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Datasheet for the decision of 11 November 2021

Case Number: T 0331/15 - 3.2.02

Application Number: 06752435.5

Publication Number: 1885273

IPC: A61B19/00, B25J9/16

Language of the proceedings: EN

Title of invention:
Highly configurable robotic systems for surgery and other uses

Patent Proprietor:
Intuitive Surgical Operations, Inc.

Opponents:
KUKA Roboter GmbH
Deutsches Zentrum für Luft- und Raumfahrt e.V.

Headword:

Relevant legal provisions:
EPC Art. 54, 56, 83, 84, 123(2), 111(1)
RPBA Art. 12(4)
RPBA 2020 Art. 11

Keyword:

Amendments - added subject-matter (no)
Claims - clarity (yes)
Sufficiency of disclosure - (yes)
Late-filed evidence - submitted with the statement of grounds of appeal - admitted (yes)
Appeal decision - remittal to the department of first instance (no)
Novelty - (yes)
Inventive step - (yes)

Decisions cited:

Catchword:

Europäisches Patentamt
European Patent Office
Office européen des brevets

Beschwerdekammern

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Case Number: T 0331/15 - 3.2.02

D E C I S I O N
of Technical Board of Appeal 3.2.02
of 11 November 2021

Appellant: (Opponent 1)	KUKA Roboter GmbH Zugspitzstr. 140 86156 Augsburg (DE)
Representative:	Schlotter, Alexander Carolus Paul Wallinger Ricker Schlotter Tostmann Patent- und Rechtsanwälte Partnerschaft mbB Zweibrückenstrasse 5-7 80331 München (DE)
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Respondent: (Patent Proprietor)	Intuitive Surgical Operations, Inc. 1020 Kifer Road Sunnyvale, CA 94086 (US)
Representative:	MacDougall, Alan John Shaw Mathys & Squire The Shard 32 London Bridge Street London SE1 9SG (GB)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 11 December 2014 concerning the maintenance of European Patent No. 1885273 in amended form**

Composition of the Board:

Chairman	M. Alvazzi Delfrate
Members:	D. Ceccarelli
	N. Obrovski

Summary of Facts and Submissions

I. Opponent 1 has appealed against the Opposition Division's decision, posted on 11 December 2014, that, account being taken of the amendments according to the main request made by the patent proprietor during the opposition proceedings, European patent No. 1 885 273 and the invention to which it related met the requirements of the EPC.

II. Opponent 2 appealed but then withdrew its appeal.

III. Anonymous third-party observations were filed by submission dated 20 October 2021.

IV. Oral proceedings took place on 11 November 2021 in the absence of the party as of right/opponent 2, which had announced that it would not be attending by submission dated 10 November 2021. In accordance with Rule 115(2) EPC and Article 15(3) RPBA, the proceedings were continued without this party.

The appellant requested that the decision under appeal be set aside and that the patent be revoked.

The respondent requested that the appeal be dismissed (main request) or, in the alternative, that the patent be maintained on the basis of one of the auxiliary requests filed with the submission dated 24 August 2015 (first auxiliary request B to fourth auxiliary request D).

V. The following documents are relevant for this decision:

A1: "Mechatronics and Autonomy in Minimally Invasive

Robotic Surgery", T Ortmaier et al., Proceedings 3rd International Conference on Humanoid Robots (Humanoids2003), Munich and Karlsruhe, Germany, October 2003

E1: "Towards semi-autonomy in laparoscopic surgery through vision and force feedback control", A Krupa et al., Proceedings of the International Symposium on Experimental Robotics (ISER), 2000

E4: "Dynamic Task/ Posture Decoupling for Minimally Invasive Surgery Motions", M Michelin et al., Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2004

E7: "Programming by Touch: The Different Way of Human-Robot Interaction", G Grunwald et al., IEEE Transactions on Industrial Electronics, vol. 50, no. 4, August 2003

E8: US-A-2002/0082612

E21: "Kinematic Control of Redundant Robot Manipulators: A Tutorial", B Siciliano, Journal of Intelligent and Robotic Systems 3: 201-212, 1990

E24: "Manipulability and Accuracy Measures for a Medical Robot in Minimally Invasive Surgery", R Konietschke et al., Advances in Robot Kinematics, Genoa, Italy, 2004

E25: "A Preoperative Planning Procedure for Robotically Assisted Minimally Invasive Interventions", R Konietschke et al., 3. Jahrestagung der Deutschen Gesellschaft für Computer- und Roboterassistierte Chirurgie (CURAC), Munich, Germany, 8-9 December 2004

