INTELLECTUAL PROPERTY OFFICE

BL O/336/08

22 December 2008

**PATENTS ACT 1977**

APPLICANT Geoffrey Robinson

ISSUE Whether patent application number GB 0502802.2 complies with sections 1(1(a), 1(2)(a) and 14(3)

HEARING OFFICER R C Kennell

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# DECISION

## Background

1 This application is directed to improving the accuracy of calculation of the velocity of a remote object by means of Doppler-shifted electromagnetic radiation. It was filed on 11 February 2005 with no claim to any earlier priority date, and was published on 23 August 2006 under serial no. GB 2423430 A.

2 Despite a substantial exchange of correspondence and amendment to the claims, Mr Robinson has not persuaded the examiner that the invention is either "capable of industrial application" as required by section 1(1)(c) of the 1977 Act or disclosed "in a manner which is clear enough and complete enough to be performed by a person skilled in the art" as required by section 14(3). (Section 4 of the Act states that an invention is capable of industrial application "if it can be made or used in any kind of industry, including agriculture".) The basis of the examiner's objection under sections 1(1) and 14(3) is that the invention cannot be made or used or sufficiently disclosed for its performance to be possible because it contravenes a well-established scientific theory, namely Einstein's theory of special relativity. Mr Robinson on the other hand believes that his invention is complementary to, rather than in conflict with, that theory.

3 In his letter of 11 November 2008, Mr Robinson has opted to have the matter decided on the basis of the papers on file rather than to present his arguments at a hearing. In reaching my decision I have read and taken account of all the documents which have been cited in the correspondence, including those which Mr Robinson has submitted with the above letter and with a subsequent e-mail on 11 December 2008; I have listed all these documents in the Annex to this decision. I am grateful to both Mr Robinson and the examiner (Dr E Plummer) for

their thorough exploration of the theoretical basis of the invention, and for the supply by Mr Robinson of a copy of his book explaining his thinking on relativity (doc 15); this has helped me considerably in reaching my decision.

4 In the papers submitted by Mr Robinson, he refers to two other patent applications of his, nos GB 0321548.0 (granted as GB 2406453 B) and GB 0712353.2 (published as GB 2441610 A). My decision does not extend to these.

**The invention**

5 The invention has its genesis in analyses of data, including radio Doppler and ranging data, from the Pioneer 10 and 11 spacecraft; these were launched in the 1970s but have long since left the solar system. The data, which relate to parts only of the flights, indicate that the spacecraft were experiencing an unexpected acceleration force towards the Sun which could not be explained by any known theory. A comprehensive study in 2002 by John D Anderson et al (doc 7) has been unable to find any physical effect inside or outside the spacecraft or any error in modelling and computational techniques which might explain the apparent anomaly, and leaves open the possibility that the effect might be real and require a new theoretical explanation. It appears that research on this problem is continuing using further data from the spacecraft which have since been recovered (see doc 12).

6 In his specification Mr Robinson suggests that the anomaly is explained by a "relativistic Doppler effect" which causes the expected relative velocity of the spacecraft to be incorrectly estimated. However, he goes on from this to develop a wider principle, the basis of which appears to be stated at page 8 lines 1-10 of the published specification:

> "A moving source changes wavelength and thus cycle time and frequency. …… A moving observer changes cycle time and frequency but not wavelength. Measuring change of wavelength of a source can thus indicate the source velocity independent of movement of an observer in the same frame of reference as the source. Any change of cycle time or frequency observed beyond that due to wavelength change is caused by, and is a measure of, the observer's velocity in that reference frame. It is possible in a common reference frame to differentiate between source and observer movements and thereby improve accuracy of Doppler determined velocity".

7 The claims have been amended during substantive examination. I think it will be helpful for understanding Mr Robinson's invention if I set out the latest amended version (submitted with his letter of 28 September 2005) in full:

> 1. An improvement in the accuracy of determination of velocity of relatively moving objects, in which the measured velocity of one object is computed from cycles counted during a period of the observer's time, the cycles being from Doppler shifted frequency of electromagnetic radiation emitted by or reflected from the object, the improvement comprising taking into account the difference between the effects of movement of a source of electromagnetic radiation and movement of an observer of the radiation, the movements being relative to a reference frame in which source and observer were initially at rest or move at known velocity relative to that frame.

