherein said program (42) enables said camera control unit (20) to issue commands (34) to said camera (12), and wherein said camera (12) is adapted to send confirmation to said camera control unit (20) that said commands (34) were received and said commands (34) have been, or will be, executed."

X. Claim 1 according to the appellant's **third auxiliary request** reads as follows:

"Video imaging system, comprising:

a camera (12) for acquiring image data and having a storage device (40) positioned within said camera (12);

a camera control unit (20) coupled to said camera (12) and receiving the image data, said camera control unit (20) having a processor (64) and at least one configurable hardware device (62); and

said configurable hardware device (62) processing said image data received from said camera (12),

characterized by the camera control unit (20) receiving a program (42) stored on said storage device (40), which is executable to perform functions and/or operations for which the program (42) was written, the program (42) adapted to be executed on said processor (64) to perform the function of configuring said at least one configurable hardware device (62) for compatibility with said camera (12), and the video system having a further program executing on said camera control unit (20) for overwriting a pre-existing application on said camera control unit (20)."

Reasons for the Decision

1. The appeal is admissible.

Main request - inventive step (Article 56 EPC 1973)

2. Closest prior art

The examining division considered document D1 to be the closest prior art for the subject-matter of claim 1. The appellant has not disputed this finding.

3. Disclosure of D1

3.1 D1 discloses an "electroendoscope apparatus" to which a plurality of types of endoscopes having different types of solid-state imaging devices can be connected (see column 1, lines 8 to 10). The video imaging system of the apparatus comprises a camera (endoscope 1 or 2 having CCD 11 or 12 in figures 1a, 1b and 2) and a camera control unit (CCU) (3 in figures 1a, 1b and 2). The CCU comprises *inter alia* a configurable signal processing device (16 in figure 2) for processing image data received from the camera (column 3, line 63, to column 4, line 4) and a CPU (18 in figure 2). The video imaging system also comprises a storage device which, in the first embodiment of D1, is positioned within the camera (see data ROM 19 or 20 in figure 2). The data storage stores "circuit data" specific to the type of camera on which it is stored (column 4, lines 18 to 21). The configurable signal processing device 16 is a field programmable gate array (FPGA), such as a logic cell array (LCA), which can be programmed on the basis of said "circuit data" (see column 4, lines 5 to 8 and 18 to 30). When a camera (i.e. an endoscope) is connected to the apparatus, the circuit data stored in the camera (in data ROM 19 or 20 in figure 2) is loaded

from the camera and used for reconfiguring the signal processing circuit to make it compatible with, and optimised for, the specific type of camera (see column 4, lines 18 to 21 and 44 to 57).

3.2 The appellant did not dispute the above disclosure of D1.

4. Distinguishing feature(s)

4.1 The examining division held that the subject-matter of claim 1 differed from D1 by the following distinguishing features (highlights by the examining division):

(a) the processor executes the program from the storage device of the camera to configure the configurable hardware device and
(b) the video system includes a further program which overwrites a pre-existing application.

4.2 In the statement of grounds of appeal, the appellant submitted that the distinguishing features were as follows (highlights by the appellant):

(a1) a program (instead of circuit data according to D1) is used to ensure compatibility, wherein the program resides on a storage device positioned within the camera;
(a2) a processor executes the program (instead of a processor, CPU 18, loading circuit data according to D1);
(b) a further program is used which overwrites a pre-existing application (D1 lacks such further program).

4.3 The board notes that according to document D1, column 4, lines 29 and 30, "A logic circuit is formed by a configuration program based on the circuit data mentioned above". From this sentence, it is derived that the circuit data is configuration data, on the basis of which an executable program for reconfiguring the signal processing circuit 16 can be generated, rather than the executable program itself.

For the above reasons, the board concurs with the appellant that the "circuit data" of document D1 is not necessarily a "program adapted to be executed on the processor" and hence that feature (a1) is not disclosed in D1.

4.4 As to the alleged distinguishing feature (a2), the board does not regard it as being a separate distinguishing feature because claim 1 does not state that the processor executes the program, but only that the program is "adapted to be executed on the processor", which is a characterisation of the program, not of the processor. This characterisation of the program should thus have been included in the formulation of distinguishing feature (a1).

4.5 Regarding the alleged distinguishing feature (b), there is no dispute between the examining division and the appellant that said further program is not disclosed in D1.

4.6 For the reasons set out above, the board considers the distinguishing features to be as follows:

(A) a program adapted to be executed on the processor is stored in the camera; and

(B) there is a further program executing on said camera control unit for overwriting a pre-existing application on said camera control unit.

