



PATENTS ACT 1977

APPLICANT	Nicholas Gaston Klemz
ISSUE	Whether patent application GB1915297.4 complies with Section 1(1)(a), Section 1(1)(c), Section 4(1), Section 14(3), and Section 14(5)(b) of the Patents Act 1977
HEARING OFFICER	Laura Starrs

DECISION

Introduction

- 1 Patent application GB1915297.4 entitled 'An apparatus for generating a force' was filed on 22 October 2019. It was published on 28 April 2021 as GB2588415A. The first substantive examination report of 31 August 2023 raised objections under clarity, industrial applicability, novelty and/or inventive step, deferred completion of the search, and notified the applicant about potential post-grant conflict with a co-pending European patent application EP4048890A1.
- 2 Further rounds of discussion via telephone and written correspondence followed where the applicant, Mr Klemz, disagreed with substantive examiner's objections without any amendments being filed. The arguments put forward by the applicant failed to persuade the examiner that the application satisfied the requirements of the Patents Act 1977 ("the Act"). Consequently, an offer of a hearing was made on 5 March 2024, which the applicant accepted in their email of 18 April 2024. A pre-hearing report of 30 April 2024 outlined the matters to be considered at the hearing. The hearing took place on 12 June 2024 via a video conference. The hearing was attended by the applicant, my assistant, and an IPO observer.
- 3 The main matter before me, which was the subject of the hearing, is whether the claimed invention is capable of industrial application. Other issues I am asked to consider are as set out in the pre-hearing report, namely clarity and claim construction, sufficiency, and novelty and/or inventive step. I am grateful to Mr Klemz for the skeleton arguments provided on 4 June 2024 which I have taken account of in my decision. I have also considered all correspondence on the file.

The invention

- 4 The application relates to the field of vehicle propulsion. Primarily, the invention is described in the context of propelling a spacecraft in space, as noted on page 25,

lines 13-19 of the description as filed. Specifically, the present invention proposes an apparatus that does not require an exhaust for expulsion of reaction mass. It appears to require a magnet adjacent to a cavity which emanates a magnetic field into the cavity, wherein the cavity further contains a cathode and an anode, such that electrons are emitted from the cathode and travel through the magnetic field and to the anode. This arrangement is alleged to result in momentum and kinetic energy from the electrons being transferred to the magnet, and hence the apparatus housing (when the device is accelerating). In summary, acceleration of the device is alleged to be achieved from deceleration of the electrons by the magnetic field. The reverse applies when the device is decelerating (transfer of kinetic energy from the apparatus to the electrons is alleged to decelerate the apparatus).

- 5 The current claim set remains unamended, as originally filed on 22 October 2019, and comprises a single independent claim (claim 1):

*An apparatus for generating a force, the apparatus comprising:
a housing having a cavity therein;
a magnet adjacent the housing, the magnet and housing arranged so that, in use, the cavity contains a magnetic field from the magnet, magnetic field lines within the cavity comprising non-parallel magnetic field lines;
a cathode capable of emitting electrons into the cavity; and
an anode,
the arrangement being such that, in use, the cathode emits electrons into the cavity and the electrons are deflected by the magnetic field from the magnet, such that a force acts between the magnetic field from the magnet and a magnetic field from the electrons and kinetic energy is transferred between the apparatus and the electrons.*

6 **The Law**

The Patents Act 1977

- 7 Section 1(1) of the Act requires an invention is new, inventive and is capable of industrial application. The relevant part of the Act reads as follows:

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;*
- (c) It is capable of industrial application;*
- (d) ...*

- 8 The Act defines what is meant by industrial application in section 4(1):

4(1) An invention shall be taken to be capable of industrial application if it can be made or used in any kind of industry, including agriculture.

- 9 The requirement that the claims be clear is set out in section 14(5)(b) of the Act as follows:

14(5) The claim or claims shall –

(a) ...

(b) Be clear and concise;

(c) ...

(d) ...