2. An improvement according to claim 1 where the improvement is obtained from the effect on observed frequency f of movements of source and observer represented by the equation $f = f_0(1 \pm [V_s/c])^{-1}(1 \pm [V_o/c])$ where $f_0$ is the source frequency in the absence of movement; $V_s$ is source velocity and $V_o$ the velocity of the observer in the frame of reference in which source and observer were initially at rest or move at known velocity relative to that frame; c is the speed of light.

3. An improvement according to claims 1 and 2 where the improvement is obtained by replacing the conventional 2-way frequency shifted equation for a receding target $f = f_0(1 – [2v/c])$, where $f_0$ is the source frequency in the absence of movement; v is the target velocity; c is the speed of light, by $f = f_0(1 – [v/c])(1 + [v/c])^{-1}$ to compute the target-shifted frequency received by an observer stationary in the frame of reference in which source and observer were initially at rest or move at known velocity relative to that frame.

4. An improvement according to claims 1 and 2 where the improvement is obtained by replacing the conventional 2-way frequency shifted equation for a receding target $f = f_0(1 – [2v/c])$, where $f_0$ is the source frequency in the absence of movement; v is the target velocity; c is the speed of light, by $f = f_0(1 \pm [V_s/c])^{-1}(1 – [v/c])(1 + [v/c])^{-1}(1 – [V_o/c])$, where $V_s$ and $V_o$ are the source and observer velocities respectively in a direction opposite to the target velocity v, to compute the target-shifted frequency received by an observer moving in the frame of reference in which source, target and observer were initially at rest or move at known velocity relative to that frame.

4 *[sic].* An improvement according to claim 3 where the improvement is obtained for an approaching target by substituting –v for v.

5. An improvement according to claim 4, where any or all of source, observer and target move in the opposite direction to that in claim 4, where the improvement is obtained by substituting $–V_s$ for $V_s$, $-V_o$ for $V_o$, -v for v determined by which of source, observer and target is moving in the opposite direction to that in claim 4.

6. An improvement substantially as described herein.

## Arguments and analysis

Analysis of Mr Robinson's invention and the examiner's objections

*The equations for Doppler shifted frequency*

8 In his specification, Mr Robinson first explains that a signal transmitted from a fixed source with a frequency $f_0$ will be received at a moving target with frequency $f = f_0(1 – [v/c])$ on account of the Doppler shift caused by movement of the target, where v is the target velocity and c is the speed of light. He says that in conventional theory the shift for the return leg is taken to be the same because only relative movement between the source and target can be accommodated, giving a total shifted frequency of $f = f_0(1 – [2v/c])$. This is the classical Newtonian non-relativistic approach.

9 Mr Robinson argues that, although this suffices for values of v which are very low

in relation to c, it is not in fact correct. In support of this he works through examples to show that the effect of target velocity on the frequency is not the same for the outward and return legs. He concludes that the shifted frequency received by an observer stationary in a frame of reference common with a stationary source and receding target is in fact $f = f_0(1 - [v/c])(1 + [v/c])^{-1}$. As he says, for a spaceship velocity of 12200 $ms^{-1}$ and an emitted frequency of 2.11 GHz, this gives a frequency shift of 171725 Hz rather than 171732 Hz by the "conventional" method. He believes that this can account for the anomalous acceleration of $(8.74 \pm 1.33) \times 10^{-8}$ $cms^{-2}$ reported by Anderson et al, who appear to have been using the conventional theory (see formula (15) in the paper.)[1]

10 However, the examiner thought that this was nothing more than the known consequences of the theory of special relativity, and I have to say I find it difficult to avoid this conclusion. Thus the concluding "Discussion" section in the paper "Doppler Reflections" (1989) cited by the examiner (doc 1) shows that the application of the well-known Lorentz factor to the Doppler formula in order to take effect of "time dilation" under special relativity for both the outward and return legs leads to Mr Robinson's formula of $f = f_0(1 - [v/c])(1 + [v/c])^{-1}$. The publications by Rindler to which Mr Robinson has referred (docs 9, 10) also seem to lead to the same conclusion. (As I understand it, the Lorentz factor of $(1 - [v^2/c^2])^{-1/2}$ must be applied to the non-relativistic observed cycle time $t = \lambda/(c-v)$ where $\lambda$ is the wavelength, from which it can be straightforwardly deduced that the one-way time-dilated shifted frequency is $f_0(1 - [v/c])^{1/2}(1 + [v/c])^{-1/2}$ and that the two-way shifted frequency is $f_0(1 - [v/c])(1 + [v/c])^{-1}$.)