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

"A minimally invasive master-slave robotic surgical system (200, 300) comprising:

a manipulator assembly (304, 306) for robotically moving a distal end effector (50) relative to a proximal base (302), the manipulator assembly (304) having a plurality of joints (J1-J10), the joints (J1-J10) having redundant degrees of freedom for robotically moving the distal end effector (50);

wherein the manipulator assembly (304, 306) comprises:

a surgical instrument (306) comprising the distal end effector (50), a proximal end (53), and an intermediate portion (14.1) between the end effector (50) and the proximal end (53); and

a manipulator (304) configured to support the proximal end (53) of the surgical instrument (306) and to move the surgical instrument (306) from outside a patient while the intermediate portion (14.1) of the surgical instrument (306) passes through an access site (514) of the patient;

wherein the plurality of joints (J1-J10) of the manipulator assembly comprise joints (J1-J7) of the manipulator and joints (J8-J10) of the surgical instrument;

an input device (220) for receiving an indication of a desired movement of the distal end effector (50) within a surgical workspace inside the patient by the movement of the input device (220); and

a processor (210) configured to concurrently operate in a master-slave end effector (50) manipulation mode in which the processor (210) determines desired movement of the joints (J1-J10) of the manipulator assembly to effect the desired movement of the end effector (50) such that

movement of the end-effector (50) follows the movement of the input device (220) and in a clutch mode in which the processor (210) determines desired movement of at least one of the joints (J1-J10) of the manipulator assembly in response to a manual articulation of another joint of the manipulator assembly (304) which another joint of the manipulator assembly is a joint (J1-J7) of the manipulator that is proximal of the access site (514);

wherein when operating in said master-slave end effector (50) manipulation mode, the processor is further configured to determine desired movement of the plurality of joints (J1-J10) of the manipulator assembly that constrain the intermediate portion (14.1) of the surgical instrument (306) to pass through the access site (514) and pivot about a pivotal centre of the surgical instrument (306) located adjacent the access site (514); and

wherein the plurality of joints (J1-J10) of the manipulator assembly are configured to provide sufficient degrees of freedom to allow a range of joint states proximal of the access site (514) for a determined end effector position while the intermediate portion (14.1) passes through the access site (514)."

VII. The appellant's arguments, where relevant to the present decision, can be summarised as follows:

Added subject-matter

Claim 1 of the main request included the newly added last feature that the plurality of joints of the manipulator were configured to provide sufficient

degrees of freedom to allow a range of joint states proximal to the access site for a determined end effector position while the intermediate portion passed through the access site. In other words, the plurality of joints proximal to the access site had to be redundant.

However, paragraphs [0010], [0011] and [0050] of the application as filed did not distinguish between joints within or outside the body of a patient. Hence, these paragraphs were not a direct and unambiguous disclosure of the joints proximal to the access site being redundant.

Paragraphs [0081], [0082], [0181], [0183] and [0188] disclosed a specific embodiment with a particular kinematic structure comprising a certain number, type and configuration of joints. This particular kinematic structure was of importance for the invention, as stressed in paragraph [0188], which expressly mentioned the benefit provided by "this additional degree of freedom" in accordance with the specific embodiment.

Since claim 1 of the main request was directed to any redundant configuration of joints "proximal of the access site", it constituted a non-allowable intermediate generalisation.

Lack of clarity

The person skilled in the art would not be able to establish whether a given manipulator assembly fell within the scope of claim 1 of the main request or not.

The access site, to which the claim referred, did not belong to the manipulator assembly. The location of the

access site could be varied so that the position of a given joint could change from proximal to distal. It followed that a given manipulator assembly could be redundant or not proximal to the access site depending on the current position of the access site.

Moreover, for a given manipulator assembly, the same joints proximal to the access site could be redundant or not depending on the current pose of the manipulator assembly. Two joints which generally provided two different degrees of freedom might provide a single redundant degree of freedom in a particular pose.

Insufficiency of disclosure

Claim 1 of the main request defined a processor configured to concurrently operate in a master-slave end effector manipulation mode and in a clutch mode. This defined a problem to be solved. However, the patent merely described the advantages resulting from the solution of the problem, without disclosing the technical means necessary to achieve this solution. Whether the prior art disclosed such technical means was not decisive, as the patent had to disclose the invention in a sufficient manner without the need to refer to further prior art. It followed that the subject-matter of claim 1 could not be carried out by the person skilled in the art, in particular over the whole scope of the claim.

Admittance of A1 and remittal

A1 had been filed with the statement of grounds of appeal as a reaction to the Opposition Division's decision to admit the main request filed after the summons to oral proceedings and also as a reaction to

the finding that the subject-matter of claim 1 of this request was novel and inventive. A1 should be admitted into the appeal proceedings. There was no reason to remit the case to the Opposition Division if A1 was admitted.

Lack of novelty

The subject-matter of claim 1 of the main request was not novel over A1, E24, E1 or E4.