- 10 Section 14(3) is concerned with sufficiency:

14(3) The specification of an application shall disclose the invention in a manner which is clear enough and complete enough for the invention to be performed by a person skilled in the art.

Relevant Caselaw

Blacklight Power v Comptroller-General of Patents

- 11 *Blacklight Power*¹ was an appeal from the decision of the Hearing Officer acting on behalf of the Comptroller-General refusing two patent applications in the name of the appellant. Both applications were refused by the Hearing Officer on the ground that the species of hydrogen (termed by the applicant as *hydrino*) was contrary to generally accepted physical laws and was, in consequence not capable of industrial application, and on the ground that the claimed inventions relied for their performance on the existence of hydrino the specifications did not comply with requirement for sufficiency.
- 12 Floyd J noted, at paragraph 13 of *Blacklight Power*, that that the hearing officer was right to address whether the underlying theory for the existence of the hydrino, which in turn was an essential component of the invention, was true. The Patents Court held that the Comptroller had to examine the material before him and attempt to come to a conclusion on the balance of probabilities. If he considered that there was a substantial doubt about an issue of fact which could lead to patentability at that stage, he should consider whether there was a reasonable prospect that matters would turn out differently if the matter was fully investigated at a trial. If so he should allow the application to proceed – see paragraph 34 *Blacklight Power*.

¹ *Blacklight Power Inc. v Comptroller-General of Patents* [2009] RPC 6

- 13 It was also held, at paragraph 35, that mere optimism and a reasonable prospect of matters turning out differently were not the same thing. The reasonable prospect had to be based on credible material before the Office. The greater the opportunity afforded to an applicant to produce such material at the application stage, the smaller scope there was for supposing that giving him the benefit of the doubt would lead to a different conclusion.
- 14 Therefore, if when considering whether an invention operates in a manner which is clearly contrary to well-established physical laws, and there is substantial doubt about an issue of fact which could lead to patentability, it is necessary for the Comptroller to:
- a) consider the material before them on the balance of probabilities;
 - b) consider whether the evidence provided by the applicant gives rise to a reasonable prospect that the applicant's theory might turn out to be valid if it were to be fully investigated at a trial with the benefit of expert evidence;
 - c) noting that the reasonable prospect must be based on credible material before the Office.

Argument and analysis

Clarity and claim construction

- 15 Claim 1 requires 'an apparatus for generating a force'. When construed in view of accompanying description and drawings, claim 1 is considered to require an apparatus suitable for generating a force where the generated force acts on the apparatus itself and can be used to accelerate or decelerate the apparatus and any object to which the apparatus is attached. The description provides example uses of the apparatus including the propulsion of a vehicle, such as a spacecraft in deep space, an aircraft in the atmosphere, a road vehicle, a submarine, or moving a load on a crane. While claim 1 does not explicitly require the generated force to act upon the apparatus, I am of the view that this is implicit in view of accompanying description and drawings. This interpretation of claim 1 is also consistent with the skeleton arguments and the description given by Mr Kelmz at the hearing.
- 16 The description states that the apparatus can act both as a thruster and a damper, and in each case it is alleged to result in a force that either causes the apparatus to accelerate (when used as a thruster) or decelerate (when used as a damper). Claim 1 further requires the apparatus to have a housing comprising a cavity. A cathode emits electrons into the cavity in direction of an anode. In some embodiments a cathode is circumferentially surrounded by an annular anode. In other embodiments – the opposite arrangement is envisaged – a central anode is circumferentially surrounded by an annular cathode, see e.g. page 18 lines 11-15 of the description as filed.
- 17 A magnet is provided adjacent the housing such that non-parallel magnetic field lines are within the cavity in use. The claim does not appear to require any other technical features. However, the claim appears to further attempt to define the physical apparatus by two desirable results achieved during its operation. Namely that:

- i) the electrons are deflected by the magnetic field from the magnet in a way that a force acts between the magnetic field from the magnet and a magnetic field from the electrons, and
- ii) that kinetic energy is transferred between the apparatus and the electrons, which is construed to (implicitly) cause said generation of a force alluded to in the preamble of the claim.

