



Neutral Citation Number: [2022] EWCA Civ 20

Case No: A3/2020/1535

**IN THE COURT OF APPEAL (CIVIL DIVISION)**  
**ON APPEAL FROM HIGH COURT CHANCERY DIVISION**  
**The Honourable Mr Justice Morgan (Sitting as a Judge of the Patents Court)**  
**HP-2017-000085 / HP-2019-000019**

Royal Courts of Justice  
Strand, London, WC2A 2LL

Date: 14/01/2022

**Before:**

**LORD JUSTICE MOYLAN**  
**LORD JUSTICE BIRSS**  
and  
**SIR NICHOLAS PATTEN**

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**Between:**

**LUFTHANSA TECHNIK AG (a company incorporated in Germany)** **Respondent**

- v -

**ASTRONICS ADVANCED ELECTRONICS SYSTEMS**  
**(a company incorporated in the state of Washington, USA)**

&

**SAFRAN SEATS GB LIMITED**

&

**PANASONIC AVIONICS CORPORATION (a company incorporated in the state of Delaware, USA)**

**Appellants**

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**Piers Acland QC & Stuart Baran (instructed by Hogan Lovells International LLP) for the Appellants**

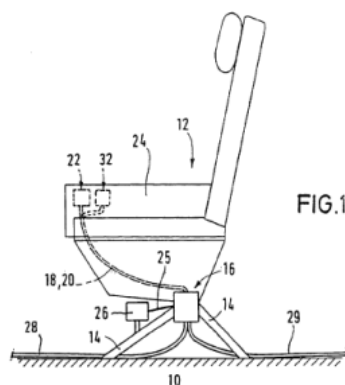
**Hugo Cuddigan QC & Christopher Hall (instructed by Jones Day) for the Respondent**

Hearing dates: 3 & 4 November 2021

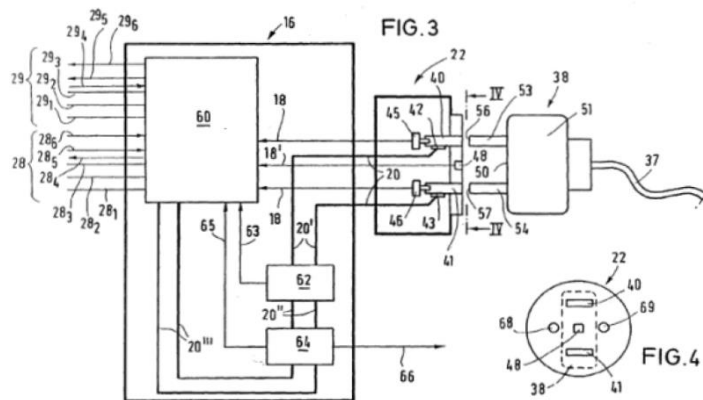
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**Approved Judgment**

**Lord Justice Birss:**

1. This appeal relates to the judgment of Morgan J on 22 July 2020 ([2020] EWHC 1968 (Pat)), in which he held that European Patent (UK) 0 881 145 B1 (“Electrical Power Supply Device”) was valid and was infringed by the defendants’ products. The patent belongs to Lufthansa Technik AG. The defendants are Astronics Advanced Electronic Systems, Safran Seats GB Limited and Panasonic Avionics Corporation.
2. The patent was granted on 26 November 2003 claiming a priority date of 31 May 1997. It expired on 22 May 2018. The specification of the granted patent was in German. The case has used an English translation for all purposes and no issue arises in relation to that translation.
3. The defendants sought permission to appeal on construction and on the validity of claims 1 and 2. Permission was granted by Arnold LJ on certain grounds and the application for permission on one ground was adjourned to this hearing (novelty of claim 1). The issues arising on appeal concern claim construction and validity only. There is no issue about infringement. The appellants also made an application for permission to introduce a new ground of appeal, to challenge the validity of claim 3.
4. There were two actions before Morgan J. They have been tried and heard together below and on appeal. In one the claim by Lufthansa is against Astronics and Safran and in the other the defendant is Panasonic.
5. The invention is concerned with the provision of high-voltage AC electrical power inside an aircraft for a passenger’s electronic device. Figure 1 of the patent is as follows:



6. The power is delivered via a socket, such as item 22 shown in the arm rest of the passenger seat, and a power supply device, such as item 16 shown under the seat in the figure. Figures 3 and 4 are as follows:



7. Fig 3 shows a power supply device (item 16), a socket (item 22) and a plug (item 38). Fig 4 depicts an alternative socket which can accommodate two kinds of plug.
8. Claim 1 is as follows:

A voltage supply apparatus for providing a supply voltage for electric devices (36) in an aeroplane cabin, comprising

a socket (22) to which the device (36) is connectable by means of a plug (38) and to which the supply voltage can be applied,

the socket (22) comprising a socket detector (45, 46, 48) detecting the presence of a plug (38) inserted in the socket (22), and

a supply device (16) being provided remotely from the socket (22) and being connected to the socket (22) via a signal line (18) and via a supply line (20) for the supply voltage,

the supply device (16) applying the supply voltage to the socket (22) when the plug detectors (45, 46, 48) indicate the presence of the plug (38) via the signal line (18) to the supply device (16)

**characterized in that**

the plug detector (45, 46) is formed such as to detect the presence of two contact pins (53, 54) of the plug (38) in the socket (22), and

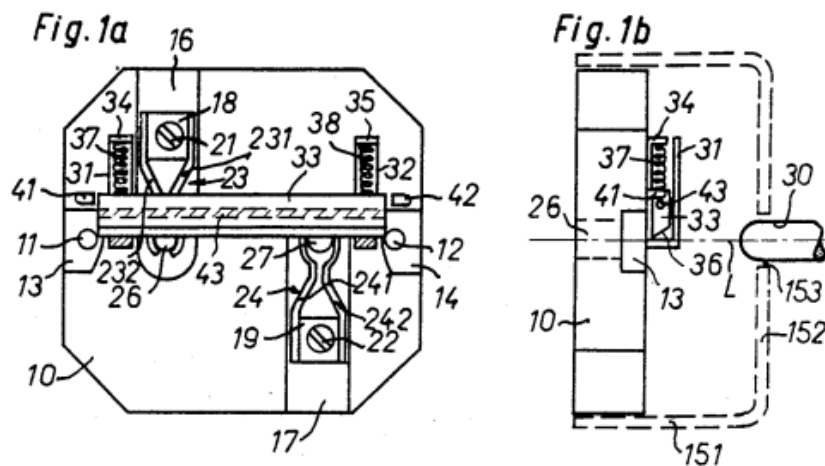
the supply device (16) only applies the supply voltage to the socket (22) if the presence of two contact pins (53, 54) of the plug (38) is detected simultaneously.