A1 was an article that had been part of the IEEE-RAS International Conference on Humanoids in 2003. It belonged to the state of the art of the patent in suit.

A1 disclosed a minimally invasive master-slave robotic surgical system with all the features of claim 1 of the main request. In particular, it disclosed a processor which was configured to operate in a master-slave end effector manipulation mode and in a clutch mode. The processor could concurrently operate in these two modes. This was derivable from point 2.1, first paragraph, last sentence; point 2.1, second paragraph, last sentence; point 2.1, fourth paragraph; and point 2.2, first paragraph, eighth sentence, and last paragraph.

E24 also disclosed a minimally invasive master-slave robotic surgical system with all the features of claim 1 of the main request. In particular, a manipulator assembly with a processor configured to operate in a clutch mode was disclosed in point 1 - Introduction, first paragraph, last sentence. In this passage it was explicitly stated that the redundancy of the robotic surgical system could be used to avoid collisions in unpredictable environments. However,

collisions in such environments were avoided by pushing the manipulator assembly out of the way. This, which corresponded to a clutch mode of operation, was also confirmed by Figure 10C of the patent. In any case, E7 and E21 disclosed that usually, redundant robotic systems could be pushed out of the way by manually moving their joints.

E1 also disclosed a processor configured to concurrently operate in a master-slave end effector manipulation mode and in a clutch mode. The clutch mode was implemented by a force feedback controller for avoiding the application of lateral forces to the access site (through a trocar), as disclosed in Section 1.2.

E4 was similar to E1. E4 disclosed in particular a processor configured to concurrently operate in a master-slave end effector manipulation mode and in a clutch mode in point 1 - Introduction, first to third paragraphs, in point 2.3 and in Figure 1. This was also clear from a comparison between Figure 1 of E4 and Figure 10B of the patent in suit.

Lack of inventive step

The subject-matter of claim 1 of the main request was not inventive when starting from A1, E24 or E1.

If it was considered that A1 did not disclose a processor configured to concurrently operate in the two modes defined in claim 1 of the patent as granted, this distinguishing feature would address the objective technical problem of enabling the manipulator assembly to reliably react to unpredictable events during an operation.

E24 taught that the operating room was an unpredictable and overcrowded environment (Introduction, first paragraph, last sentence). In view of this teaching, during surgical interventions it would have been obvious to implement collision avoidance with the clutch mode of operation in the robotic surgical system of A1.

Moreover, E7 taught a robotic system which could operate in clutch mode at the same time as it was performing the task of balancing an inverted pendulum (page 664, last full paragraph, and Figure 9). E7 taught that such a robotic system could be employed in a variety of environments, including hospitals (abstract). This would have prompted the person skilled in the art to implement the concurrent operation of the master-slave end effector manipulation mode and the clutch mode in the robotic surgical system of A1.

E8 taught that during operation it was desirable to intuitively move a surgical end effector which was controlled remotely (paragraph [0009]), for example from a patient's side, to provide clear access to the patient. In view of this teaching, the person skilled in the art would have implemented the concurrent operation of the master-slave end effector manipulation mode and the clutch mode in the robotic surgical system of A1 in an obvious way.

Starting from E24 it would have been obvious to implement concurrent operation of a master-slave end effector manipulation mode and a clutch mode in view of E7 (page 664, last full paragraph, and Figure 9) in order to effectively avoid collisions. The person skilled in the art would have considered E7 in

combination with E24 since they concerned the same robotic system, i.e. the "DLR lightweight robot" (E7, page 663, last paragraph). This was made clear by E25, which referred to "DLR minimally invasive robotic surgery (MIRS)" (page 2, penultimate paragraph, first sentence) and to E24. Moreover E7 and E24 had a common co-author.

The same held true for the combination of E24 with A1, which also rendered obvious the subject-matter of claim 1 of the main request.

Starting from the robotic surgical system according to E1, if it was considered that this document did not disclose an articulated instrument, it would have been obvious for the person skilled in the art to employ such an instrument in the robotic surgical system in order to address the objective technical problem of improving manipulability in a patient under treatment. Articulated instruments for such a purpose were clearly known from E8 and E25.

VIII. The party as of right/opponent 2 submitted arguments only in relation to the availability to the public of A1 before the priority date of the patent in suit. The third party's observations contained arguments in favour of the admittance of A1 and arguments against an inventive step of the subject-matter of claim 1 of the main request, which supported but did not go beyond the arguments provided by the appellant.

IX. The respondent's arguments, where relevant to the present decision, can be summarised as follows:

Added subject-matter

The subject-matter of claim 1 of the main request had a basis in particular in paragraphs [0011] and [0050] of the application as filed, which generally disclosed manipulator assemblies with many degrees of freedom, as well as in paragraphs [0082], [0083] and [0188], and in claims 2 and 7, which taught a system that was redundant proximal to the access site.

