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Datasheet for the decision of 25 November 2020

Case Number: T 2201/16 - 3.2.08

Application Number: 11194019.3

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Title of invention:
Steerable, follow the leader device

Applicant:
Carnegie Mellon University

Headword:

Relevant legal provisions:
EPC Art. 52(1), 54, 56
RPBA 2020 Art. 13(2)

Keyword:
Novelty - main request (yes)
Inventive step - main request (no) - auxiliary request 1 (no)
Amendment after summons - exceptional circumstances (no) - taken into account (no)

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Catchword:

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Case Number: T 2201/16 - 3.2.08

D E C I S I O N
of Technical Board of Appeal 3.2.08
of 25 November 2020

Appellant: (Applicant)	Carnegie Mellon University Center for Technology Transfer and Enterprise Creation 5000 Forbes Avenue Pittsburgh, PA 15213 (US)
Representative:	Weber-Bruls, Dorothée Jones Day Nextower Thurn-und-Taxis-Platz 6 60313 Frankfurt am Main (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 18 April 2016 refusing European patent application No. 11194019.3 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairwoman	P. Acton
Members:	M. Olapinski
	C. Schmidt

Summary of Facts and Submissions

I. The applicant filed an appeal against the decision of the examining division to refuse the patent application in suit.

II. In the decision under appeal, the examining division came to the conclusion that the application did not meet the requirements of Article 52(1) EPC because the subject-matter of claim 1 of the requests then on file did not involve an inventive step.

III. Oral proceedings were held before the Board on 25 November 2020.

IV. The appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the main request or one of auxiliary requests 1 to 3, filed by letter dated 21 January 2016 (main request), with the grounds of appeal on 15 August 2016 (auxiliary request 1) and by letter dated 22 October 2020 (auxiliary requests 2 and 3).

V. The following documents are referred to in the present decision:

D1: US 5 251 611 A
D6: US 2002/026096 A1
D7: US 2004/073084 A1

VI. Claim 1 of the main request reads (feature denomination in bold added by the Board):

"A system comprising:

(A) a highly articulated robotic probe (10) comprising:
(A1) a first mechanism (12) comprising a plurality of first links (24), and
(A2) a second mechanism (14) comprising a plurality of second links (22), wherein the second mechanism (14) is configured to surround at least a portion of the first mechanism (12);
(A3) a first wire (59) extending through either said plurality of links of said first mechanism (12) or said plurality of links of said second mechanism (14) and
(A4) a plurality of wires (54, 55, 56) running through the other of said plurality of links of said first mechanism (12) or said plurality of links of said second mechanism (14);

(B) an electromechanical feeder mechanism (16) configured to
(B1) alternate each of said first mechanism (12) and said second mechanism (14) between a limp mode and a rigid mode,
(B2) advance and retract the highly articulated robotic probe (10), and
(B3) steer at least one of said first and second mechanisms (12, 14); and

(C) a computing device (62) in communication with the feeder mechanism (16), wherein the computing device (62) is configured to:
(C1) receive two-axis data,
(C2) translate the two-axis position data into three-axis coordinate system data, and
(C3) adjust a position of one or more second mechanism motors (50, 51, 52) based on the three-axis coordinate system data, wherein the second mechanism motors (50, 51, 52) control said wires (54, 55, 56), respectively."

Claim 1 of auxiliary request 1 differs from claim 1 of the main request in that it further specifies the following features:

(A5) "wherein the plurality of second links (22) comprises each a plurality of channels configured to surround each at least a portion of the plurality of wires (54, 55, 56);"

(B4) "a first motor (58) for controlling the tension of the first wire (59);

(B5) a plurality of second motors (50, 51, 52) for controlling tension of the plurality of wires (54, 55, 56), wherein each second motor (50, 51, 52) controls tension of one of the plurality of wires (54, 55, 56);"

and in that Feature C3 was amended in the following way (differences marked-up):

(C3') "adjust a position of one or more of the plurality of second motors ~~second mechanism motors~~ (50, 51, 52) based on the three-axis coordinate system data, wherein the plurality of second motors ~~second mechanism motors~~ (50, 51, 52) control said wires (54, 55, 56), respectively."

Claim 1 of auxiliary request 2 differs from claim 1 of auxiliary request 1 in that it further defines the following features:

"wherein the feeder mechanism (16) comprises:
a first movable cart (42) comprising a first actuator (46) that is configured to control movement of the first movable cart (42), wherein the first movable cart

(42) is configured to carry the plurality of second motors (50, 51, 52);
a second movable cart (44) comprising a second actuator (48) that is configured to control movement of the second movable cart (44), wherein the second movable cart (44) is configured to carry the first motor (58), wherein the first and second actuators (46, 48) are linear actuators."