9. The claim is drafted using the EPO's conventional approach of having two portions divided by the words "characterised in that". By convention the pre-characterising part is based on prior art, in this case a patent called Quintel (FRA 2,653,944). This case highlights a curiosity of the pre/post characterising approach to claim drafting. When drafted this way the characterising features of the claim explain what the patentee

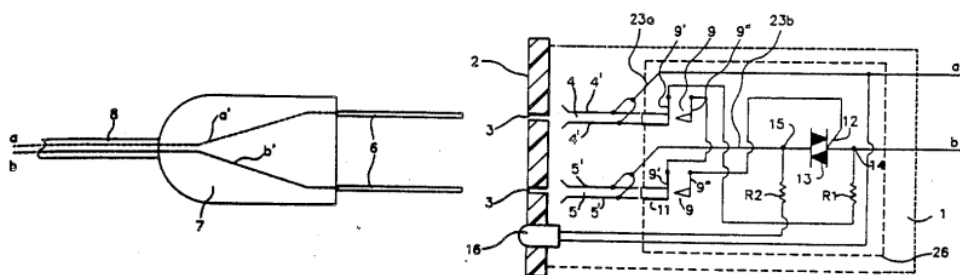
thought were features not disclosed in the prior art on which the pre-characterising part was based, i.e. Quintel. In other words these characterising features are presented as representing the inventive step over that prior art. However the challengers to validity in this case, as they are entitled to, rely on different prior art. In response the patentee seeks to identify distinctions over that other prior art. As it turns out in this case those distinctions are features of the pre-characterising part. So the inventive step (if it is one) over the other prior art may very well not be the features in the characterising portion of the claim at all. I mention this only to make the point that it is a legitimate approach for patentees to take. Many good inventions amount to new combinations of old features. The fact that each of the individual features making up a claimed invention can be found in various places in the prior art may well help the party challenging validity to make their case but it does not, on its own, prove that a claim lacks an inventive step.

10. Claim 1 claims a product rather than a process. It is a voltage supply apparatus. It is suitable for supplying power to electrical devices, such as a laptop computer, in an aeroplane cabin. The apparatus comprises a socket and a supply device which can supply electrical power. The plug of the user's laptop can be plugged into the socket. There is a detector in the socket for detecting the plug. It is called a "socket detector" in this portion of the claim but reading the claim as a whole it is really a plug detector. Nothing turns on that. The supply device is provided remotely from the socket. There are two lines from the socket to the supply device – a signal line and a supply line. The apparatus is set up so that when the plug detector detects a plug it sends a signal on the signal line to the supply device. In response the supply device applies the supply voltage. By contrast, if no plug is plugged in, no signal is sent to the supply device and thus no electrical power is sent to the socket, and the socket is safe.
11. All of what has been described so far is based on the pre-characterising portion of the claim and the two issues of construction on this appeal both relate to the same pre-characterising portion. The first is about what "inserted in the socket" means and the second is about what "remotely" means. On the first issue, the judge accepted the patentee's case that inserted in the socket means fully inserted (judgment paragraphs 67-79). The appellants contended below and in this court that that is wrong and that a detector which detects a partially inserted plug will do. In relation to "remotely", the judge also favoured the patentee, holding (paragraphs 80-94) that it means that the supply device has to be kept away from the socket and arranged in such a way that there is no source of danger to the passenger. In reaching this conclusion the judge was rejecting the appellants' case that all that is required is some separation between the supply device and the socket. The appellants contend that the claim just requires the supply device to be "physically separate from" the socket and would include within its scope a set up with the supply device in a separate box located side by side with the socket, for example with both fitted in the arm rest of the passenger seat. I will refer to the two rival cases as "far remote" and "near remote". The appellants contend for the latter. In reaching the conclusion in favour of "far remote" the judge also rejected the appellants' submission that that construction would render claim 1 invalid for insufficiency (uncertainty). On appeal the appellants maintain their case that "near remote" is the right construction, and their case that if "far remote" is the right construction then the claim is insufficient.

12. To finish claim 1, the characterising portion introduces two further features. The socket must be formed to detect the presence of two contact pins of the plug, and the apparatus must be set up so that the supply voltage is only supplied if the presence of two contact pins is detected simultaneously. The latter feature means that the two pins must both be present at the same time. Whether they arrive at the same time or one after the other does not matter for claim 1.
13. Claim 2 is as follows:
  2. The voltage supply apparatus according to claim 1, wherein the supply device (16) only applies the supply voltage if a maximum contact time is not exceeded between the detection of the first and the second contact pin (53, 54) of the plug (38).
14. By setting the maximum contact time to a small period, the system will be able to distinguish between the case in which the two pins arrive together, as they would with a real plug, and a case in which one pin is inserted and then another one, perhaps as a result of a child playing with paper clips.
15. Claim 3 is as follows:
  3. The voltage supply apparatus according to claim 1 or 2, wherein the plug detector comprises mechanical switches (45, 46) activated by the inserted contact pins (53, 54) of the plug (38).
16. The requirement for the mechanical switches serves as a distinction over an item of prior art called Neuenschwander (see below).
17. Claims 4 and 5 are:
  4. The voltage supply apparatus according to one of claims 1 - 3, wherein the plug (22) comprises a casing detector (48) detecting the presence of the plug casing (51) of the plug (38) at the socket (22).
  5. The voltage supply apparatus according to claim 4, wherein the casing detector (48) is an optical reflection sensor detecting a minimum distance of the plug casing (51) to the socket (22).
18. In the court below the appellants contended that the patent was invalid on a number of grounds. One was the insufficiency (uncertainty) point mentioned already. The others related to lack of novelty and obviousness over two items of prior art. They are U.S. patents: US 4,591,732 published on 27 May 1986 (“Neuenschwander”) and US 4,871,924 published on 3 October 1989 (“Sellati”).
19. Neuenschwander describes a mains electric socket in which the supply of high voltage is triggered by insertion of a plug. One embodiment of Neuenschwander is shown in figs 1a and 1b:



