

OPINION UNDER SECTION 74A

Patent	EP 1641572 B1
Proprietor(s)	Spectrum Technologies PLC
Exclusive Licensee	
Requester	Laser Wire Solutions Ltd
Observer(s)	
Date Opinion issued	15 November 2018

The Request

1. The comptroller has been requested by Laser Wire Solutions Ltd (“the Requester”) to issue an opinion on whether EP 1641572 B1 (“the Patent”) is valid on the following grounds: (i) whether the claims of the Patent lack novelty or an inventive step in light of three cited documents D1-D3; (ii) whether claim 1 of the Patent includes ‘added matter’ that extends beyond the application as filed; and (iii) whether the Patent discloses the invention as defined in claim 1 clearly enough and completely enough for it to be performed by a person skilled in the art.
2. The request was received from the Requester’s representatives Urquhart-Dykes & Lord LLP on 20 August 2018. The request was accompanied by a statement explaining the request as well as copies of the cited documents.
3. There were no observations or observations in reply.
4. The Patent entitled ‘Laser removal of layer or coating from a substrate’ was filed on 8 July 2004 under the provisions of the Patent Cooperation Treaty (PCT) with international application number PCT/GB2004/002950 in the name of Spectrum Technologies PLC. The application claimed an earliest priority date of 8 July 2003 and was initially published as WO 2005/005065 on 20 January 2005. After entering the European regional phase, the Patent was granted on 28 December 2011 and remains in force in the UK.

Whether all parts of the request are allowable

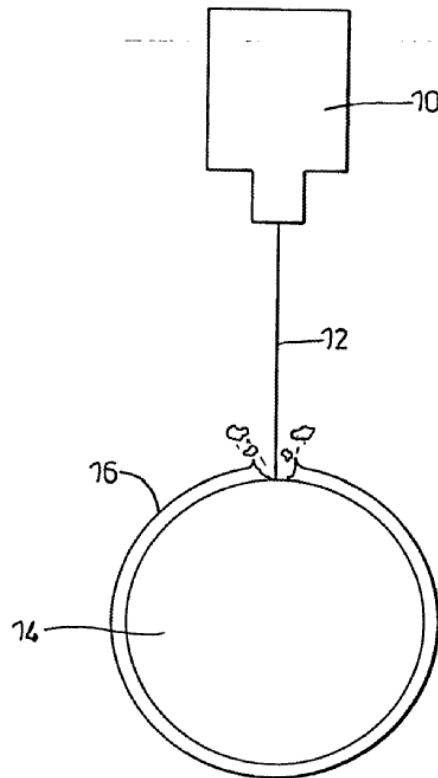
5. The comptroller will not issue an opinion if for any reason he considers it inappropriate in all the circumstances to do so (by virtue of section 74A(3)(b) of the Patents Act 1977 – “the Act”). In particular, requests will be refused which do no

more than repeat arguments already considered pre-grant. Here, the Requester requests an opinion on whether the Patent is invalid on the basis of insufficiency i.e. whether it fails to disclose the invention as defined in claim 1 clearly enough and completely enough for it to be performed by a person skilled in the art. Specifically, the Requester asserts that claim 1 defines the invention in terms of the result to be achieved. Although a claim may be defined in this way in particular circumstances, the Requester submits that the claimed invention is not such an exceptional case. They assert that the Patent does not provide any specific definition or description to indicate what a key feature, a “shockwave effect”, may be and furthermore they assert that the Patent fails to include reference to any tests or procedures that would enable a skilled person to determine whether a “shockwave effect” has been created.

6. As the Requester points out, the applicant’s representative addressed the issue of claim 1 defining the invention by the result to be achieved in their letter to the EPO of 22 September 2006. This was in response to an objection raised in this regard in the written opinion of the international searching authority and then re-raised in the first examination report issued on entry into the European regional phase. In response to arguments presented in the applicant’s letter, the examiner stated that they agreed with the applicant on this issue and conceded that the definition of claim 1 was allowable. In light of this, I consider that the argument raised by the Requester with respect to insufficiency was clearly raised by the examiner pre-grant and subsequently answered by the applicant to the satisfaction of the examiner. I therefore refuse part (iii) of the Request detailed above. I will, however, consider the two further questions (i) and (ii) raised by the Requester.