- 18 When considering the claim in view of accompanying description and drawings, it appears that claim 1 is envisaged to require provision of a magnet juxtaposed to the chamber (as opposing to e.g. being provided annularly around the chamber). Magnetic fields and electric fields are interrelated and are both components of the electromagnetic force. It is common general knowledge that a moving charge in a magnetic field experiences a force perpendicular to its own velocity and to the magnetic field.
- 19 I note that several parts of the description appear to cast doubt on claim 1 requiring that deceleration or acceleration of electrons is necessary for creating a force on the magnet in either direction. For example, page 4 lines 1-8 appears to suggest that this is merely optional, rather than essential. This appears to be a drafting issue. Therefore, for the purposes of reaching this decision, I have construed it to be an essential requirement of claim 1 that the magnetic field from a magnet must be orientated in the cavity such so as to decelerate the electrons as they move from the cathode to the anode.
- 20 The description, on page 10, lines 4-10, states that a created vortex of electrons will create a magnetic field that repels the magnetic field emanating from the juxtaposed magnet, acting to push the magnet and the vortex of electrons apart. Both uses of a bar magnet and an electromagnet are envisaged as alternatives, see page 27 line 30 for example. The induced electromotive force (emf) is described to slow down the electrons orbiting in the vortex (as noted on page 10, lines 20-21 for example). Page 11 continues to explain that the vortex of electrons is stationary in space, as it is being diminished and replenished at a new position in space as electrons are emitted from the cathode and into the vortex before the crash into the housing 103 (i.e. into the anode). Electrons reaching the anode return to cathode via a completed electrical circuit. In other words, claim 1 is construed to require an isolated system.

Industrial application

- 21 Section 1(1)(c) of the Act states that a patent may be granted only for an invention that is capable of industrial application. Section 4(1) states that an invention shall be taken to be capable of industrial application if it can be made or used in any kind of industry.
- 22 The proposed industrial application is the propulsion and control of a space vehicle for use in deep space (even though the application suggests other potential uses). Ordinarily, the propulsion and control of a space vehicle would be considered as having an industrial application provided the disclosed apparatus can be put into practice. However, it is a settled matter in law that systems that are alleged to operate in a manner that is clearly contrary to well-established physical laws are

regarded as not having any industrial application, because they cannot be made to operate as described and therefore cannot be useful in industry².

- 23 The examiner has argued, in paragraphs 5-6 of the pre-hearing report, that the proposed mechanism whereby the invention generates a force on the apparatus is contrary to the principle of conservation of momentum. Pages 10 – 12 of the description as filed propose a mechanism by which kinetic energy and momentum are transferred between the magnet/housing of the apparatus and the electrons emitted by the cathode. All the electrons emitted by the cathode eventually reach the anode. Therefore, any momentum that has been transferred from the magnet/housing to the electrons will be transferred back to the housing when the electrons reach the anode. In this way, the total momentum of the apparatus does not change, and the apparatus will not be accelerated or decelerated. The examiner has argued that momentum lost by the electrons as they decelerate around the axis of the cavity (i.e. the cathode) cannot be equal to the change in the momentum of the housing moving along the same axis because these two momenta act in different directions.
- 24 The examiner also argues, in paragraph 8 of the pre-hearing report, that if the claimed invention were to operate to generate a net force on the apparatus, this would also violate Newton's third law, which states that every action force has an equal and opposite reaction force. In the examiner's view the application does not describe any way in which the apparatus could exert a force on something external to itself. Page 10 of the description as filed explains how there is a force between the magnetic field of the magnet and the magnetic field due to the motion of the electrons emitted by the cathode. Newton's third law requires that the force exerted on the magnet by the electrons is equal and opposite to the force exerted on the electrons by the magnet. However, the electrons are contained within the apparatus itself, and will eventually reach the anode, where they will exert a force on the anode and the anode will exert an equal and opposite force back on the electrons (to decelerate them). The force exerted on the magnet by the magnetic field of the electron motion will be balanced by the force exerted on the anode by the electrons crashing into the anode, so there will be no net force exerted on the apparatus by the electrons.
- 25 Mr Klemz set out in detail his theory of how the claimed apparatus generates a force which may either accelerate or decelerate the apparatus in his skeleton arguments and at the hearing itself. Starting with Maxwell's equations³, he claims the apparatus exploits the laws of classical electricity and magnetism to surf a travelling transverse pressure wave in the electromagnetic field, so it works by directing and manipulating the electromagnetic field, to create a force in a direction. Specifically, Mr Kelmz alleges that the magnetic field acts to decelerate the electrons, and this results in acceleration of the device. Working as a thruster, it is alleged to create a transverse pressure gradient, which causes the magnet to be repelled away from the electrons