20. As the pins (30) of the plug approach the contact terminals in the socket, they engage with a bridge (33) pushing it aside (upwards as shown in the diagrams above). The bridge is part of a "light barrier means" which works here by allowing light to travel around an optical circuit when the plug pins are present. The light triggers an amplifier circuit which in turn switches a relay to connect the mains voltage supply to the electric contacts in the socket.
21. In Neuenschwander the mains voltage supply is triggered when the plug pins are not fully inserted into the socket. It was common ground on the judge's interpretation of "inserted" in claim 1 that Neuenschwander does not anticipate the claim nor was there any case advanced below or before this court that the claim would be obvious over Neuenschwander (recorded by the judge at para [263]). For the appellants to succeed on either novelty or obviousness over Neuenschwander, they have to win on the first construction point.
22. As regards the location of the supply device relative to the socket in Neuenschwander, the judge held (paragraphs 147-148) that it did not contain clear and unmistakable directions to separate the power supply from the socket and so claim 1 was novel on either parties' construction.
23. Sellati is entitled "Safety Power Receptacle with Hot Wire Switch-through". Figure 1 is:



24. In this set up the complete insertion of both prongs (6) of a plug (7) generates a signal which activates a triac semiconductor device (13) to switch on the power to the prongs. It was common ground that Sellati discloses both characterising features of claim 1 (detects two pins and does so simultaneously). It is also common ground that Sellati discloses a device which required full insertion of the plug. Therefore it was pertinent prior art even on the “fully inserted” construction of claim 1 which the judge had accepted. In relation to the issue of the location of the supply device relative to the socket, the judge held (paragraph [182]) that Sellati did not contain clear and unmistakable directions to separate the power supply from the socket and so claim 1 was novel on either parties’ construction.
25. Turning to obviousness, before the judge the appellants’ case was advanced primarily over Sellati. The judge followed the structured approach to the issue of obviousness based on Windsurfing/Pozzoli [2007] FSR 37 and recently reiterated in Actavis Group PTC EHF v ICOS Corpn [2019] UKSC 15. At the first step, the skilled person was identified as a person interested in power supply systems in an aeroplane. They would have a degree or equivalent in electrical engineering and 3 to 5 years’ experience working in the aircraft industry (judgment paragraphs [9] to [17] and [198]). Nothing now turns on that definition. At the second step, the judge identified the common general knowledge in detail in paragraphs [199] to [244]. These included a point on a document called the ARINC specification (paragraphs [207]-[208]) and a point on mindset ([217]-[238]). Aside from those two points, nothing further turns on the common general knowledge. The differences between the relevant claims and the prior art had been identified in the consideration of novelty (paragraph [245]) and the difference between claim 1 and Sellati could be summarised as being that Sellati did not disclose remote separation (paragraph [250]). The judge went on to consider in detail whether claim 1 was obvious over Sellati (paragraphs [246] – [260]), holding it was not obvious. Addressing claim 2, the judge held that the timing feature of that claim was also inventive over Sellati (paragraphs [265] – [271]).
26. For each of the two claims considered (claim 1 and claim 2) the judge then went on to briefly deal with the obviousness over Neuenschwander and concluded both times that he reached the same conclusions as over Sellati for the same reasons. This reflected the way the appellants’ case was put in the court below. The obviousness case over Neuenschwander was put as based simply on the same reasons as advanced over Sellati (closing paragraph [288]). The judge did not address claim 3 at all because it was clear on the case advanced before him that no separate invalidity attack was maintained against that claim over either Sellati or Neuenschwander (appellants’ closing below paragraphs [267] and [301]).
27. Now on appeal in relation to obviousness the appellants have changed tack. They do not challenge the judge’s conclusions that the claims are valid over Sellati at all. However they argue, or wish to argue, that all three of claims 1, 2 and 3 are obvious over Neuenschwander.
28. Examining the case on appeal it is clear that a “far remote” location of the power supply relative to the socket is not disclosed in Neuenschwander and so, if that is the correct construction of claim 1, then the claim is still novel even if the appellants succeed on the first construction issue. In that circumstance the appellants maintain on appeal that having a “far remote” supply is obvious over Neuenschwander (the judge held it was not at paragraph 262 referring back to paragraphs 246-260).

29. If, on the other hand, the appellants succeed on both construction issues so that the claim includes partial insertion and also means “near remote”, then the appellants contend claim 1 lacks novelty over Neuenschwander or alternatively is obvious. To resolve that question one also needs to address what exactly is disclosed in Neuenschwander. The judge held that Neuenschwander did not clearly and unambiguously disclose separating the socket and the power supply (judgment paragraphs 147-148), in other words Neuenschwander does not anticipate claim 1 even if “near remote” is the right construction of the claim. The appellants challenge the judge’s conclusion about the disclosure of Neuenschwander and argue that it does describe a “near remote” apparatus, depriving claim 1 of novelty. The appellants’ application for permission to appeal on this point was adjourned to this hearing. The appellants also argue on appeal that even if it does not disclose a “near remote” supply device, that arrangement would be obvious over Neuenschwander.
30. If the appellants succeed in showing claim 1 is invalid, they also maintain an obviousness attack on claim 2 over Neuenschwander. As I have explained this failed below (judgment paragraph 272 and see paragraphs 265-271). On the face of it Neuenschwander does not disclose the timing idea which is the subject of claim 2 but the appellants contend that the judge made a finding that there was a “hint” in Neuenschwander which would point the skilled person in a direction leading to claim 2 without an inventive step.
31. Shortly before the hearing of this appeal the appellants sought permission to amend their grounds of appeal to advance a challenge to the validity of claim 3. Given the claim dependencies the point only arises in the event that the appellants succeed in challenging at least claim 1. The respondent contended that permission should be refused for a number of reasons, including that this amounted to an attempt to withdraw an admission made in the court below that claim 3 would be invalid if the judge found (as he did) that claims 1 and 2 were invalid.