11 In any case, I note that it was suggested as long ago as 1998 (see doc 8) that the anomalous acceleration can be accounted for by the difference between the conventional and the time-dilated "special relativistic" Doppler shifts. I have drawn Mr Robinson's attention to this paper since it had not previously featured in the proceedings on this application, although it was cited on his earlier application. I accept that, as Mr Robinson says, this paper provides no means whereby the author's opinions can be substantiated.

*The underlying general principle*

12 As I have mentioned above, Mr Robinson appears to be suggesting that it is possible in a common reference frame to differentiate between source and observer movements and thereby improve accuracy of Doppler determined velocity. As I understand his arguments, he does not think this necessarily conflicts with the theory of special relativity. He says in his letter of 15 December 2006 that, although the theory works well where only the relative velocity of source and observer can be considered, this is a self-imposed limitation.

13 As the examiner has pointed out,

- what Mr Robinson is suggesting does indeed conflict with the theory of special relativity which holds that it is impossible to make such a

[1] Although Toth (correspondence at doc 11) says that correct relativistic Doppler equations have been used from the start, special, as opposed to general, relativity is not listed in the paper (see Section V, paragraph A) as one of the effects considered.

differentiation and that only relative motion between the source and the observer can be detected,

- contrary to what claim 1 apparently requires, measurement must inevitably take place in the frame of reference of the observer, and

- it is not clear what is meant by "initially" in claim 1 and that if it refers to the start of the measurement then the velocity of the spacecraft cannot be known accurately at this point;

his conclusion is therefore that the invention defined by the claims has not been described in terms which enable it to be put into practice. He points out that the theory of special relativity is extensively supported by experimental data and that it would not be right to reject it without convincing experimental evidence, which Mr Robinson has not supplied.

14 In an attempt to get to the bottom of this I have referred to Mr Robinson's book (doc 15), even though the first edition was not published until after the filing of the application in suit. The latest (2008) edition extends to some 123 pages and would seem essentially to be concerned with new mathematical explanations for a variety of relativistic phenomena. Like the specification, it does not present any experimental data from which it might be inferred that the theory of special relativity is inadequate. However it includes at Chapter 19 and Appendix C an analysis of the Pioneer problem, which would appear to be the "probing theoretical evaluation" to which Mr Robinson refers at page 2 of his specification.

15 The crux of the matter would in fact seem to be stated most clearly at page 53 in the conclusions to Chapter 12 which deals with the aberration of starlight – that in Mr Robinson's view there are situations where only the relative velocity of source and observer is known, when the Lorentz transformation would be required in accordance with special relativity, but that when the separate velocities can be determined relative to some initial state in a common frame of reference there will be ways to relate events in different frames of reference other than by the Lorentz transformation. As I understand it this appears to involve doing away with one of the central tenets of the theory of special relativity, that the speed of light is the same to all observers regardless of the velocity of the observer.

16 What I am unable to find is any concrete example from Mr Robinson of a situation where the separate velocities could be determined in this way so as to make possible the invention which is now claimed. Indeed, I can find no convincing explanation for a radical departure from the theory of special relativity such as Mr Robinson is proposing, bearing in mind that his patent application seems to be based on a calculation of Doppler shift which can be perfectly well explained by the effects of time dilation under the theory of special relativity. In his e-mail of 11 December 2008 Mr Robinson suggests that the "laser comb" technology for accurate measurement of wavelengths which is described in docs 16 and 17 supports his theory, but I cannot see how it follows that the separate velocities of source and observer can be determined. I do not find the various explanations of the new theory that Mr Robinson has put forward in the prosecution of the application to be at all convincing and I share the doubts which the examiner has

raised.