Lack of clarity

The reference to the access site did not make claim 1 of the main request unclear. An access site was a well-understood term of art and all minimally invasive robotic systems used surgical instruments that had a distal end effector, a proximal end and an intermediate portion that was designed to extend through an access site into the patient. A device with a robot arm could only fall within the scope of claim 1 if it was suitable for being inserted into an access site such that joints to the exterior of the patient fulfilled the claimed requirements for redundancy. The fulfilment of these requirements was not dependent on the current pose of the device but instead required a processor able to compensate for manual articulations of the robot arm. In turn, this required a robot arm with more than six degrees of freedom.

Insufficiency of disclosure

The patent in suit sufficiently described a processor that could deal with the redundancies as defined in claim 1 of the main request to achieve the desired control, in particular in paragraphs [0094] to [0134].

Admittance of A1 and remittal

It was not *prima facie* clear whether A1 was prior art. Moreover, there was no reason why the appellant could not have filed A1 before. The amended claims filed after the summons to oral proceedings at first instance appeared in substance in claim 6 as filed. The fact that the Opposition Division had come to a decision favourable to the patent proprietor did not justify the filing of a new document. Moreover, A1 was not *prima facie* more relevant than the other cited documents. Hence, A1 should not be admitted into the proceedings. If if was admitted, the case should be remitted to the Opposition Division so that A1 could be examined at two levels of jurisdiction.

Lack of novelty

It was not established that A1 belonged to the state of the art of the patent in suit. In any case, A1 did not disclose a manipulator assembly controlled with a processor configured to concurrently operate in a master-slave end effector manipulation mode and in a clutch mode. Collision avoidance did not imply manual articulation. Figure 10C of the patent did not mean that. Collision avoidance could be implemented by employing sensors to detect when the manipulator moved close to another object such that the processor could make the manipulator assembly move out of the way. There was no suggestion in A1 that someone in the operating room could manually articulate the robotic arm of the device of A1 while the surgeon was performing surgery. Manual articulation might be allowed only for positioning the manipulator assembly before surgery.

E24 did not disclose a clutch mode of operation. It disclosed the possibility of using redundancy to avoid collisions, but it did not disclose how the collisions were avoided.

Neither E1 nor E4 disclosed a manipulator assembly which could be manually articulated in an operating room while a surgeon was performing an operation. In particular, E1 disclosed a controller for adjusting the configuration of a robotic arm in response to a force sensed at an access site so as to bring this force to zero. Therefore, these documents did not disclose the clutch mode of operation defined in claim 1 of the main request.

Lack of inventive step

None of the cited documents disclosed a minimally invasive robotic surgical system with a manipulator assembly and a processor configured to operate in a clutch mode that allowed someone within an operating room to manually move the manipulator assembly while a surgeon was performing a surgical procedure.

The combination of A1 and E24 would not lead the person skilled in the art to the subject-matter of claim 1 of the main request in an obvious way. E24 did not teach a clutch mode of operation concurrent with a master-slave end effector mode of operation as a measure to be applied in unpredictable environments. It taught that redundancy could be used for collision avoidance.

Starting from A1 or E24, the skilled person would not have considered the teaching of E7. This document did not disclose a surgical robot which could operate in a master-slave end effector manipulation mode. E7

described a general-purpose robot programmed to carry out a fairly trivial task. The robot disclosed in E7 was not the same as the one disclosed in E24. DLR made a large number of different robots.

Starting from A1, the combination of this document with E8 would not render the subject-matter of claim 1 of the main request obvious, because E8 did not disclose a clutch mode of operation. E8 taught manipulators which could be moved by an intuitive remote control.

Starting from E1, it had to be considered that this document disclosed neither an instrument having multiple joints, nor the clutch mode of operation as defined in claim 1 of the main request. E8 and E25 did not disclose the claimed clutch mode of operation either.

Reasons for the Decision

1. The invention

The invention relates to a minimally invasive master-slave robotic surgical system.

The claimed system comprises a manipulator assembly with a surgical instrument and an input device for receiving an indication of a desired movement of a distal end effector of the surgical instrument. Typically, such a system, an example of which is shown in Figures 1B and 1C of the patent, which are reproduced below, comprises a plurality of manipulator assemblies in the form of robotic arms (304), which each serve to support a surgical instrument (306) inside an operation room. The robotic arms are

controlled remotely by a surgeon.