The Patent

7. The Patent relates to a method of removing a layer or coating from a substrate and in particular to laser removal of the insulating coating or “enamel” from a conductor as a preliminary step in making an electrical connection by e.g. spot welding, soldering, crimping etc. The Patent explains in paragraph [0008] that existing forms of laser wire stripper operate by vaporising the insulation from the outside in whereas in the invention of the Patent the removal is effected by creating an interaction effect at the interface between the substrate and the layer or coating to create a shockwave or the like which causes local separation.
8. Figure 1 from the Patent reproduced below and described in paragraph [0017] is a schematic view of a laser wire stripper where a laser 10 directs a pulsed beam 12 of laser radiation towards a copper wire 14 having a coating 16 of polyimide material, to create an interface effect at the interface between the coating 16 and the wire 14 to cause the coating to fragment and to be lifted off by a shockwave effect.



9. The Patent has 14 claims including a single independent claim, claim 1, which reads as follows with the features separated out in the same form as in the request:

1a) A method of at least partially removing a layer or coating of material from a substrate, said method comprising the step of:
1b) directing at said substrate a pulsed beam of laser radiation;
1c) of wavelength selected so that the layer or coating is substantially transparent to said laser radiation;
characterised in that
1d) said pulsed beam of laser radiation is controlled
1e) to cause a shockwave effect
1f) at the interface between said layer or coating and said substrate
1g) to effect local separation of said layer or coating from said substrate.

Novelty and Inventive step – the law

10. The Requester argues that claims 1 -14 lack novelty or an inventive step in light of three documents. Section 1(1)(a) and (b) of the Act reads:

1(1) A patent may be granted only for an invention in respect of which the following conditions are satisfied, that is to say
(a) the invention is new;
(b) it involves an inventive step;

11. The relevant provisions in relation to novelty are found in section 2(1) and section

2(2) which read:

2(1) An invention shall be taken to be new if it does not form part of the state of the art.

2(2) The state of the art in the case of an invention shall be taken to comprise all matter (whether a product, a process, information about either, or anything else) which has at any time before the priority date of that invention been made available to the public (whether in the United Kingdom or elsewhere) by written or oral description, by use or in any other way.

12. The provisions in relation to inventive step are found in section 3 which states:

3. An invention shall be taken to involve an inventive step if it is not obvious to a person skilled in the art, having regard to any matter which forms part of the state of the art by virtue only of section 2(2) above (and disregarding section 2(3) above).

Construction of claim 1

13. When considering the validity of the claims of the Patent I will first need to construe them. That is to say I must interpret them in the light of the description and drawings as instructed by Section 125(1). In doing so I must interpret the claims in context through the eyes of the person skilled in the art. Ultimately the question is what the person skilled in the art would have understood the patentee to be using the language of the claims to mean.

14. The Requester has not defined the skilled person. I consider this person to be a person skilled in the art of both cleaning and layer removal using lasers.

15. Regarding claim 1, the Requester provides their interpretation of each of features 1(a) -1(g). Many of these are straightforward to construe and require no further comment.

16. The first feature to consider is feature 1(c) which requires that the wavelength of the laser radiation is selected so that the layer or coating is 'substantially transparent' to the laser radiation. I agree with the Requester that the skilled person would realise from the Patent that the purpose of the transparency of the layer or coating to the laser radiation is to enable the laser radiation to penetrate the layer or coating. From paragraph [0008] the removal of the layer is effected by creating an interaction effect at the interface between the substrate and the layer or coating rather than relying on vaporising the layer from the outside. The Requester asserts that any arrangement in which the laser beam is able to penetrate the coating and interact with the substrate will anticipate feature 1(c). However, I consider the skilled person, from their understanding of the field, would assign a more precise meaning to the term 'substantially transparent' to mean laser radiation of a selected wavelength that passes through the layer or coating without being absorbed by any significant amount.

17. Feature 1(d) requires the pulsed beam of laser radiation to be 'controlled'. In

paragraph [0019] of the Patent we are told that the pulse repetition rate, the spot size and scan rate are controlled to effect material removal. Further parameters to be controlled are listed in paragraphs [0012] and [0022]. I agree with the Requester that all lasers will be 'controlled' in some manner. However, the skilled person would realise here that the laser is controlled in such a manner to cause removal of material in the way defined in the remainder of the claim.