### *The Applicable Law*

32. This case engages four areas of patent law: claim construction, novelty, obviousness and insufficiency. There is no dispute about the essential legal principles to be applied and they can be stated shortly. The legal principles applicable to claim construction derive from Article 69 of the European Patent Convention (EPC) and Article 1 of the Protocol as to the interpretation of Article 69 EPC, as applied by s125(3) of the Patents Act 1977. These essential principles are not in dispute. This case is only concerned with the “normal interpretation” of the claims and not with equivalents (see *Actavis (UK) Ltd v Eli Lilly* [2017] UKSC 48 and *Icescape Ltd v Ice-World International BV* [2018] EWCA Civ 2219). The claims are construed purposively (*Virgin Atlantic v Premium Aircraft* [2009] EWCA Civ 1062). They may be narrower than (or wider than) the embodiments described in detail in the patent (see Floyd LJ in *Adaptive Spectrum and Signal Alignment Inc v BT* [2014] EWCA Civ 1462 at paragraph [45]).
33. The requirement for novelty is in s.1 of the 1977 Act, which corresponds to Art 54 EPC. The legal principles relating to novelty are set out by the House of Lords in *General Tire and Rubber Co v Firestone Tyre and Rubber Co* [1972] RPC 457 in paragraphs 485-486. Novelty is a question of fact, whereby it is necessary to compare the prior publication with the patentee’s claim. If that prior art discloses the same device as the device claimed, then the patentee’s claim has been anticipated. Clear and



unmistakeable directions to do or make something within the patentee's claim are required.

34. The cases which set out the framework for the determination of obviousness have been mentioned already.
35. In relation to insufficiency, the relevant provision of the 1977 Act is s72(1)(c). As it applies to "uncertainty" the law is as set out in Anan Kasei v Neo Chemicals [2019] EWCA Civ 1646. The term "uncertainty" was the word coined in Anan Kasei to characterise the kind of uncertain or ambiguous language in a claim which justifies a finding of invalidity

*Construction issue 1 "inserted"*

36. The appellants argue that the judge adopted an erroneous literalistic approach to construction on both issues, and also made a specific error of law in deciding the point on the meaning of "inserted". The error is said to be that the judge placed weight on the reference numerals in the claim. The argument is that in working out what "inserted" meant the judge took reference numerals 45 and 46 in claim 1 into account, identifying that in figure 3 of the patent these numerals identify the plug detectors which will only detect a plug which has been fully inserted.
37. The law about reference numerals is clear. There is an explicit drafting rule in the Implementing Regulations of the EPC that reference numerals should be used to help make the claim intelligible but are not to be used to limit the claim (now rule 43(7)). As an instrument made under the EPC, the Implementing Regulations are relevant (s130(6) and (7) of the 1977 Act). The law was definitively summarised by Jacob LJ in Virgin v Premium, as follows:

"16. [...] As regards rule 29(7), Laddie J in *Telsonic AG's Patent* [2004] R.P.C. 38 § 26 said that:

'Reference numerals ... are designed to be, and can be, useful tools to elucidate the inventor's intention. As such they may, depending on the circumstances, help to illustrate that the inventor intended a wide or narrow scope for his claim. On the other hand they cannot be used to import into the claim restrictions which are not foreshadowed by the language of the claim itself.'

17. We think that is not quite right. In particular we do not think that numerals should influence the construction of the claim at all – they do not illustrate whether the inventor intended a wide or narrow meaning. The patentee is told by the rule that if he puts numerals into his claim they will not be used to limit it. If the court subsequently pays attention to the numbers to limit the claim that is simply not fair. And patentees would wisely refrain from inserting numbers in case they were used against them. That is not to say that numbers are pointless. They help a real reader orient himself at the stage when he is trying to get the general notion of what the patent is about. He can see where in

the specific embodiment a particular claim element is, but no more. Once one comes to construe the claim, it must be construed as if the numbers were not part of it. To give an analogy, the numbers help you get the map the right way up, they do not help you to read it to find out exactly where you are.”

38. Paragraph 69 of the judgment is the start of the judge’s consideration of this issue. He approaches the issue by first putting to one side an argument about whether Quintel was relevant to this issue and focussing first on the language of claim 1. It is set out below but for the purposes of argument I have divided the paragraph into four parts and labelled each part (a) to (d):

- “(a) Before I deal with the submissions as to the relevance of the full patent specification in Quintel, I will consider the submissions based on the language used in the Patent itself. I will start with the wording of claim 1. This describes a socket and a plug. It refers to "the presence of a plug inserted in the socket". The presence of the plug is detected by the socket detector.
- (b) Claim 1 says that the socket detector includes that which is numbered 45 and 46. The numbers are obviously references to the drawings and, in particular, Figure 3. Accordingly, simply to understand what is referred to in claim 1, it is necessary to refer to the drawings which show the location of the detectors numbered 45 and 46. Figure 3 shows the detectors numbered 45 and 46 at the bottom of the holes which receive the pins of the plug.
- (c) Claim 1 goes on to provide that the plug detectors (45 and 46) are formed so as to detect the presence of "two contact pins" (53 and 54) of the plug in the socket. The contact pins, 53 and 54, are simply the pins of the plug. The natural reading of claim 1 is that it is describing detection which occurs when the contact pins make contact with the detectors at 45 and 46. That means that the pins of the plug must be inserted so that they make contact with the detectors. There was no technical evidence to the effect that the detectors detect the pins of the plug as they approach the detectors as distinct from when they touch the detectors. In this way, the words "inserted in the socket" and "the plug in the socket" are referring to a state of affairs where the pins of the plug are in contact with the detectors of the pins of the plug and that requires a degree of insertion which brings the pins into contact with the plug detectors.
- (d) In addition, the natural meaning of the words "inserted in the socket", using the past participle, suggests that the plug has been fully inserted rather than partially inserted although that sense might not have been the only possible reading if there were other wording to contradict the natural meaning.”