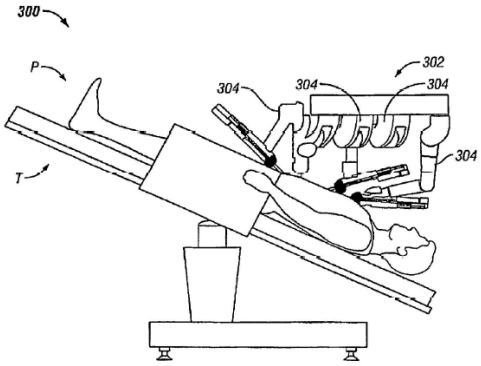

FIG. 1B

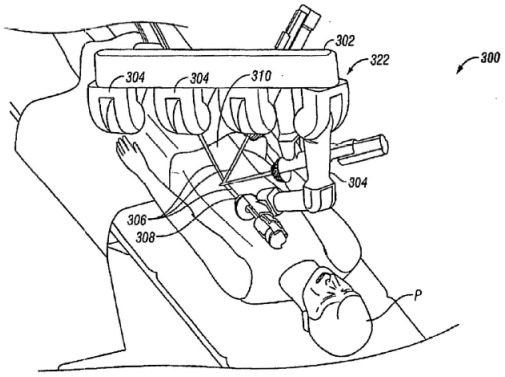

FIG. 1C

The manipulator assembly comprises a plurality of joints having redundant degrees of freedom. A schematic representation of the joints (J1-J10) can be seen in Figure 6 of the patent, which is reproduced below.

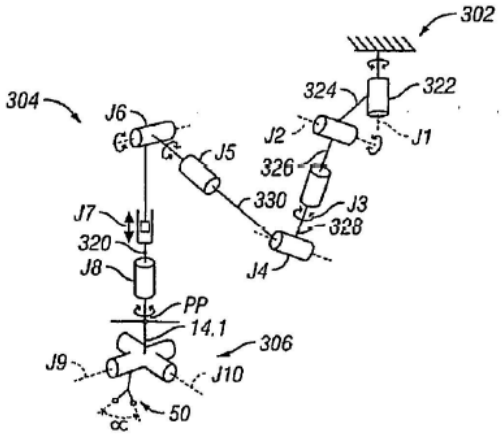

FIG. 6

The plurality of joints allows the same movement of the distal end effector (50) to be performed with a range of different configurations of the manipulator assembly.

The surgical instrument comprises a proximal end, an intermediate portion for passing through an access site

(PP) of a patient, and the distal end effector.

The input device may be in the form of an operator console, for remotely driving the surgical instrument. The input device is for receiving an indication of a desired movement of the end effector within the patient by the movement of the input device.

The system further comprises a processor configured to concurrently operate in a master-slave mode and in a clutch mode.

In the master-slave mode, the processor determines movements of the joints of the manipulator assembly to effect the desired movement of the end effector as provided by the input device.

In the clutch mode, the processor determines the desired movement of at least one joint of the manipulator assembly in response to a manual articulation of another joint of the manipulator assembly. This may be the case when an operator wants to manually reposition the manipulator assembly within the operation room, for example to get it out of their way.

When operating in the master-slave mode, the processor is configured to constrain the intermediate portion of the surgical instrument such that it passes through the access site and pivots about a point adjacent to the access site. This is so as not to injure the patient at the access site while moving the surgical instrument.

The possibility of concurrent operation in the master-slave mode and in the clutch mode permits repositioning of the part of the manipulator assembly

proximal to the access site to avoid the risk of injury to the patient at the access site while the end effector is operating within the patient. This results in a practical and safe robotic system.

2. Added subject-matter

Claim 1 of the main request is generally based on paragraphs [0003], [0010], [0011], [0049], [0050], [0060], [0070], [0081], [0082], [0083], [0089] and [0118] of the application as filed. The feature of the processor being configured to concurrently operate in the master-slave mode and the clutch mode was originally disclosed in claim 14 of the application as filed.

The appellant raised an objection of added subject-matter against the last feature of the claim, according to which the plurality of joints of the manipulator assembly is configured to provide sufficient degrees of freedom to allow a range of joint states proximal to the access site for a determined end effector position while the intermediate portion passes through the access site.

This feature technically requires the redundancy of the joints of the manipulator assembly which are proximal to the access site. Paragraphs [0010], [0011] and [0050] of the application as filed do not disclose in general terms a manipulator with redundant degrees of freedom proximal to the access site. However, it is common ground that the feature is disclosed as such, for example in paragraphs [0082] and [0188], and Figures 6, 8A and 8D of the application as filed, albeit with respect to a specific kinematic structure.

The appellant argued that omitting the other features of the specific kinematic structure amounted to an unallowable intermediate generalisation.