Claim 1 of auxiliary request 3 differs from claim 1 of auxiliary request 2 in that it further specifies the following feature:

"wherein the first and second actuators (46, 48) carry encoders used for position control of the linear actuators (46, 48)."

VII. The appellant's arguments can be summarised as follows.

(a) Main request - Novelty

D1 did not disclose an "electromechanical feeder mechanism" within the meaning of the application, that is, an apparatus as shown in Figures 6A and 6B. D1 broadly disclosed "servo-motor driven" controllers but did not disclose the structure of a feeder mechanism nor the function of the motors. Hence, it did not disclose Features B to B3.

Furthermore, the disclosure in D1 that the distal end of the instrument "may be guided by a joy stick" did not require or imply computer involvement. It was also not implicit that translation into three-axis data was needed for that. Hence, D1 did not disclose a computing device in communication with a feeder mechanism (Feature C) and with Features C1-C3.

(b) Main request - Inventive step

The "three-axis coordinate system data" of the distinguishing Features C-C3 was to be seen in conjunction with the three functions of the electromechanical feeder mechanism (Features B1-B3) controlled by the computing device. The "three-axis" data related not only to the conventional angular steering of the probe tip along two axes on a spherical surface (the two angular coordinates of a spherical coordinate system) but included the advancement and retraction movement as the third dimension. Thus, the distinguishing features did not only represent an implementation of the feature "guided by a joy stick" of D1 but solved the problem of a more accurate, easy, truly three-axis navigation based on conventional two-dimensional input data.

D1 disclosed an advance/retract "controller" but not that this control element was under computer control. It could also not be derived from D1 that the joystick would be used for more than the conventional control of the two-dimensional steering of the probe tip.

Likewise, D6 and D7 also only disclosed the flexing of the probe tip along two axes under computer-controlled operation by a joystick. Thus, these documents did not disclose the translation of two-axis data into "three-axis coordinate system data". The advancement and retraction of the endoscope was performed manually in D6 and D7.

Accordingly, there was neither a suggestion nor a disclosure of the distinguishing features in the prior art. Therefore, the subject-matter of claim 1 involved an inventive step.

(c) Auxiliary request 1 - Inventive step

Claim 1 additionally differed from the system disclosed in D1 by specifying a plurality of second motors for controlling the tension of the plurality of wires, wherein each motor controlled the tension of a respective one of the plurality of wires.

D1 did not disclose how many motors were used in the "servo-motor driven" controllers. It was conceivable that a clutch and/or gear mechanism could be used for tensioning different wires by a single motor. The limitation of "one motor per wire" was thus also not implicit.

Using a clutch and/or gear mechanism was less reliable and less precise. By contrast, the specification of an individual motor for each wire allowed very precise control of the tensioning and movement of the probe.

As this feature was not derivable from D1, the subject-matter of claim 1 involved an inventive step.

(d) Auxiliary requests 2 and 3 - Admittance

Auxiliary requests 2 and 3 were to be admitted according to Article 13(2) RPBA 2020. Exceptional circumstances were present as the Board had raised a new objection of lack of novelty in its preliminary opinion and stated that the features seen as distinguishing features in the decision under appeal were implicitly disclosed in D1. As the Board considered the electromechanical feeder mechanism implicitly disclosed, it was necessary to specify its structure in more detail. The new requests *prima facie* overcame the issues raised by the Board without giving rise to new objections, were not complex and were not detrimental to procedural efficiency. Thus, they should be admitted.

Reasons for the Decision

1. Main request - Novelty

1.1 D1 discloses a system comprising:

(A) a highly articulated robotic probe (abstract, Figures 1 and 2; column 11, lines 52-56) comprising:
(A1) a first mechanism comprising a plurality of first links (conduit 10, column 4, lines 49-58; column 6, lines 41-50; Figure 2) and
(A2) a second mechanism comprising a plurality of second links, wherein the second mechanism is configured to surround at least a portion of the first mechanism (conduit 11 with its distal steerable end 12; Figure 1; column 8, lines 60-63; column 6, lines 41-50);
(A3+A4) a first wire ("flexible cables" 20) extending through either said plurality of links of said first mechanism or said plurality of links of said second mechanism and a plurality of wires running through the other of said plurality of links of said first mechanism or said plurality of links of said second mechanism (Figures 3 and 4, column 6, lines 41-50; column 8, lines 59-63).

1.2 The appellant argued that D1 did not disclose Features B-B3 since it did not exhibit an "electromagnetic feeder mechanism" within the meaning of the application and Figures 6A and 6B.