4.7 During the oral proceedings, the appellant stated that it accepted distinguishing features (A) and (B).

5. Technical effect and objective technical problem

5.1 The technical effect of distinguishing feature (A) appears to be that the CCU can be directly configured by executing the stored program.

The technical effect of distinguishing feature (B) appears to be that not only the hardware device is reconfigured, but the application running on the CCU is also replaced, hence presumably improving the adaptation of the CCU to the connected camera.

In view of the above, the board considers that the objective technical problem should be generally formulated, without a pointer to the solution, as how to improve the adaptation of the CCU to a connected camera.

5.2 The appellant stated during the oral proceedings that it accepted the above formulation of the objective technical problem.

6. Obviousness

The board concurs with the examining division that the subject-matter of claim 1 does not involve an inventive step for the reasons set out below.

6.1 Re distinguishing feature (A)

6.1.1 According to the "Summary of the invention" section of D1 (column 1, line 59, to column 2, line 30), the main advantage of the video imaging system of D1 is that a CCU can be flexibly adapted to a newly connected camera by reconfiguring its signal processing circuit, composed of programmable logic elements, on the basis of stored circuit data (configuration information) to make the signal processing circuit compatible with that camera.

According to the first embodiment of D1 (figures 1 to 5), the circuit data is stored in the camera and the reconfigurable signal processing circuit 16 is a logic cell array (LCA), which is one type of FPGA. According to the second embodiment (figure 6), the circuit data is stored in the CCU. According to the third embodiment (figure 7), the circuit data is stored on a removable storage device connected to the CCU.

In the board's view, it would have been obvious to the skilled person that the main advantage of the video imaging system of document D1 did not depend on the form (circuit data or program) or location (in the camera, in the CCU or on a removable media) of the configuration information or on the type (FPGA, DSP, etc.) of the signal processing circuit, but depended only on that the signal processing circuit could be configured on the basis of stored configuration information specific to the newly connected camera. The skilled person would thus naturally have considered alternative forms of configuration information and alternative types of signal processing means.

The skilled person would therefore have realised that the configuration information could alternatively be stored under the form of an executable program for

reconfiguring the signal processing circuit, such as the "configuration program based on the circuit data" mentioned in column 4, lines 29 and 30, to be executed by the CPU (18 in figure 2) of the CCU. The pros and cons of this alternative solution would have been obvious to the skilled person:

the main advantage would have been greater flexibility in reconfiguring the signal processing circuit, regardless of its type, such as FPGA, DSP, etc., and

the main disadvantage would have been that an executable program would likely have required more storage space in the camera than configuration data.

For the above reasons, the board finds that the skilled person would have considered storing a program executable on the CPU of the CCU instead of circuit data as an obvious design alternative with predictable pros and cons.

Hence, the skilled person would have arrived at distinguishing feature (A) without the exercise of inventive activity.

6.1.2 The appellant's arguments

The appellant's arguments may be summarised as follows:

In the system of D1 shown in figure 2, "circuit data" is stored in the camera (in data ROM 19,20), i.e. not a program. In D1, a fixed program for configuring signal processing circuit 16 is used. When the circuit data is loaded, the program uses it to configure the camera control unit (CCU). There is no suggestion in D1 to store such a program in the camera instead of circuit data. Storing a program, instead of just circuit data,

has the advantage of allowing greater flexibility in configuring the CCU. When considering what the skilled person would have wanted to do, it is important to remember that the person skilled in the art at the priority date in 2001 was less knowledgeable than today. That skilled person would have had no good reason to want to replace the circuit data stored in the camera in figure 2 of D1 by a program.

The board does not find the appellant's arguments persuasive for the following reasons:

For the reasons given under point 6.1.1 *supra*, storing a configuration program in the camera would have been an obvious alternative to storing circuit data (configuration data) in the camera. In D1, the circuit data is essentially a list of the changes to be made to the hardware of the CCU. This list is then turned by the CPU (18 in figure 2) into a program which, when executed by the CPU, carries out these changes. Hence, storing a program instead of a list would have been a straightforward alternative for the skilled person, with obvious pros and cons. In 2001, at the priority date, reconfigurable circuits, such as FPGA and DSP, had been around for many years and were common general knowledge, a fact that the appellant accepted during the oral proceedings.

The appellant also argued that the skilled person would not have wanted to use CPU 18 (in figure 2 of D1) to configure signal processing circuit 16 because D1 did not suggest that the CPU could be used for this purpose.

The board does not find this argument persuasive because it was common practice to use a CPU for

programming a FPGA and because the fourth embodiment of D1 suggests to do so (see the arrows connecting CPU 75 to FPGA circuits 71 to 74 in figure 8, and column 10, lines 42 to 45).