² See, for example, *Eastman Kodak Co. v American Photo Booths Inc*, BL O/457/02, available at <https://www.ipo.gov.uk/p-challenge-decision-results/o45702.pdf>, and *Robinson's Application*, BL O/336/08, available at <https://www.ipo.gov.uk/p-challenge-decision-results/o33608.pdf>

³ See, for example, <https://www.maxwells-equations.com/> and Appendix 1 of applicant's skeleton arguments.

emitted by the cathode, which in turn is what is alleged to create the force suitable for e.g. propelling a vehicle.

- 26 According to Mr Klemz, at the 2nd paragraph of page 12 of his skeleton arguments, all electromagnetic and mechanical momentum is conserved and accounted for. Momentum lost by the electrons as they decelerate around the axis is equal to the momentum gained by the housing as it accelerates along the axis. The device is mechanically sealed, but electromagnetically and thermodynamically the device is open as charge flows into the cavity via the cathode and flows out via the anode. Energy enters the cavity via the electric field between cathode and anode and exits via an antenna as radio waves and as waste heat. The electrons in the cavity are effectively in free space and at the instant they are emitted from the cathode they have a velocity of zero, so all of the energy and momentum they gain is from the force due to the electric field and they transfer this momentum to the housing via the magnetic field of the bar magnet via covariant electromotive (emf) and magnetomotive (mmf) forces as described by Faraday's law and Lenz's law.
- 27 Following the Court judgment in *Blacklight Power*, I must consider whether the claimed invention operates contrary to accepted physical law on the balance of probabilities in view of the credible material filed by the applicant before the Office. This material includes the information provided in the specification itself, as well as evidence filed during the course of communication with the Office before and during the hearing.
- 28 To demonstrate the viability of the theory, Mr Klemz has conducted experiments which he claims show a prototype operating in the way his theory suggests it should. These experiments are described in the application (see pages 12 to 17 of the description as filed). In these experiments a prototype apparatus is suspended by a fishing line from a bicycle maintenance stand. Movement of the apparatus in these experiments was measured by shining a laser beam on to a mirror attached to the suspended apparatus and observing a laser dot produced by the reflected beam on a target screen. Movement of the laser dot across the screen indicates movement of the device itself.
- 29 During the hearing Mr Klemz showed videos of the experiments he has conducted using the prototype apparatus. These videos show a laser dot traversing across a screen. They do not show what is happening to the prototype apparatus concurrent to the laser dot moving across the screen. There appeared to be some vibration to the recorded laser dot, appearing to suggest vibration of the apparatus, particularly when it was set in motion as a pendulum. I note the experiments were conducted in a non-vacuum industrial environment, presumably prone to convection, whilst the device itself was generating a lot of waste heat (as admitted by Mr Klemz at the hearing and in the application). Mr Klemz also described a "wobble" that he believes is introduced by the power cables that connect the prototype to a power supply.
- 30 In one of the experiments shown in a video recording called 'static thrust', after the device is switched on, a small and gradual displacement of a laser dot can be observed over a short period of time, although the dot appears to vibrate during the course of said gradual overall displacement. As the video was played during the hearing, Mr Klemz remarked that the device is trying to push the pendulum uphill. At

a certain point, displacement of the laser dot appears to be ceasing, which is when the applicant has further remarked during the hearing that the device comes to a halt, because the restorative force equals the thrust from the device. After the equipment was switched off, the laser dot does not appear to return to its original position.