39. The appellants make no complaint about part (a) but they argue that in part (b) the judge falls into error because he there takes the reference numerals into account in construing claim 1. I was initially attracted by the appellants' argument when I first read this paragraph but on closer examination I believe the respondent is correct that there is no such error here at all. In part (a) the judge rightly indicates that he is going to start with the language of claim 1. What is happening in part (b) is that the judge is orienting himself, seeking to understand claim 1 by examining how the claim relates to the illustrated embodiment in the patent. He is right and entitled to do so and there is nothing wrong with using the reference numerals to describe how the claim works by reference to the figure.
40. The respondent argues that what the judge does next, at part (c), is to address what the language of claim 1 provides, and what a natural reading of that language amounts to, taking into account a point on technical evidence (or lack of it). Then at (d) the judge supports his finding at (c) with an additional point also based on the language. The respondent says this is not a ruling based on what is in the drawing, it is a decision based on the natural reading of the language of the claim. I agree with the respondent. In parts (c) and (d) of paragraph 69 the judge is not committing the mistake identified in *Virgin*. He is doing the opposite, having seen how the claim reads onto the embodiment he then returns to the language of the claim and construes it. Moreover I agree with the judge's reasoning in parts (c) and (d). The natural way to read the references in the claim to a plug "inserted in the socket" is to a plug which has been plugged in, i.e. fully inserted. It is not talking about a plug being detected as it is being inserted, it is detecting a plug which has been inserted into the socket.
41. Of course, as the judge had clearly observed, the apparatus in figure 3 does operate by detecting full insertion of the plug. A different point is whether the judge committed the error of reading a narrowing limitation into the claim from the description in the patent, irrespective of any issue about reference numerals. However I do not accept that criticism either. For one thing, at paragraph 65 the judge expressly reminded himself of the observation in *Adaptive Spectrum* that claims may be narrower or wider than embodiments. Nor is there any basis for a case that the judge may have stated the law correctly but did not apply it. Paragraph 69 starts and ends with the claim language itself and then in the remainder of this part of the judgment the judge examines how the claim stands by reference to the rest of the claims and the rest of the specification. This is not an exercise of reading a limitation from one embodiment into the claim.
42. At paragraph 70 the judge compares his reading of claim 1 to see if it is consistent with other claims. The particular question was about claim 5. The point was that claim 5 (with claim 4) requires there to be a detector in the socket which detects the plug casing a minimum distance from the socket. So one could have a set up in which a relatively large minimum distance meant that the casing detector could detect a plug without that plug being inserted fully into the socket. The judge held that this did not detract from his conclusion that claim 1 required full insertion. I agree. The casing detector is there to allow the socket to distinguish between an authentic plug and, for example, the insertion of two safety pins by a child. The fact that the casing detector may be triggered when a plug is not fully inserted tells you nothing about how the pin detectors have to work.
43. At paragraph 71 the judge deals with the description of the patent, notes that the terms "plugged in" and "inserted" are used on numerous occasions and holds that the natural

meaning of them is that the plug is fully plugged in. I will refer to an example. At the outset, in paragraph [0002] the patent describes an apparatus which has a socket into which the passenger's electrical device is "plugged in so that the device can be connected to the supply voltage". This obviously refers to the plug being fully plugged into the socket and supports the judge's conclusion.

44. Still in paragraph 71 the judge then asks if there is anything in the description which might yield an alternative interpretation and notes that the description in paragraph [0024] expressly refers to the detectors as being at the bottom of each plug hole (at col 5 ln 12), and in paragraphs [0026] and [0027] expressly refers to the free ends of the contact pins being what activates the microswitches at 45 and 46.
45. Next, at paragraphs 72 to 74 the judge addresses the appellants' best case for a passage in the description which might describe an apparatus which detects pins when they are not fully inserted. It relates to figure 4 and paragraph [0032]. The figure is set out above. It represents a socket which can cater for two kinds of plug – US and European. Rectangular plug holes 40 and 41 detect a US plug and round holes 68 and 69 detect a European one. The appellants' argument is that paragraph [0032] proposes an alternative arrangement to that shown in figure 4. In the alternative the two pairs of plug holes are not at right angles but overlay each other and, as paragraph [0032] then states, "in which case the microswitches are arranged to the sides of the holes". The appellants contend that putting the microswitches at the sides meant that a plug would be detected when it was not fully inserted.
46. The judge's conclusion on this is at paragraph 74. At paragraph 73 the judge accepts the possibility that what the appellants rely on might be disclosed in paragraph [0032] but then in paragraph 74 he concludes:

"On that basis, claim 1 and, indeed, the other claims do not appear expressly to deal with the possibility referred to in paragraph [0032]."
47. In other words the judge was holding that what might be disclosed implicitly in [0032] as a possibility was not within claim 1 in any event. The appellants contend that this is another error by the judge in that, first the judge ought to have held that detectors which detect pins without full insertion was actually disclosed by paragraph [0032] and second that this supported their case that claim 1 was not limited to full insertion. The respondent supports the judge's findings on disclosure and interpretation and also argues under the respondent's notice that there was no evidence that paragraph [0032] did in fact disclose a system which necessarily would fall outside claim 1 on the judge's construction.
48. The respondent is correct that there was no technical evidence from either expert to describe how the alternative in paragraph [0032] could or would necessarily work. Counsel submitted that without that evidence the appellants' case was flawed. He supported his point with a submission that even without that evidence one could see that a switch could be arranged to the side of a plug hole in a manner whereby what it detected was full insertion. To achieve that you mount the switch to the side and at the bottom.