While paragraph [0181], mentioned by the appellant, refers to a specific "kinematic structure which provides both compactness and high dexterity", the Board does not consider other technical features of that specific structure to be inextricably linked to the provision of redundant degrees of freedom of the joints proximal to the access site. This provision permits, as such, a range of different configurations of the manipulator assembly, with the surgical instrument being in the same position distally from the access site. Although paragraph [0188] of the application as filed, referred to by the appellant, mentions the benefit provided by "*this additional degree of freedom*" of the specific kinematic structure of the manipulator assembly, it is clear from the context that the benefits are ascribed to the provision of any additional degree of freedom: "*by providing this additional degree of freedom, the arm is able to attain an infinite number of poses or configurations for a given end effector position, even while the shaft of the instrument remains constrained to pivotal motion about a minimally invasive aperture*". Hence, the application as filed presents the optimisation of the manipulator assembly in relation to a particular joint for providing a redundant degree of freedom as merely being preferred.

It follows that claim 1 of the main request does not involve any unallowable intermediate generalisation, and complies with Article 123(2) EPC.

3. Clarity

The appellant argued that the reference to the access site, which was not part of the surgical system, and the defined redundancy of the joints proximal to the access site introduced a lack of clarity in claim 1 of the main request.

3.1 The Board considers the reference to the access site to be an allowable functional definition of the surgical system.

As already indicated by the Board in the communication of 11 February 2020 (point 3), for a given surgical instrument the person skilled in the art will know which part of it is suitable for passing through an access site during an operation. In any case, even if more elements of a surgical instrument were suitable for passing through the access site during an operation, it would not be problematic to establish whether or not the surgical instrument falls within the scope of the claim. If for at least one of these elements the surgical instrument fulfils the requirements of the claim when the element passes through the access site, the surgical instrument falls within the scope of the claim. Otherwise it does not. Such a situation may render the claim broad but not unclear.

3.2 The appellant's argument that the same joints proximal to the access site could be redundant or not, depending on the current pose of the manipulator assembly, is not convincing. Interpreting the claim wording in a technically sensible manner in the context of the patent as a whole, the definition that "the plurality of joints (J1-J10) of the manipulator assembly are

configured to provide sufficient degrees of freedom to allow a range of joint states proximal of the access site (514) for a determined end effector position" requires more than six degrees of freedom provided by the joints proximal to the access site. A joint redundancy which can be achieved only for one or for a discrete number of singular poses does not make it possible to reposition the manipulator assembly in a different location while the intermediate portion passes through the access site and the end effector is in a determined position. This is, however, what the patent aims to achieve (paragraph [0080], for example).

It follows that claim 1 is clear, in compliance with Article 84 EPC.

4. Sufficiency of disclosure

The appellant raised an objection of a lack of sufficiency directed to the functional features of claim 1 of the main request, according to which the processor is configured to concurrently operate in the master-slave mode and in the clutch mode.

Implementing such control by the processor is a programming task based on known mathematics. The specific programming task is enabled by the detailed description of the patent (paragraphs [0090] to [0158]) in view of the common general knowledge of the person skilled in the art of robotics. The cited prior art, which implements motion control requiring programming tasks of comparable difficulty, does not cast any doubt on the feasibility of the specific control required for achieving the claimed functional feature.

It follows that the invention as defined in claim 1 of

the main request is sufficiently disclosed, in compliance with Article 83 EPC.

5. Admittance of A1 and remittal

A1 was filed by the appellant with the statement of grounds of appeal.

5.1 Under Article 12(4) RPBA 2007, which applies by virtue of Article 25(2) RPBA 2020, everything presented by an appellant with the statement of grounds of appeal is normally to be taken into account by the Board if and to the extent it relates to the case under appeal and is appropriately reasoned. However, the Board retains a discretion not to admit evidence which could have been presented in the first-instance proceedings.

The Board is satisfied that the filing of A1 is an appropriate reaction by the appellant to the Opposition Division admitting the main request into the proceedings, which was filed after the summons to oral proceedings.

The Board thus makes use of its discretion under Article 12(4) RPBA 2007 to admit A1 into the appeal proceedings.

5.2 According to Article 111(1) EPC, to decide on an appeal the Board "may either exercise any power within the competence of the department which was responsible for the decision appealed or remit the case to that department for further prosecution".

Hence, a decision to remit is a discretionary decision by the Board. A party has no absolute right to two levels of jurisdiction.

Moreover, according to Article 11 RPBA 2020, the Board must not remit a case for further prosecution to the department whose decision was appealed, unless special reasons present themselves for doing so.

The Board notes that in the impugned decision the Opposition Division considered novelty and inventive step of claim 1 of the main request in particular in view of the claimed features of the processor configured to operate in a master-slave mode and in a clutch mode (point 3.6 of the Reasons). The assessment of novelty and inventive step in view of A1 mainly concerns the same features.

In view of these circumstances the Board decides not to remit the case, in accordance with Article 11 RPBA 2020 and Article 111(1) EPC.

6. Novelty

The appellant argued that the subject-matter of claim 1 of the main request was not novel over A1, E24, E1 or E4.