6.2 Re distinguishing feature (B)

D1 mentions that the signal processing circuit 16 of figure 2 has an application running on it: see "As shown in FIG. 3, an LCA **121** is a logic IC driven by a program in the same manner as a microcomputer" in column 4, lines 23 and 24. It would thus have been obvious to the skilled person that also this application would have had to be adapted to the newly connected camera, i.e. the pre-existing application would have to be overwritten by a new application.

For the above reasons, the skilled person would have arrived at distinguishing feature (B) without the exercise of inventive activity.

6.2.1 The appellant's arguments

The appellant essentially argued that there is no pre-existing application to overwrite in D1 because the configured signal processing circuit 16 in figure 2 would operate exclusively in hardware, with no software running on it.

The board disagrees because the sentence in column 4, lines 23 and 24, reading "As shown in FIG. 3, an LCA **121** is a logic IC driven by a program in the same manner as a microcomputer" provides a clear indication that the signal processing circuit 16 executes a program, i.e. an application. It would thus be clear to the skilled person that whenever the hardware

configuration of the signal processing circuit is changed, the overlying application must be adapted, if only to take into account the hardware changes. In other words, the existing application would have to be replaced, i.e. overwritten, by a new application. The overwriting of an application is typically done by a (further) program.

7. Conclusion on inventive step for the main request

For the above reasons, the board considers that the subject-matter of claim 1 does not involve an inventive step (Article 56 EPC 1973) in view of prior-art document D1 and common general knowledge.

8. Conclusion on the main request

Since the subject-matter of claim 1 of the main request does not meet the requirement of Article 56 EPC 1973, the main request is not allowable.

First auxiliary request - inventive step (Article 56 EPC 1973)

9. Claim 1 according to the first auxiliary request differs from claim 1 according to the main request by the additional features of dependent claims 16 and 17 of the main request, i.e. by the following additional features:

> "said configurable hardware device (62) further comprises a non-overwritable portion for requesting said program (42), wherein said non-overwritable portion is adapted to load said program (42)".

10. The board considers that these additional features do not add anything inventive for the following reasons:

According to the first embodiment of D1 (figure 2), the circuit data stored in the camera (in data ROM 19, 20) is loaded from the camera into signal processing circuit 16 (see column 4, lines 52 to 54, and the arrows between the camera and the signal processing circuit in figure 2). The board understands from the disclosure of D1 that the circuit data must then be passed on from signal processing circuit 16 to CPU 18 where it is fed to a program for configuring signal processing circuit 16 (see column 10, lines 42 to 45, and column 11, lines 51 to 56).

The signal processing circuit must therefore comprise circuitry for requesting and loading the circuit data from the camera when an endoscope is connected to the CCU 3. Such circuitry would typically be non-overwritable, similarly to a "boot loader" in a computer, because if the loading of configuration information is wrongly performed due to a configuration error, the device cannot recover from it. Figures 8 and 12 of D1 and the associated description make clear that the signal processing circuit comprises both configurable portions (FPGAs (1) to (4) (71 to 74)) and non-overwritable portions (the circuits other than FPGAs (1) to (4)). The skilled person would thus want to use a non-overwritable portion of signal processing circuit 16 for requesting and loading the circuit data from the camera to the signal processing circuit 16 (figure 2).

As explained above regarding the main request, the skilled person would have had good reasons to replace said circuit data by a program. This program would thus

be requested and loaded by a non-overwritable portion of signal processing circuit 16.

11. The appellant submitted the following arguments:

(a) In the embodiment shown in figure 2 of D1, the circuit data is not requested by signal processing circuit 16, but by CPU 18 via signal processing circuit 16.

(b) The portions other than FPGAs (1) to (4) in figures 8 and 12 of D1 may be overwritable.

(c) The common general knowledge on boot loaders only applied to the activation of an initial boot routine when a device is powered on, but not to the detection of a connected device.

(d) Since a fixed loading program is used in D1, a non-recoverable malfunction cannot occur. Hence, there is no need to use a non-overwritable portion of the configurable hardware device.

12. The board does not find these arguments persuasive for the following reasons:

Re argument (a)

According to column 4, lines 52 to 54, of D1, the circuit data is loaded into signal processing circuit 16 when an endoscope is connected to the CCU. There is no disclosure that the CPU plays a role at this stage. It appears rather that the signal processing circuit requests the circuit data in response to the connection of the endoscope to the CCU. Hence argument (a) is not persuasive.