1.2.1 For assessing novelty and inventive step, it is established case law that additional limitations deriving only from the figures or description but not suggested by the explicit wording of the claims cannot be read into the claim (see Case Law of the Boards of Appeal, 9th edition 2019, II.A.6.3.4). Accordingly, the specific structure of the feeder mechanism of Figures 6A and 6B, such as its assembly as a single apparatus including movable carts mounting the motors of the respective mechanisms movable by linear actuators, cannot be taken into account for the assessment of novelty and inventive step of the subject-matter of claim 1 vis-a-vis the disclosure of D1.

1.2.2 D1 discloses "controllers" 14-16 configured to
(B1) alternate each of said first mechanism and said second mechanism between a limp mode and a rigid mode (controller 16, column 4, lines 36-39; column 6, line 59, to column 7, line 7),
(B2) advance and retract the highly articulated robotic probe (controller 15, column 4, lines 36-39), and
(B3) steer at least one of said first and second mechanisms (controller 14, column 4, lines 34-36, and column 4, line 62, to column 5, line 27).
Accordingly, the "controllers" represent a mechanism configured for the same functions as required by Features **B1-B3** of claim 1.

D1 discloses wires ("flexible cables" 20, Figure 3) for controlling the stiffening/relaxing and the steering of the distal end 12 (column 6, line 41, to column 7, line 25; column 8, lines 60-63). Therefore, it would have been clear for the skilled person that the "controllers" 14 and 16 actuate or control the tensioning of the wires, that is, they perform a feeding operation on the wires. The mechanism comprising controllers 14-16 thus represents a "**feeder** mechanism".

D1 discloses that the tensioning of the wires may be carried out by "tensioning means", *inter alia* "solenoid feedback systems" (column 7, lines 40-45) or "electromechanical means" (column 11, lines 2-5). According to column 4, lines 40-43, the controllers may be "servo-motor driven". The controllers are thus understood to have **electromechanical** "tensioning means" in the form of servo motors for tensioning the wires.

Hence, D1 discloses an electromechanical feeder mechanism (Feature **B**) with all the Features **B1-B3** as required by claim 1.

1.3 While the terms "controller" and "servo-motor driven" in D1 do not necessarily imply computing means, D1 also discloses features like "voice activation", a "smart" instrument and a "video screen" for assisting navigation (column 4, lines 42-48) which imply a "computing device in communication with the feeder mechanism" as required by claim 1 (Feature **C**).

1.4 D1 further discloses that "the device 1 and in particular the distal end 12 thereof [...] may be guided by a joy stick" (column 4, lines 43-47). From this passage, the skilled person would have understood that the two-dimensional angular steering of the probe tip could be controlled by a two-axis joystick in the conventionally known manner.

As it is conceivable that the two-axis input from a joystick could be directly fed to controller 14 steering the probe tip without intermediary computerised data conversion steps, D1 does **not** disclose Features **C1-C3**.

1.5 Accordingly, the subject-matter of claim 1 is novel with respect to D1.

2. Main request - Inventive step

2.1 Claim 1 differs from the system of D1 by the configuration of the computing device to perform Features **C1-C3**, that is, to:
- receive two-axis data
- translate the two-axis position data into three-axis coordinate system data, and
- adjust a position of one or more second mechanism motors (50, 51, 52) based on the three-axis coordinate system data, wherein the second mechanism motors (50, 51, 52) control said wires (54, 55, 56), respectively.

2.2 According to the appellant, the "three-axis coordinate system data" of Features C2 and C3 was to be understood as including both the steering angle (position of the probe tip on a spherical surface representing the polar and azimuthal dimensions in a spherical coordinate system) and the advancement/retraction position of the probe tip as the third (radial) dimension.

However, according to this understanding, the computing device would require input on three independent dimensions. This is not defined in claim 1.

Moreover, the appellant's interpretation of the "three-axis coordinate system data" is in conflict with the description of the application and Feature C3 which require that the adjustment of the position of one or more "motors" controlling "said wires, respectively" is based on the three-axis coordinate system data. The wires are typically attached to the distal probe tip (see paragraph [0052]) and allow the transmission of pulling forces to flex or steer the distal tip (see the background section of the application in paragraphs [0016] and [0018]; paragraph [0050]-[0054]). However, these wires cannot be used for advancing and retracting the mechanisms because this also requires transmission of pushing forces and actuation of the proximal links. The advancement and retraction is indeed carried out by linear actuators 46 and 48 (paragraphs [0080]-[0082]). Accordingly, the "three-axis coordinate system data" and position adjustment of Features C1-C3 does not relate to the forward/backward position but only to the angular steering of the probe tip.