*Conclusion*

17 In the light of the above I conclude that:

1. Although on the documents before me it does not appear to have been followed up, there is actually nothing new in the suggestion (however speculative) that ignoring relativistic effects might account for the apparent acceleration of the Pioneer spacecraft.

2. Although he may to some extent have found a new way of explaining known relativistic phenomena, Mr Robinson has not provided any clear or convincing explanation of how it is possible to determine the separate velocities of the radiation source and the observer rather than their relative velocity.

3. Mr Robinson has not pinpointed any real-life situations which can be explained by his theory but not by the theory of special relativity.

I must now assess how these findings impact on his application.

The test to be applied

18 Mr Robinson concludes his last letter by asking how the "unconventional novelty" of his invention is to be recognised other than by the "independent unbiased evaluation of the patent route". I do not want Mr Robinson to be under any misapprehension about this. It is not the primary function of the Intellectual Property Office to validate new scientific theories. The examiner will consider the validity of a theory only to the extent necessary for him or her to be satisfied that the application complies with the requirements of the Patents Act and Rules.

19 In a case such as the present in which the requirements for industrial application and sufficiency of description turn on the validity of the underlying theory, the question arises as to what standard of proof should be applied by the examiner. Guidance on this was given on 18 November 2008 by the Patents Court in *BlackLight Power Inc v Comptroller-General* [2008] EWHC 2763 (Pat)[2] on appeal from the decision of the hearing officer (BL O/114/08). Mr Robinson was referred to O/114/08 during the examination proceedings and I have since drawn his attention to the judgment of the court.

20 Although I agree with Mr Robinson that *BlackLight Power* relates to a completely different scientific field, the case is of more general importance because the court recognised the danger of refusing an application based on a disputed theory which might turn out to be correct. However, it did not accept the hearing officer's view (which the examiner adopted in the present case) that it was simply a question of whether it was more probable than not that the theory was valid. As appears from paragraphs 34-35 and 52, if, on the material before the

[2] http://www.bailii.org/ew/cases/EWHC/Patents/2008/2763.html

Comptroller, he considers that there is a substantial doubt as to the validity of the theory, then he should consider whether, on a full investigation with the benefit of expert evidence, there is a reasonable prospect that the theory might in fact turn out to be valid.

21 However, as I read the court's judgment at paragraph 47, it did not consider the hearing officer wrong in the case before him to take into account the criteria that (a) the explanation provided by the theory should be consistent with existing generally accepted theories, (b) the theory should make testable predictions, and the experimental evidence should show rival theories to be false and should match the predictions of the new theory, and (c) the theory should be accepted as a valid explanation of physical phenomena by the community of scientists who work in the relevant discipline. I will take these factors into account below, where appropriate.

Application of the Patent Court's test

22 Mr Robinson says in his e-mail of 11 December 2008 that agreement that a relative velocity of electromagnetic radiation is possible and acceptance of the analysis of starlight aberration in Chapter 12 of his book should suffice to meet the test. However I think this merely begs the questions which I have to answer.

23 My first task is therefore to consider whether the material before me raises a substantial doubt as to the validity of the theory on which Mr Robinson's invention is based. Although Chapter 7 of his book rightly reminds me that I should keep an open mind, I think that my conclusions above do indeed point towards such a doubt. This to my mind is reinforced by the substantial absence of comments from other workers investigating the Pioneer anomaly, apart from the correspondence with Mr Toth (doc 11) which in fact suggests that Mr Robinson may have misunderstood some aspects of the Pioneer data. I therefore consider there is indeed a substantial doubt as to the validity of his theory.

24 Going on to the second step of the test, I do not think there is any reasonable prospect of resolving these doubts in Mr Robinson's favour by some fuller investigation with the benefit of expert evidence - there is in my view simply nothing on which expert evidence could bite. It might have been different if Mr Robinson had been able to provide at least some experimental results which were explained by his new theory but not by the theory of special relativity, but that is not the case.

**Conclusion**

25 I therefore agree with the examiner that the method of determining velocity which Mr Robinson claims contravenes a well-established scientific theory and cannot therefore be put into practice. It follows that the invention is neither capable of industrial application as required by section 1(1)(c) nor sufficiently disclosed as required by section 14(3).