49. Having had the benefit of the assistance of the experts the judge was in a good position to read and interpret the patent. However like the judge I am not prepared to go further than seeing that the passage the appellants rely on might disclose an arrangement which detects partially inserted plugs rather than fully inserted plugs, but then again it might not. The passage certainly does not spell out that that is how it works nor is it clear that that must inevitably be how the alternative arrangement functions. If the disclosure had been clearer then no doubt expert evidence would not have been needed but without it the appellants' case on this aspect founders. The words as they stand do not provide sufficient support for a conclusion that the inventors were here specifically describing a system which detected partial insertion such that the skilled person would be caused to think that had an impact on their interpretation of claim 1. There is no error in paragraphs 72 to 74.
50. In a related but distinct submission, the appellants submit that the judge also erred by failing to appreciate that the purpose of the invention overall, irrespective of paragraph [0032], does not require the detector to detect full insertion of the plug. As part of this submission the appellants contend that the purpose of the invention, based on paragraphs [0006] to [0012] of the patent, is to create a voltage supply apparatus for aeroplane cabins which ensures increased safety against incorrect application of the supply voltage to the socket.
51. The appellants are right that the judgment does not address this submission about purpose, at least in the context of the construction of "inserted". The relevant paragraphs of the patent are addressed, accurately, in paragraphs 25-28. No criticism is made of those paragraphs.
52. Considering the point afresh, I am not convinced it makes any difference. The highest this point goes is that assuming one contemplates that the detection of a fully inserted plug seems to be what was intended, one cannot say that the patent expresses a reason why that should be done rather than, for example, detecting partial insertion. However simply because that is true, it does not follow that one can then conclude that detection of partial insertion must have been intended to be covered by the language used. Far from it.
53. Finally at paragraph 75, the judge concludes his analysis as follows:

"Based on the above considerations, I conclude that claim 1 requires the insertion of a plug in a socket to such an extent that the tips of the pins of the socket make contact with the plug detectors at 45 and 46. I do not think that state of affairs is satisfied by any partial insertion of a plug short of that. [...]"
54. I believe the judge was right in this conclusion for the reasons he gave.
55. The judge then went on to address the respondent's further argument that Quintel supported their case on "inserted". Like the judge I have found that one reaches the conclusion on interpretation without the need to consider Quintel but I will address the point briefly. The argument is that since the word "inserted" is in the pre-characterising part of the claim and, since the patent expressly tells the reader that Quintel is the basis for the pre-characterising part, it is appropriate to take Quintel into account. In Quintel

it is an express requirement that the plug has to be fully inserted for various reasons and so, it is said, one would conclude that “inserted” in the claim means fully inserted.

56. At this stage it is relevant to mention the 2013 judgment of the German Federal Patent Court which considered the German designation of the same patent. That court reached the same conclusion, that the claim required full insertion. Quintel played an important part in that court’s reasoning. The judge recognised he had independently come to the same conclusion as the Federal Patent Court albeit without reference to Quintel but based on reasoning which did overlap to some extent.
57. The judge’s approach was as follows. He started with the reference to Quintel in the patent. This is at [0005], which states:
- “In [Quintel], on which the introductory clause of claim 1 is based, a voltage supply apparatus is described that comprises a socket and a supply device that is arranged away from the socket. The socket and the supply device are connected to each other via signal lines for the transfer of signals and power supply cables for the transfer of power. The socket has a plug detector that detects the presence of the plug casing at the socket. The detection supply voltage via the supply cables to the socket, if the presence of the plug is signalled to the supply device via the signal lines.”
58. The judge held that while this passage was consistent with the plug being fully inserted, there was nothing here which spelled out the method of detection in Quintel, and it could not be said with complete confidence from reading this passage alone that Quintel required full insertion. I agree.
59. The judge then turned to the submission put to him by the patentee that the court should consider not just what the patent says about Quintel, but Quintel itself, and that if one did so then one would see it did require full insertion. The judge rejected that, accepting the appellants’ case that there was no principle of law which required a finding that a skilled reader of the patent would obtain and consider the full specification and take it into account in construing the patent. The cases cited by the appellants before the judge, on which he based his conclusion were Ultraframe (UK) Ltd v Eurocell Building Plastics Ltd [2005] RPC 7 per Lewison J at [73] (not affected by anything said on appeal in that case at [2005] EWCA Civ 761), Adaptive Spectrum and Signal Alignment Inc v BT at [110] (which cited the relevant statement of Lewison J in Ultraframe) and Akebia Therapeutics Inc v Fibrogen Inc [2020] EWHC 866 (Pat) per Arnold LJ (sitting at first instance) at [218]. The judge was also shown Virgin Atlantic v Premium Aircraft at [21].
60. Before us the respondent contends that the judge here erred in law, and also contends that what I said about this on appeal in FibroGen Inc v. Akebia Therapeutics Inc. and ors [2021] EWCA Civ 1279 at paragraphs 145-148 was at odds with paragraph [218] of the first instance judgment in that case which had been cited below. The respondent maintained that the right approach in law meant that Quintel would be read. The appellants supported the judge’s conclusions on this aspect.

61. The law as it currently stands when one is dealing with a reference to another document in a patent specification is that what matters is the way in which the reference to that other document in the patent would be understood by the skilled reader (*Adaptive Signal* paragraph [110] citing *Ultraframe*). The issue in *Fibrogen* was about the quality of the cross-reference in that case and in that sense it therefore made no difference to the principle approved in *Adaptive Signal*. I also said in *Fibrogen* that I preferred not to resolve the issue but wait for a case in which it mattered.
62. In the present case, given that there is no reason for the skilled reader to think Quintel itself has a bearing on the question of insertion, the judge's approach was an orthodox application of the law as it stands. Since it cannot assist the appellants I do not propose to examine the issue any further but prefer to take the same course as I took in *Fibrogen* and leave the question to be addressed in a case in which it actually matters.
63. I would therefore dismiss this appeal on construction issue 1.