- 31 To my mind, the fact that the laser dot does not appear to return to its start position appears to be contrary to what should be expected in a situation where a thrust is exerted on a suspended body, and then subsequently removed. In particular, if the device is suspended by a line, and a force acts to displace it sideways (upwards) like a pendulum - then the device should tend to swing back towards the neutral (bottommost) position when the thrust force is removed.
- 32 If the device is moved such that it rotates about the vertical axis of the suspension line under an action of a force then the line would presumably experience torsion. When the force is removed (when the device is switched off), the torsion in the line would reasonably be expected to act to return the device towards its starting position, unless perhaps a part of the device has instead undergone non-recoverable deformation (e.g. heat-induced plastic deformation). Such deformation may explain the displacement in the first place. Mr Klemz remarked at the hearing that the device gets very hot and would fail if left on indefinitely. It appears that a reason for the displacement observed may potentially be in the onset of that equipment failing.
- 33 It is difficult to assess whether thrust is generated in the way the applicant describes based on the evidence provided in the video showing the laser dot alone, i.e. without a full and detailed view and analysis of the overall apparatus itself, e.g. from a concurrent second video showing the apparatus itself. I am of the view that the reason for displacement of the laser dot (and the device) is likely, if fully investigated at a trial with the benefit of expert evidence, to turn out to be due to reasons other than a thrust force. Potential other sources of the observed movement could include vibration of the device, a draft in the room, air convection, thermal expansion, non-recoverable deformation of test equipment part(s) due to heating. It may have been useful to test the device for different periods of time, for example to see what happens if it is left running for longer, and how that influences the observed displacement; to test it in a vacuum chamber on a sensitive scale; to heat the apparatus to temperatures comparable with what the apparatus experiences when it is switched on, but without actually switching it on, so as to assess whether heat in itself may contribute to the observed displacement. This type of evidence has not been provided during the examination process or during the hearing.
- 34 Having considered the specification as originally filed, as well as the reasoning provided by the applicant during their follow-up correspondence, and during the hearing, I understand why the provided evidence may be considered to provide grounds for optimism that the invention may potentially be able to generate a force useful for industrial application. However, I am of the view that the conditions in which the experiments were conducted leave large margins for experimental uncertainties.
- 35 As noted above in paragraph 15 referring to *Blacklight Power*, mere optimism and a reasonable prospect of matters turning out differently are not the same thing.

Considering the issue on the balance of probabilities, I am of the view that the evidence provided by the applicant does not give rise to a reasonable prospect that the applicant's theory might turn out to be valid if it were to be fully investigated at a trial with the benefit of expert evidence. Therefore, the claimed invention is considered to lack industrial application.

Sufficiency

- 36 Industrial applicability and insufficiency are often assessed together. If an invention is said to contradict the laws of physics as currently understood, then the application for a patent would not appear to teach the skilled reader clearly enough and completely enough how to work the invention. Therefore, the claimed invention is not considered to be sufficiently enabled, because the skilled person cannot put it into practice, based on the teaching of the application and their common general knowledge alone.

Other matters

- 37 In view of finding the application lacks industrial application, it is not considered to be necessary to assess whether or not the application is novel and inventive.
- 38 It should be noted that the compliance period to put the application in order for grant expired on 31 August 2024. It is possible to extend this period by 2 months, retrospectively by filing patents form 52 with a fee.

Conclusion

- 39 I find the application not to be capable of industrial application, contrary to Section 1(1)(c), and to be insufficiently enabled, contrary to Section 14(3), and not to be claimed clearly, contrary to Section 14(5)(b). I therefore refuse the application under Section 18(3) of the Act.

Appeal

- 40 Any appeal must be lodged within 28 days after the date of this decision.

LAURA STARRS

Patent Examination Group Head, acting for the Comptroller