6.1 A1 concerns robots for minimally invasive surgery (Introduction, fifth paragraph). More specifically, it discloses a minimally invasive master-slave robotic surgical system with a redundant kinematic structure, and a processor configured to operate in a master-slave manipulation mode and a clutch mode as defined in claim 1 (point 2.1, first paragraph). In particular, the clutch mode is disclosed in the third sentence of that first paragraph: "*if in addition to the redundant structure also joint torque sensors are implemented then pose reconfiguration of the arm can be achieved in*

an intuitive way by touching and pushing the robot into the desired direction".

However, A1 does not disclose that the processor is configured to concurrently operate in the master-slave mode and in the clutch mode.

The processor in A1 may simply be able to switch between the two modes, enabling repositioning only while no movement of the end effector (in the master-slave mode) is taking place.

The passages cited by the appellant do not allow a different conclusion to be drawn.

6.1.1 Point 2.1, first paragraph, last sentence, reads: "*this represents an advantage in comparison to non-redundant systems such as the da VINCI where surgeons often have to cope with collisions between the robotic arms during surgical interventions*". However, what represents an advantage during surgical interventions according to this passage becomes clear from the previous sentence in A1, which reads: "*furthermore, the redundancy can be used to implement collision avoiding arm control leading to a more flexible operating room setup*". Hence, the redundancy used to implement collision avoidance represents an advantage.

The same is derivable from point 2.2, first paragraph, eighth sentence, which reads: "*the kinematic redundancy allows for flexible operating room setup and collision avoidance during surgical interventions*".

Collision avoidance is not necessarily implemented with a clutch mode of operation. Collision avoidance could

be carried out, for example, in the master-slave mode of operation, employing sensors to detect that a manipulator of the robot is moving close to another object and using the sensor outputs to constrain the motion of the manipulator.

Hence, these passages do not imply a processor configured to concurrently operate in a master-slave mode and in a clutch mode.

6.1.2 The second paragraph, last sentence, and fourth paragraph of point 2.1 mention "*totally endoscopic bypass grafts*" and "*high level of immersion of the surgeon into the remotely performed operation*" respectively. These passages do not relate to the clutch mode of operation. Hence, they do not imply a processor configured to concurrently operate in a master-slave mode and in a clutch mode.

6.1.3 According to point 2.2, last paragraph: "*each of the DLR's joint units is equipped with a torque sensor. In combination with impedance control laws this enables the above mentioned direct robot man interaction*". This amounts to a disclosure of a clutch mode of operation. However, there is still no disclosure of a processor configured to concurrently operate in a master-slave mode and in the clutch mode.

6.2 E24 too concerns robots for minimally invasive surgery (point 1 - Introduction, first paragraph). More specifically, it discloses a manipulator assembly with a redundant kinematic structure *"to avoid collisions without changing the position and the orientation of the tool tip"* (point 1 - Introduction, first paragraph, last sentence). It also discloses an algorithm for controlling the manipulator in the presence of further

kinematic constraints in addition to the constraint at the access site of the patient (point 2 - Problem statement).

However, E24 does not disclose a processor configured to operate in a clutch mode. As a consequence, it does not disclose a processor configured to concurrently operate in a master-slave mode and a clutch mode as defined in claim 1 of the main request.

E24 does not make any reference to a possible manual articulation of a joint of the manipulator proximal to the access site.

The passage in point 1 - Introduction, first paragraph, last sentence, referred to by the appellant and disclosing the redundant kinematic structure to avoid collisions in unpredictable environments, does not amount to a disclosure of a clutch mode of operation, which would permit pushing the manipulator assembly out of the way. As explained in relation to A1 in point 6.1.1 above, collision avoidance is not necessarily implemented with a clutch mode of operation.

Figure 10C of the patent, which illustrates a processor control schematic with a master-slave mode and a clutch mode, does not link collision avoidance with the clutch mode of operation in a univocal way.

E7 and E21 are specialised technical articles which disclose specific kinematic controls of redundant robots. Their teaching does not extend implicitly to the robots disclosed in E24. Whether they disclose clutch modes of operation is without relevance for the assessment of novelty of the subject-matter of claim 1

of the main request in view of E24.

6.3 E1 discloses "automatic modes" of operation of robots for minimally invasive surgery, using a force sensor at the access site for giving force feedback to a controller (point 1.2 - Force feedback). However, E1 does not disclose that the controller could be configured to operate in a clutch mode. As a consequence, it does not disclose a processor configured to concurrently operate in a master-slave mode and a clutch mode as defined in claim 1 of the main request.

The force feedback, referred to by the appellant, is not disclosed as being used while a manual articulation of a joint proximal to the access site is taking place. There is no disclosure that a manual articulation is possible.