*Construction issue 2 – remotely*

64. I turn to the question of the meaning of the phrase “a supply device being provided remotely from the socket” in claim 1. The judge held it meant that the supply device is “kept away” from the socket and “arranged in such a way that there is no source of danger to the passenger”. The appellants contend he is wrong and that all that is required by this language, read in context, is the physical separation of the supply device and the socket, regardless of the distance between socket and supply device. Earlier in this judgment I characterised these rival interpretations as “far remote” and “near remote”. The appellants' reasons in support of their “near remote” case are:
- i) The judge considered the meaning of ‘remote’ without reference to context at paragraph 84, by excluding at the outset an arrangement in which the supply device is near the socket. The judge then found at paragraph 87 that his acontextual construction is supported by Figure 1, thereby wrongly taking into account a specific embodiment in the construction exercise.
  - ii) The purpose of the invention is not concerned with the precise location of the supply device with respect to remoteness to the passenger. The purpose is instead fulfilled by the physical separation of the supply device and the socket, regardless of the distance.
  - iii) The risks the judge identified to support his construction do not vary with distance as shown by evidence and common general knowledge; they are overcome simply by separating the supply device from the socket. The first risk is that liquid entering the socket might cause a short circuit/electric shock (‘the drenching problem’). The skilled person would comprehend that separation of the supply device from the socket offers some protection against the drenching problem. The second is the risk to passenger safety against incorrect application of supply voltage to the socket. The passenger safety risk is not correctly assessed by reference to the distance of the supply device to the passenger (as the judge does), but by remoteness of the supply device from the socket (where separation suffices).

- iv) The judge wrongly held that, by reference to “separate and remote” at [0010] of the patent, ‘remote’ means something different from ‘separate’ and mere separation is insufficient.
  - v) If the judge’s “far remote” construction is correct, then that leaves uncertain the minimum distance the supply device is to be kept away from the socket. There is no information on this point derivable from common general knowledge or the patent. The skilled person would also be unable to determine it. On this reading, the patent would be invalid for insufficiency.
65. The respondent supports the judge, arguing that the patent discloses the remoteness element as a safety feature in the face of an electrical threat. The supply device is always live and, for this reason, is required to be remote from the socket (and by implication therefore remote from the passenger) at all times. Paragraph [0010] also mentions that the cables connecting supply device and socket are benign when the socket is not in use. The patent’s own guidance at [0008], that the supply device is “located away from the socket”, contradicts the appellants’ submission that mere separation suffices to satisfy the claim. By the wording “separately and remotely” at [0010], the patentee is envisaging more than just physical separation. Paragraph [0010] also describes the supply device as a source of danger to the passenger and contains an implicit acknowledgement of the proximity of the socket to the passenger. With this in mind, the respondent argues that the appellants’ interpretation permits an arrangement with a socket and supply device physically separate from one another but side by side e.g. in the arm rest of the passenger seat, and contends that this directly contradicts paragraph [0010] of the patent. The judge’s analysis, the respondent says, did consider the purposive meaning of the claim, namely removing the source of danger to the passenger. Although finding it unnecessary to rely on Quintel for this point as well, the judge also noted at paragraph 89 that Quintel taught a degree of separation that was consistent with his construction of “remotely”.
66. On insufficiency, the respondent also supports the judge. The concept is that the supply device is to be kept away from the passenger. Various arrangements are possible to achieve this result, but there is no material uncertainty involved.

#### *Assessment*

67. Like the judge, I start with the ordinary meaning of the word “remote”. As the judge observed at paragraph 83, the ordinary meaning of that term is not consistent with the appellants’ case. A supply device which is near the socket is not remote from it. The fact the supply device is separate from the socket, but near it, still does not make it “remote” as that term would be ordinarily understood.
68. Secondly, again as the judge held (paragraphs 84-86), there are paragraphs in the patent which support the respondent’s case in that they describe the supply device as being arranged or located “away from the socket”. These include paragraph [0005] which describes Quintel and also paragraph [0008], which is expressly concerned with the pre-characterising portion of claim 1. Paragraph [0010] provides:
- “[0010] Due to separate and remote locating of supply device and socket, the supply device, which may be carrying mains voltage, is kept away from the actual power drawing point,



namely the socket. The supply device can then be arranged in such a way that there is no source of danger for the passenger. Therefore, under normal circumstances, i.e. non-use of the socket, there is only a small signal voltage over the lines between the supply device and socket but not, however, the supply voltage. The supply cables, that are arranged at the seat, therefore only carry a supply voltage if an electrical device is actually connected. In the unused state, the supply cables are free from a supply voltage and therefore do not represent a source of danger for persons.”

69. In the first two sentences this passage explicitly explains what the purpose of the “separate and remote” location of the supply device relative to the socket is. The purpose is to keep the supply device, which may be carrying mains voltage, away from the socket, so that the supply device can be arranged in such a way that there is no source of danger to the passenger. These passages make clear that remoteness of the supply device is something to arrange over and above separateness. As the judge put it in paragraph 86, the appellants’ case gives no distinct meaning to the word remote and seeks to equate it with separate.
70. The appellants are correct on appeal that the purpose of the invention is not concerned with the precise location of the supply device but that does not justify a conclusion that the supply device only has to be separated from the socket and could be located anywhere, even very close to the socket. The purpose of this aspect of the invention is to keep the supply device away from the socket and arrange things in such a way that there is no source of danger to the passenger.
71. Before this court the appellants also made a complicated point about supply cables. The argument is that the only source of danger expressly referred to in paragraph [0010] is supply cables. However, say the appellants, the supply cables referred to in that paragraph are only the ones running from the supply device to the socket (item 20 in fig 1). Any danger from these is not mitigated by moving the supply device further away from the socket (or from the passenger). What is true is that there are other supply cables, which supply power to the supply device (item 29 in fig 1) and these can be regarded as always live. It is also true that moving the supply device further away moves these other supply cables further from the passenger, but the appellants say that is not what paragraph [0010] is talking about.
72. I do not accept this submission, which reads too much into the latter half of paragraph [0010]. The appellants are right that the supply cables referred to there are the ones between the supply device and the socket, and those are one source of danger to the passenger, but none of this justifies qualifying the generality of the explanation at the start of paragraph [0010] that moving the supply device away from the socket allows things to be arranged in such a way that there is no source of danger to the passenger.
73. Moreover, contrary to another aspect of the appellants’ case, the judge did not reach his conclusion on construction by reference to the drenching problem. Paragraph 90 of the judgment notes that the patent itself does not refer to the drenching problem and also holds that there is no need to decide at that stage if the risk of drenching was part of the common general knowledge.