18. Feature 1(e) specifies that a 'shockwave effect' is caused at the interface between the layer or coating and the substrate. The Requester notes that the Patent does not assign any specific meaning to the term 'shockwave effect'. The Requester also asserts that the Patent does not describe what form or properties the shockwave effect may take including its direction or the medium through which it travels. The Requester therefore assigns a broad interpretation to this term as the generation of any energy wave which propagates through the substrate and/or the coating.
19. I agree that the Patent does not fully explain the physical origin of the shockwave effect. In paragraph [0008] we are told that existing laser wire strippers operate by vaporising the insulation from the outside in whereas in the invention "the removal is effected by creating an interaction effect at the interface between the substrate and the layer or coating to create a shockwave or the like which causes local separation, rather than relying on a vaporisation technique". Later in paragraph [0017] the Patent explains that a laser directs a pulsed beam of radiation "to create an interface effect at the interface between the coating and the wire to cause the coating to fragment and to be lifted off by a shockwave effect." Similar comments are made in paragraph [0019] including the observation that the substrate absorbs some of the laser radiation. From these passages I consider the skilled person would understand this term to mean that after laser energy is transmitted through the layer to be removed it causes an effect at the interface between the layer and substrate that generates an energy wave that is directed at least in part in a direction back through the layer.

Whether claim 1 lacks novelty in light of the cited prior art

20. The Requester submits that claim 1 lacks novelty over each of three documents D1-D3.
21. D1 is an article titled 'Industrial Laser Cleaning' which was published in the magazine 'Industrial Laser Solutions for Manufacturing' (volume 17, issue 11) on 11 January 2002, before the earliest priority date of the Patent. The article is available online at <https://www.industrial-lasers.com/articles/print/volume-17/issue-11/features/industrial-laser-cleaning.html>.
22. D1 describes the use of lasers for industrial cleaning and art conservation for example for the removal of graffiti and paint from metal and polychrome surfaces. Page 2 of D1 describes the cleaning process to be "based on photothermal ablation with shockwave production during the expansion of the plasma produced by the absorption of the short pulse laser beam." The article goes on to explain that in the case of Q-switched lasers, two events can happen. In the first, the layer to be removed absorbs the laser radiation and micro-explosions occur resulting from the shockwave produced by the plasma generated in the layer. The Requester brings my attention to the alternative event, "Or, the layer to be removed is transparent to

the laser wavelength, so the laser radiation interacts with the substrate and the plasma generated produces a shockwave, rejecting the overlaying layer". The Requester submits that this second described event explicitly discloses all of the features of claim 1.

23. Considering the features of claim 1 in turn, this passage clearly discloses feature 1(a) of claim 1. Q-switched lasers are a source of pulsed laser radiation and therefore feature 1(b) is also disclosed. The passage states that the layer to be removed is transparent to the laser radiation, thus meeting the terms of feature 1(c). The passage also states that a 'shockwave' is produced. The skilled person would realise that the shockwave must occur at the interface between the layer to be removed and the substrate as the layer is transparent to the radiation and therefore cannot have absorbed the radiation previously. Also the passage explicitly states that the laser radiation interacts with the substrate generating a plasma and hence the shockwave. The passage states that the shockwave causes rejection of the layer. Although the passage doesn't state this explicitly, the laser must have been controlled in some way to cause this process. Therefore this passage discloses further features 1(d) – 1(g).
24. The relevant disclosure in D1 highlighted by the Requester is a very brief disclosure. In order to anticipate claim 1, the disclosure must also be an 'enabling disclosure'. In other words the skilled person must be able to work the disclosed invention, using trial and error experiments if necessary. In my view, even from such a short description the skilled person would be able to use their expertise and knowledge to carry out the invention defined in claim 1. Therefore in my opinion claim 1 is not novel in light of D1.
25. D2 is an article titled "Lasers Demonstrate Potential, with Focus on Precision Cleaning" published in "Precision Cleaning" in May 1994 before the earliest priority date of the Patent. The article describes two cleaning tasks using a pulsed laser: removal of epoxy patches or layers from metal surfaces and final removal of particulates in a cleanroom environment. In the first task the epoxy layer is described as having 'some transparency' to the laser light (page 33, column 2, line 37) qualifying a number of mechanisms for epoxy removal. Figure 1, also referred to by the Requester, illustrates the possible epoxy removal mechanisms and describes the epoxy layer as 'semi-transparent'. The Requester also refers to page 34, column 3, lines 18-20 where it is speculated that the substrate absorbs 'most of the heat' and resulting shear stress may be responsible for the de-bonding effect. However, none of these references in D2 meet feature 1(c) of claim 1 that requires the layer for removal to be 'substantially transparent' to the laser radiation; the layers in D2 are disclosed as merely partially transparent.
26. In the second task (page 35 column 2 to page 37) D2 describes a liquid-assisted laser cleaning technique for removing particulates. The Requester directs me to page 36, column 1, lines 4-8 which describes how a liquid is formed on the surface to be cleaned before delivery of a laser pulse. The liquid works its way under the particles by capillary action and is explosively evaporated by conduction of the substrate's heat from the laser pulse. The article later describes how the laser wavelength may be matched to the absorption line of the liquid. There is no mention, however, that the particles are transparent to the laser radiation. Figure 3, highlighted by the Requester, is merely schematic and does not indicate that the