6.4 The disclosure of E4 is similar to that of E1. E4 does not disclose a processor configured to operate in a clutch mode. As a consequence, it does not disclose a processor configured to concurrently operate in a master-slave mode and a clutch mode as defined in claim 1 of the main request.

The passages in point 1 - Introduction and in point 2.3 and Figure 1 referred to by the appellant disclose teleoperated modes of working of robots for minimally invasive surgery which make use of a force-position control respecting a force constraint at the access site of a patient.

Neither Figure 1 of E4 nor Figure 10B of the patent illustrates a clutch mode of operation.

6.5 It follows that the novelty objections under Article 54(1) and (2) EPC raised by the appellant do not prejudice the maintenance of the patent on the basis of the main request.

7. Inventive step

The appellant argued that the subject-matter of claim 1 of the main request was not inventive when starting from A1, E24 or E1.

7.1 As explained above, A1 does not disclose a processor configured to concurrently operate in a master-slave mode and in a clutch mode.

This distinguishing feature of claim 1 of the main request allows an operator to manually displace the part of the manipulator assembly proximal to the access site, while the end effector may be moved in response to the movement of the input device.

This addresses the objective technical problem of increasing the flexibility of operation of a minimally invasive robotic surgical system as claimed.

The problem formulated by the appellant, i.e. enabling the manipulator assembly to reliably react to unpredictable events during an operation, is not acceptable. This problem cannot be addressed directly by the distinguishing feature, but rather by collision avoidance control.

7.1.1 E24 does not disclose the distinguishing feature. It does not hint at this feature for solving the objective technical problem either. The teaching of E24 about collision avoidance, referred to by the appellant, is

irrelevant, as it is in no relation to the objective technical problem.

Hence, the combination of A1 with E24 does not render the subject-matter of claim 1 of the main request obvious.

7.1.2 E7 discloses a general-purpose robot pre-programmed to balance an inverted pendulum, with a processor which is configured to concurrently operate in a clutch mode in response to a user interaction (page 664, last full paragraph, and Figure 9).

However, E7 discloses neither a minimally invasive robotic surgical system nor a master-slave mode of operation of the robot. Hence, E7 neither discloses the distinguishing feature nor hints at this feature for solving the objective technical problem.

The general reference to hospitals in the abstract does not imply that the robot according to E7 can specifically be a minimally invasive robotic surgical system. Various kinds of robots for performing a wide variety of tasks could be used in hospitals.

7.1.3 As the appellant submitted, E8 discloses a surgical robot with an end effector. The end effector can be intuitively moved and remotely controlled (paragraph [0009]).

However, E8 does not disclose that the surgical robot could be controlled by a processor configured to operate in a clutch mode.

Hence, E8 does not teach the distinguishing feature of claim 1 of the main request for solving the objective

technical problem.

7.1.4 It follows that the subject-matter of claim 1 of the main request is inventive starting from A1, in combination with E24, E7, E8, E1 or E4.

7.2 The appellant raised objections of a lack of inventive step starting from E24.

Like A1, E24 does not disclose a processor configured to concurrently operate in a master-slave mode and in a clutch mode.

As explained in point 7.1 above, this distinguishing feature addresses the objective technical problem of increasing the flexibility of operation of a minimally invasive robotic surgical system as defined in claim 1 of the main request.

For reasons analogous to those given in points 7.1.1 and 7.1.2 above, the combination of E24 with A1 or E7 does not render obvious the claimed subject-matter.

The appellant's argument that E7 concerned the same robotic system as E24 is not convincing. It cannot be assumed that DLR, which stands for German Aerospace Center (E7, Abstract), used a single type of robot until the publication dates of E7 or E24 or E25. Neither can the fact that E7 and E24 share a co-author imply, as such, that the robotic systems disclosed in these documents are the same.

It follows that the subject-matter of claim 1 of the main request is inventive starting from E24, in combination with A1 or E7.

7.3 The appellant raised objections of a lack of inventive step also starting from E1.

E1 does not disclose a processor configured to concurrently operate in a master-slave mode and in a clutch mode either.

Hence, the objective technical problem and the same conclusions as those drawn for the objections starting from A1 or E24 apply.

The appellant relied on the combination of E1 with E8 or E25. However, it cited these latter two documents in relation to the provision of an articulated instrument, and not to the processor configured to concurrently operate in a master-slave mode and in a clutch mode for solving the objective technical problem.

7.4 In conclusion, the inventive-step objections under Article 56 EPC raised by the appellant do not prejudice the maintenance of the patent on the basis of the main request.

8. Since none of the objections based on A1 prejudices the maintenance of the patent on the basis of the main request, it is not necessary to establish whether A1 belongs to the state of the art.

9. Since none of the appellant's objections prejudices the maintenance of the patent on the basis of the main request, the appeal is to be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

D. Hampe M. Alvazzi Delfrate

Decision electronically authenticated