74. Finally on Quintel, like the judge (paragraph 90), I am able to reach a conclusion on this issue without going beyond what the patent itself says about that in paragraph [0005].
75. That leaves the question of uncertainty. The appellants' case on that is hopeless. I can do no better than quote paragraph 94 of the judgment, all of which I agree with:

“94. In the present case, I do not consider that there is any conceptual uncertainty in the references to remoteness in the Patent. The concept involved is in fact quite clear. The concept is that the supply device must be kept away from the socket and, as a result, the supply device will be kept away from the passenger who is intended to have access to the socket. The purpose of keeping the supply device away from the passenger is so that there will not be a risk of something happening to the supply device which would cause a problem, such as a short circuit or an electric shock being administered to the passenger. What the Patent does not spell out, I think deliberately, is what design option should be chosen to advance the achievement of the object. However, it is permissible for the Patent to leave that choice to the individual skilled person implementing the Patent. As explained in *Anan Kasei*, referring to earlier cases, a patent is not insufficient for uncertainty just because the boundary of the monopoly claimed is a “fuzzy boundary”. In this case, I do not regard the boundary as being particularly “fuzzy” and it is much less fuzzy than some earlier cases where the boundary was demarcated in the patent by language which involved matters of degree.”

76. I would therefore dismiss this appeal on construction issue 2 and dismiss the appeal on sufficiency.

*Novelty and Inventive Step*

77. Having dismissed the appeal on both construction issues, the appellants' submission that claim 1 lacks novelty over Neuenschwander cannot succeed irrespective of the argument about whether Neuenschwander discloses a separate (albeit near remote) location of the supply device from the socket. Formally it is still necessary to resolve the application for permission to appeal on novelty. I would refuse permission to appeal (rather than give permission and then dismiss the appeal) because although the appellants' argument on “inserted” which I have rejected, did have a real prospect of success, the argument about “remote” was much weaker. Therefore the novelty of claim 1 was never going to be in doubt over Neuenschwander.
78. The appellants accept that having lost the issue of the meaning of “inserted”, then their obviousness case over Neuenschwander cannot succeed. Neuenschwander's plug detection approach was based on detecting partial insertion. There was no case open to the appellants in this court that it would be obvious, starting from Neuenschwander, to produce a socket which detected the full insertion of a plug.

79. All I will add is that I was very doubtful whether the obviousness argument advanced in this court over Neuenschwander could be accepted, even if the appellants had succeeded on the construction of “inserted”. The argument started with a finding by the judge in paragraph 208 of the judgment, about the ARINC specification, that the appellants contended was a finding that part of the common general knowledge included the desirability of placing an electronics box out of the way under the seat, not for safety reasons, but simply for reasons of cabin design and convenience. It was then said that this desirability would make it obvious for the skilled person given Neuenschwander to put the supply device under the seat for those reasons. Moreover this was said to be correct even in circumstances in which the appellants do not challenge the judge’s rejection of their main case at trial, that the remote location of a supply device relative to the socket starting from Sellati was not obvious. However one simple answer to the argument over Neuenschwander in particular was that the proposal is based on an optical detection system and therefore to do what is alleged to be obvious would require the introduction of long optical fibres to carry the signal from the socket to the remote supply device. However as Mr Cuddigan pointed out in his oral submission, there was unchallenged evidence from Prof Wheeler that one reason why the skilled person would not think of adding remoteness to Neuenschwander was because at the relevant date (May 1997) there were reliability issues with long optical fibres. Given the way the arguments were put below, the judge did not have to grapple with this evidence in the judgment, and made no findings about it. I mention it simply to illustrate the difficulties which would have stood in the way of the appellants’ obviousness case even if the construction issues had gone their way.
80. The appeal relating to the obviousness of claim 2 over Neuenschwander also now fails because since claim 1 involves an inventive step, necessarily so does claim 2. Again however I will also add that I was not persuaded by the argument being advanced on this part of the appeal. What claim 2 adds to claim 1 is a timing feature. The timing feature allows for the detection of the arrival times of the two pins of a plug, so as to be able to determine if they have arrived substantially simultaneously with one with the other, and thereby distinguish between a plug and (say) two paper clips applied separately. The submission on appeal was based on an alleged hint in Neuenschwander. The hint argument arose from a sentence in paragraph 160 of the judgment which was part of the judge’s reasoning rejecting the submission that Neuenschwander contained clear and unmistakable directions to introduce the timing feature. The paragraph as a whole is:

“160. I can see how it might be said that the statement in column 3 lines 19 to 28 [*of Neuenschwander*] could signify that there would be some feature of the invention which would not allow the supply of voltage unless the pins of the plug moved simultaneously (or substantially simultaneously as stated in claims 2 and 3) into the socket. However, given the normal configuration and geometry of a plug, the pins of a plug will move substantially simultaneously when inserted into a socket. It is entirely possible that what Neuenschwander was attempting to describe in the relevant text was what would happen in the ordinary case with the ordinary plug rather than attempting to refer to a feature *of which there was no other hint* which would require further thought and design.”

[my emphasis]

81. The appellants seek to argue that because the judge referred to no “other” hint, this was a finding that the sentence in question was itself a hint of the timing feature. I am not convinced. The judge was not finding that the passage in Neuenschwander was itself a hint of the timing feature. His point was that since there was no other hint of that feature anywhere else in the document, it was entirely possible that there was no hint of the feature in the relevant passage either. The passage was simply a description of what would happen in the ordinary case when an ordinary plug was plugged in – which would be the simultaneous arrival of the two pins.
82. Finally there is the question of permission to advance an invalidity case concerning claim 3. Again as a result of the conclusions on construction I can deal with this very shortly. I would not give the appellants permission to attack the validity of claim 3 on appeal. That part of their pleaded case was expressly dropped before the judge, with the consequence that no findings were made on it. It is far too late to advance such a case now.

*Conclusion*

83. I would dismiss this appeal on all grounds, refuse permission to appeal on novelty of claim 1 over Neuenschwander, and refuse permission to the appellants to advance a case of invalidity concerning claim 3.

**Sir Nicholas Patten:**

84. I agree.

**Lord Justice Moylan:**

85. I also agree.