2.3 Starting from D1 which discloses that the distal tip of the instrument "may be guided by a joy stick", the distinguishing Features C1-C3 thus merely define a concrete computerised implementation of the joystick-guided steering. Accordingly, Features C1-C3 solve the problem of how to implement a distal tip that is "guided by a joy stick".

2.4 The joystick-controlled steering of the distal tip along a hemispherical surface is undisputedly a conventional technique routinely used in the technical field of the application as shown in D6 and D7. This technique involves the application of the two-axis input from the joystick to the movement of the probe tip and thus, expressed differently, the concrete transformation of the two-axis input into the local (three-dimensional) coordinate system of the probe tip.

2.5 The joystick-controlled steering of the distal tip along a hemispherical surface is undisputedly a conventional technique that is commonly used in the technical field of the application as shown in D6 and D7. This technique involves the application of the two-axis input from the joystick to the movement of the probe tip and thus, expressed differently, a factual transformation of the two-axis input into the local (three-dimensional) coordinate system of the probe tip, although not necessarily by means of data processing.

However, a mere computer-implementation of this technique, thus including a computerised coordinate transformation step, would have been part of the customary practice of the skilled person. Thus, it does not involve an inventive step.

Hence, the skilled person would have configured the computing device to translate the received (Feature C1) two-axis input data into the "three-axis coordinate system data" of the distal tip (Feature C2) and to adjust the position of the servo motors controlling the wires (see Reasons 1.2.2 above) of controller 14 of D1 accordingly (Feature C3).

The subject-matter of claim 1 does thus not involve an inventive step within the meaning of Article 56 EPC.

3. Auxiliary request 1 - Inventive step

3.1 It was undisputed that D1 discloses Feature A5.

3.2 Claim 1 further specifies a first motor for controlling the tension of the first wire and a plurality of second motors for controlling the tension of the plurality of wires in which each second motor controls the tension of one of the plurality of wires (Features B4 and B5). Feature C3 was amended to relate to the adjustment of the position of "the plurality of second motors" (Feature C3').

3.2.1 D1 discloses "servo-motor driven" controllers for stiffening/relaxing and steering the mechanisms but not the number of motors used. As it is conceivable that a single motor could be used in conjunction with a clutch or gear mechanism for tensioning a plurality of wires, D1 does not disclose Features B4, B5 and C3'.

3.2.2 Following the appellant's submission, the problem solved by these features can be considered the provision of a simpler and thus more reliable mechanical construction and more precise control of the wire tension as they obviate the need for an intermediary clutch and/or gear mechanism, with the corresponding advantages.

3.2.3 However, these advantages would have also been readily apparent to the skilled person at the time of filing. Hence, it would have been obvious to use a single motor for each wire to avoid a complicated mechanical clutch and/or gear mechanism and achieve better control. Accordingly, when trying to implement the "servo-motor driven" controllers of D1, the skilled person would have arrived at the subject-matter of Features B4, B5 and C3' in an obvious way.

3.2.4 Hence, the subject-matter of claim 1 of auxiliary request 1 does not involve an inventive step, either.

4. Admittance of auxiliary requests 2 and 3

4.1 Auxiliary requests 2 and 3 were filed only after notification of a summons to oral proceedings. According to Article 13(2) RPBA 2020, which applies for the case at issue pursuant to Article 25 RPBA 2020, such amendments shall, in principle, not be taken into account unless there are exceptional circumstances to be submitted by the party concerned.

The appellant submitted that the Board's preliminary assessment in its communication under Article 15(2) differed from the decision under appeal. In particular, in its preliminary opinion, the Board considered claim 1 of the main request to be not new because the "electromagnetic feeder mechanism" in general terms was known from D1.

However, the assessment of which features are known from the closest prior art forms part of the analysis of inventive step and was thus already an inevitable part of the judicial review of the decision under appeal which found that claim 1 did not involve an inventive step. Therefore, the Board's preliminary opinion did not represent a factual change of the case and therefore did not constitute exceptional circumstances within the meaning of Article 13(2) RPBA 2020.

4.2 In this context, the Board points to the fact that the in its final decision the Board did not even confirm its preliminary opinion. Rather, its findings on the main request and auxiliary request 1 were substantially in line with the decision under appeal. Thus, the amendments submitted with auxiliary requests 2 and 3 were evidently not occasioned by a change in case due to the preliminary opinion of the Board.

4.3 The Board consequently decided not to admit auxiliary requests 2 and 3 into the proceedings.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairwoman:

C. Moser P. Acton

Decision electronically authenticated