26 As I have accepted, even if Mr Robinson has not invented a new way of measuring velocity, he might conceivably have found a new way to derive the

conventional relativistic Doppler equations. However, this would not be patentable, since section1(2)(a) of the Act prevents the grant of a patent for a discovery, scientific theory or mathematical method as such.

27 Mr Robinson accepts in his e-mail of 11 December 2008 that clarification may be necessary to avoid the wrong impression that he is claiming a solution to the Pioneer problem. However, bearing in mind that new matter cannot be added to an application, I do not think that any saving amendment is possible. I therefore refuse the application under section 18(3) of the Act.

**Appeal**

28 Following my decision, the matter cannot be taken any further within the Intellectual Property Office. If Mr Robinson disagrees with the decision, he has a right to appeal to the Patents Court. Under the Practice Direction to Part 52 of the Civil Procedure Rules, any such appeal must be lodged with the Court within 28 days of the date of the decision stated above.

**R C KENNELL**
Deputy Director acting for the Comptroller

## ANNEX TO DECISION O/336/08

## Documents considered (see paragraph 3)

Cited on search report, 14 June 2005

1 Phys. Educ. Vol 24 (1989) pp 154-156, A Anderson, "Doppler Reflections"

2 IRE Trans. on Aeronautical and Navigational Electronics, ANE-6 (1959) p 37, C L Temes, "Relativistic Consideration of Doppler Shift"

3 [Online] http://phyastweb.la.asu.edu/PHY361-aLARCON/lecture6_s05.htm, final handwritten equation

4 [Online] "Klausur zur Einfuhrung in die Physik 2" (Kallenrode 16.12.2002), section 3; accessed at http://www.uni-osnabrueck.de/sotere/extraterrestrik_files/main_data/teaching_data/biology2_data/klausws.pdf ,

5 IEEE Trans. on Circuit Theory Vol CT-19 No 1 (January 1972) pp 53-59, J D Rhodes, "Matched-Filter Theory for Doppler-Invariant Pulse Compression"

6 Applied Optics, Vol 38 No 30 (20 October 1999) pp 6374-6381, V S R Gudimetla and anr., "Special relativity corrections for space-based lidars"

Referred to in specification

7 Physical Review D, Vol 65 Art 082004 (American Physical Society, 2002), J D Anderson et al, "Study of the anomalous acceleration of Pioneer 10 and 11"

Other documents cited during the proceedings

8 [Online] C E Renshaw and anr, "Review of the Anomalous Doppler Data from Pioneer 10 and 11" (29 September 1998); accessed 12 December 2008 at http://renshaw.teleinc.com/papers/prl-pi/prl-pi.stm,

9 W Rindler, "Relativity: Special, General and Cosmological", pub Oxford Univ Press 2001, pp 78-79

10 W Rindler, "Special Relativity", pub Oliver & Boyd 1960, pp 44-45

11 E-mail correspondence G Robinson – V Toth 15 July 2007 (accompanying Mr Robinson's letter of 21 August 2007, as open to public inspection on the application)

12 New Scientist 3 June 2006 pp 46-49, S Clark, "Fly another day"

13 Extract from Police Traffic Radar Handbook (accompanying Mr Robinson's letter of 11 November 2008, as open to public inspection on the application)

14 Extract from US patent 5565871 (accompanying Mr Robinson's letter of 11 November 2008, as open to public inspection on the application)

15 G Robinson, "Relatively Simple: Relativity myth and mystery dispelled", 2nd Edition, pub Lulu.com 2008

16 [Online] New Scientist 4 September 2008, J Hecht, "Laser 'comb' used to disentangle Sun's light; accessed 12 December 2008 at http://www.newscientit.com/article/dn14668-laser-comb-used-to-disentangle-suns-light.html

17 [Online] The Messenger 129, September 2007, C Arajo-Hauck et al, “Future Wavelength Calibration Standards at ESO: the Laser Frequency Comb”; accessed 12 December 2008 at http://www/vt-2004.org/sci/publications/messenger/archive/no.129-sep07/messenger-no129-24.pdf

**R C KENNELL**
22 December 2008