particles are substantially transparent to the laser radiation; it is possible for example that they are only partially so. Therefore these disclosures also fail to meet feature 1(c) of claim 1. This feature is not disclosed elsewhere in D2. Therefore claim 1 is novel in light of D2.

27. D3 is a paper published in Applied Optics in July 1995 before the earliest priority date of the Patent and titled "Paint removal using lasers". The paper describes a study into using lasers for removing paint in the form of graffiti. Pulsed lasers with different parameters such as wavelength, pulse width and repetition rate were considered. It is acknowledged in section F that how efficiently the paint can be removed depends strongly on the absorption of the laser beam and this in turn depends on its wavelength. However, although the absorption spectra of different paints are considered, the paper does not suggest anywhere that the paint for removal is transparent to the laser radiation. The Requester asserts that one laser wavelength employed in D3, 1.06 micron, is the same laser wavelength employed in the Patent and therefore meets the requirement for transparency. However, the Patent is concerned with an enamel coating which will have a different absorption spectrum to paint and therefore this conclusion cannot be made. As the Requester mentions, there are two references to a shockwave being generated in D3 on pages 4409 and 4412. However, neither passage confirms that the shockwave occurs at the interface between the paint and the substrate after the laser beam is transmitted through the paint, as required by claim 1. The further passage on page 4409 column 2 lines 13-15 highlighted by the Requester which refers to thermal conductivity of the substrate effecting removal efficiency appears to be referring to a cw (i.e. non pulsed) laser and is therefore not relevant. The second such passage indicated by the Requester bridging the two columns on page 4411 which refers to the damage threshold of the substrate being a factor, does indicate that the laser beam is interacting with the substrate but does not help to confirm whether the laser light has passed through a transparent layer. Therefore I consider claim 1 to be novel in light of D3.
28. The Requester has only produced cursory comments indicating that should I consider claim 1 to be novel, then the claim lacks inventive step based on the disclosure of D1-D3 in combination with each other and/or the common general knowledge available to the skilled person. I have found claim 1 to be not novel in light of D1. Therefore there is no need for me to consider inventive step.

Whether claims 2-14 lack novelty or an inventive step in light of the cited prior art

29. I will now briefly consider the validity of remaining claims 2-14 as requested. As explained above I consider claim 1 to lack novelty in light of D1.
30. D1 later discloses a method of precision degreasing with a Nd-YAG laser in Q-switched mode. We are told that grease is transparent to the resulting 1064 nm radiation and the removal is obtained through "the shockwave generated by the explosive vaporization of the subtle oxide layer on the metallic substrate". In my view this disclosure also anticipates claim 1 and further claims 2, 3 and 5.
31. The skilled person would choose an appropriate laser and operating conditions to

effect the invention and therefore claim 4 (CO₂ laser), claim 6 (pulse length between 1 ns and 300 ns) and claim 7 (pulse repetition rate between 1 KHz and 30 KHz) are obvious.

32. It seems likely that the method described in D1 could be readily applied by the skilled person to dielectric layers and therefore claim 8 lacks the necessary inventive step. Similarly the method in my view could be applied to copper-based substrates or metal oxide layers. Therefore claims 9 and 10 are also obvious.
33. D1 discloses that the method is also used for surface cleaning and therefore claim 11 is not new.
34. D1 refers to 'an articulated arm beam delivery' which implies that the laser beam is scanned across the substrate. In any case, laser scanning during laser layer removal would be well known to the skilled person. It would be obvious for the skilled person to control laser parameters such as scan rate, peak power of the laser etc. Therefore claim 12 is obvious. Using successive spaced scan lines would be apparent to the skilled person and therefore claim 13 also lacks the necessary inventive step.
35. The skilled person would consider multiple scans to ensure all debris is removed. Therefore claim 14 is also obvious.