Re argument (b)

D1 discloses in figures 8 and 12 and in the associated description that four FPGAs (1) to (4) are provided in the camera control unit (CCU 70), each of these FPGAs being programmable. In the board's view, it also means that the remaining circuits of the CCU need not be programmable i.e. overwritable. For the reasons given under point 10 *supra*, the board considers that the skilled person would have had good reasons to want to use a non-overwritable portion of signal processing circuit 16 of figure 2 for requesting and loading the circuit data, or alternatively a program, from the camera.

Re argument (c)

In the board's view, the automatic loading of configuration information by and for the signal processing device upon detection of a connected endoscope is analogous to the automatic loading of the initial boot routine when a computer is powered on. In both cases, the device/computer cannot recover from a wrongly executed load sequence.

Re argument (d)

In D1, the circuit data loaded by the signal processing circuit from the connected camera is then passed on to the CPU where it is executed by a presumably fixed program. Even if the loading of the circuit data is performed properly, the CPU might configure the signal processing circuit wrongly for example due to an error

in the circuit data. Once the signal processing circuit is configured to operate in a wrong manner, a further loading of circuit data by the signal processing circuit may be impossible. Hence, the loading of circuit data by the signal processing circuit is critical and should thus be performed by a non-configurable portion of the signal processing circuit.

13. Conclusion on inventive step for the first auxiliary request

For the above reasons, the board considers that the subject-matter of claim 1 of the first auxiliary request does not involve an inventive step (Article 56 EPC 1973) in view of prior-art document D1 and common general knowledge.

14. Conclusion on the first auxiliary request

Since the subject-matter of claim 1 of the first auxiliary request does not meet the requirement of Article 56 EPC 1973, the first auxiliary request is not allowable.

Second auxiliary request - inventive step (Article 56 EPC 1973)

15. Claim 1 according to the second auxiliary request differs from claim 1 according to the main request by the additional features of dependent claims 8 and 9 of the main request, i.e. by the following additional features:

> "said program (42) enables said camera control unit (20) to issue commands (34) to said camera (12), and wherein said camera (12) is adapted to send confirmation to said camera

control unit (20) that said commands (34) were received and said commands (34) have been, or will be, executed".

16. In D1, the camera control unit (CCU) controls the camera (see also column 3, lines 46 to 50). The board concurs with the examining division that such control usually implies sending commands and receiving confirmations that the commands have been received and executed (see point 6.1 of the reasons for the decision). Moreover, when one or more images are to be captured, the CCU of D1 effectively sends a command to the camera to do so and receives in return the image(s) as confirmation that the command has been received and executed.

17. The appellant argued that an image received by the CCU of D1 in response to a command to capture an image is not a confirmation for the CCU but a confirmation for a human brain.

The board does not consider this argument persuasive because receiving a captured image in response to a command to capture an image is a confirmation that the command has been executed, both for the CCU and for the human brain. Moreover,the board cannot see from the wording of claim 1 why a received image would not be regarded as a confirmation to the CCU that its command to capture an image has been received and executed.

18. Conclusion on inventive step for the second auxiliary request

For the above reasons, the board considers that the subject-matter of claim 1 of the second auxiliary request does not involve an inventive step (Article 56

EPC 1973) in view of prior-art document D1 and common general knowledge.

19. Conclusion on the second auxiliary request

Since the subject-matter of claim 1 of the second auxiliary request does not meet the requirement of Article 56 EPC 1973, the second auxiliary request is not allowable.

Third auxiliary request - inventive step (Article 56 EPC 1973)

20. Claim 1 according to the third auxiliary request differs from claim 1 according to the main request by additional features, which essentially state that the configuration program performs functions and/or steps for which the program was written and one of those functions is to configure the configurable hardware device for compatibility with the camera.

21. These additional features do not add anything inventive because by replacing the circuit data by a configuration program as discussed *supra* with respect to the main request, the skilled person would also arrive without the exercise of inventive activity at these additional features which describe what this program would do.

22. The appellant did not submit arguments specifically for the third auxiliary but, instead, referred back to its arguments regarding the main request.

23. Conclusion on inventive step for the third auxiliary request

For the above reasons, the board considers that the subject-matter of claim 1 of the third auxiliary request does not involve an inventive step (Article 56 EPC 1973) in view of prior-art document D1 and common general knowledge.

24. Conclusion on the third auxiliary request

Since the subject-matter of claim 1 of the third auxiliary request does not meet the requirement of Article 56 EPC 1973, the third auxiliary request is not allowable.

Conclusion

25. Since none of the appellant's requests is allowable, the appeal must be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chair:

K. Boelicke T. Karamanli

Decision electronically authenticated