Added matter - the law

36. The section of the Act concerning added matter is section 76(2), which reads:

76(2) No amendment of an application for a patent shall be allowed under section 15A(6), 18(3) or 19(1) if it results in the application disclosing matter extending beyond that disclosed in the application as filed.

37. In *Bonzel and Schneider (Europe) AG v Intervention Ltd* [1991] RPC 553, Aldous J described the task of determining whether an amendment to the description had the result that a patent as granted disclosed matter which extended beyond that disclosed in the application as:

(1) to ascertain through the eyes of the skilled addressee what is disclosed, both explicitly and implicitly in the application;
(2) to do the same in respect of the patent as granted;
(3) to compare the two disclosures and decide whether any subject matter relevant to the invention has been added whether by deletion or addition. The comparison is strict in the sense that subject matter will be added unless such matter is clearly and unambiguously disclosed in the application either explicitly or implicitly.

38. In *Richardson-Vicks Inc.'s Patent* [1995] RPC 568, Jacob J summarised this by saying: "the test of added matter is whether a skilled man would, upon looking at the amended specification, learn anything about the invention which he could not learn from the unamended specification."

Added matter - arguments

39. Claim 1 as originally filed in PCT application WO 2005/005065 reads as follows:

*A method of treating a substrate having a layer or coating of material thereon, at least partially to remove said layer or coating, said method comprising the steps of:
directing a pulsed beam of laser radiation at said substrate to cause an interaction at or adjacent the interface between said layer or coating and said substrate, leading to local separation of said layer or coating.*

40. During prosecution, claim 1 was amended to state that “said pulsed beam of laser radiation is controlled to cause a shockwave effect”. The Requester claims that there is no support for a claim of this scope in the application as filed. In particular the Requester maintains that claim 1 after amendment encompasses any means of ‘controlling a laser’ to effect a shockwave. The Requester continues, “However, the patent only describes a very specific and limited embodiment in which ‘the pulse repetition rate, the spot size and scan rate’ are controlled to effect material removal – paragraph [0019]. There is no disclosure of any other parameters of the laser being controlled to effect a shockwave”. The Requester concludes that the amendment of claim 1 to refer only to ‘controlling the laser’ provides a scope of protection extending beyond that described in the application as filed.

41. In response I note that as well as the passage in paragraph [0019] referred to by the Requester, the Patent (and the originally filed application) also describes in paragraph [0012] how at least one of a list of parameters is controlled to cause removal of a moving swath. The list includes additionally the peak power of the laser which is also discussed in paragraphs [0020] and [0021]. Paragraph [0022] describes how the laser in a particular example was set up to operate with a list of parameters including values of wavelength, energy per pulse and pulse width. The skilled person would realise that the laser must have been controlled to achieve these values. It is also clear from the Patent as a whole that the laser beam is controlled to be both directed at the substrate and then moved along a region of it. Therefore I disagree with the Requester that there is no disclosure of other parameters of the laser being controlled to effect a shockwave.

42. The term ‘controlling the laser’, now employed in claim 1, is certainly a broad term. However, I consider the skilled person would understand from the Patent as a whole that many different parameters may be controlled to effect the desired shockwave effect. A considerable number of such parameters have been both listed and discussed in the Patent. The claim as amended potentially covers other parameters but the claim contains no specific disclosure of them. In any case, the skilled person would realise that other commonly-known laser control parameters are also implicit in the original document as filed. Therefore, no new information about the invention has been disclosed as a result of the amendment. Therefore I do not consider the amendment to claim 1 to result in the disclosure of matter extending beyond that disclosed in the application as filed.

Opinion

43. It is my opinion that the invention of the Patent as defined in claim 1 is not novel in light of D1 but is novel in light of D2 and D3. I am also of the opinion that none of the dependent claims 2-14 is both novel and inventive in light of D1 and common general knowledge of the relevant skilled person. I consider the amendment made to claim 1 during prosecution of the Patent does not add matter that extends beyond the application as filed.

Application for review

44. Under section 74B and rule 98, the proprietor may, within three months of the date of issue of this opinion, apply to the comptroller for a review of the opinion.

Susan Dewar
Examiner

NOTE

This opinion is not based on the outcome of fully litigated proceedings. Rather, it is based on whatever material the persons requesting the opinion and filing observations have chosen to put before the Office.