

**PATENTS ACT 1977**

APPLICANT Dr M'dimoir Quaw

ISSUE Whether patent application GB1610677.5  
complies with sections 1(1)(c), 14(3) and  
14(5)(b)

HEARING OFFICER H Jones

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**DECISION**

**Introduction**

- 1 Patent application GB1610677.5 entitled 'Relocation Unit' was filed on 20 June 2016 with an earliest priority date of 19 June 2015. It was published as GB 2540868 A on 1 February 2017.
- 2 After several rounds of amendment and argument the examiner was still not satisfied that the invention set out in the application satisfies various requirements of the Act, namely whether the invention is capable of industrial application, whether the specification is sufficient and whether the claims define the protection in a clear way.
- 3 As has become the norm in recent times the matter came before me at a hearing held via Microsoft Teams™, held on 21 September 2021. Dr Quaw represented himself. The period for complying with all the requirements of the Act ended on 15 June 2021. Dr Quaw previously refused an offer by the examiner to extend this period. At the hearing it appeared that there was some confusion and Dr Quaw was not fully aware of the implications of not extending the compliance period with regard to filing subsequent amendments. I reassured him that further amendments could be filed at my discretion should the application be allowed to progress.

**The invention**

- 4 The invention relates to a relocation unit such as a spacecraft constructed to test the validity of a warp-drive hypothesis or theory. The concept of a 'warp drive' originates in science fiction where spacetime (i.e. the fusion of space and time) is warped around a spacecraft to allow it to move at huge speeds including those above the speed of light. Such a mechanism was thought to be theoretically impossible. However in 1994 while at Cardiff University, physicist Miguel Acubierre<sup>1</sup> (referenced in the application) showed that by an expansion of spacetime behind the spaceship and an opposite contraction in front of it, motion faster than the speed of light as seen by observers outside the disturbed region is possible within the laws of general relativity. The problem was that the warp drive would require a ring of negative energy density to work which in turn would require a huge amount of mass, typically

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<sup>1</sup> Miguel Alcubierre, 'The warp drive: hyper-fast travel within general relativity', Class. Quantum Grav. **11** (1994) L73-77

the mass of the entire visible universe. Since then scientists have shown that the mass requirement can be reduced and have advanced other mathematical proposals for warp-drive motion. In his letter of 19 May 2021, Dr Quaw asserts that ‘the present invention provides a good test-craft by which warp flight will be experimentally verified and effected’.

5 The current claims were filed on 15 June 2021 and comprise one independent claim (claim 1) which reads as follows:

1. A relocation unit contemporaneously constructed to test the validity of a warp-drive hypothesis or theory, comprising density-distributing means for arranging or confining mass-energy across large distances, to manipulate spacetime at least in accordance with the anticipated result of stress-energy tensor or energy-momentum tensor related-calculations, as defined within the theory of general relativity:

As is well-known in the art, the aforementioned tensor’s four categories of component, which are “time-time”, “time-space”, “space-time”, and “spatial” in description, are manifested respectively by,

energy-density either of the astrophysical plasma local to a magnetic field generator or alternatively in the wake of an object moving rapidly through a fluid or by some operative combination of both the mentioned generator and the mentioned object,

energy-flux either radiated from the mentioned generator into the mentioned plasma or alternatively from the rapid motion of the mentioned object through the mentioned fluid or by some operative combination of both the generator and the object,

momentum-density either transferred by the generator’s field or fields to the plasma or alternatively by the rapid motion of the object through the fluid or by some operative combination of both the generator and the object,

stress either applied by generator’s field or fields to the plasma or alternatively experienced due to the evacuated wake of the object moving rapidly through the fluid or by some operative combination of both the generator and the object;

and directing means such that the generator, object, or the aforementioned unit can be accelerated through, or be oriented within its local spacetime, so that the resulting velocity will appear to have been amplified by the mimicked or recreated, observed or verified, or exploited movement, relocation, contraction, expansion, or inflation

-which as a non-exhaustive example is somewhat analogous to what is observed and well-known in the art, occurring in the gravitationally-unbound and low-density regions of the voids between galactic superclusters –

of spacetime local to the unit, with respect to spacetime distant from the mentioned unit, for industrial-application sectors which may include those of scientific research and development.

## The law

- 6 Section 1(1)(c) of the Act requires an invention to be 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) ...*
- (b) ...*
- (c) it is capable of industrial application;*
- (d) ...*

- 7 The Act defines “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.*

- 8 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.*

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

*14(5) The claim or claims shall –*

- (a) define the matter for which the applicant seeks protection;*
- (b) **be clear and concise** (my emphasis);*
- (c) be supported by the description; and*
- (d) relate to one invention or to a group of inventions which are so linked as to form a single inventive concept.*

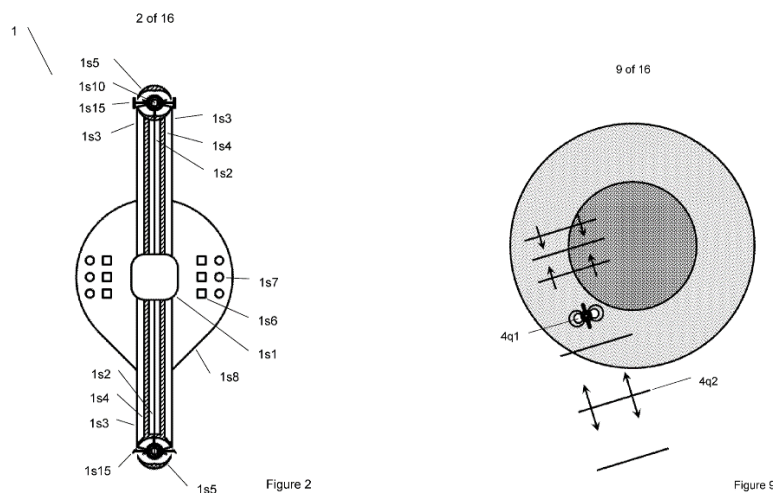
## Arguments and analysis

- 10 At the hearing we began by discussing sufficiency and how the invention is expected to work in general terms. We then moved on to industrial application and how the invention is related to established physical laws and principles. Finally, we discussed claim 1 and whether it clearly defines the invention it seeks to protect. I will follow these same steps here and conclude with a general discussion of all these requirements.

### Sufficiency

- 11 In his letter of 19 May 2021, Dr Quaw submits that his invention ‘stands as a means to test the ability to engineer warp-capable technology’. He explains this warping effect as ‘expanding, contracting, inflating, or warping spacetime’. In order to manipulate spacetime the invention according to Dr Quaw ‘produces a region of reduced energy density’. Dr Quaw explained how a spacecraft moving through the atmosphere of a star or planet will ‘depopulate space of its particles in her wake’ and produce a low-density region with effects ‘great enough to trigger the expansion of spacetime’. Further, an antenna onboard the spacecraft produce EM fields that ‘depopulate space surrounding the spacecraft’.

- 12 At the hearing, Dr Quaw directed me to Fig. 2 of the specification which illustrates a cross-section through a proposed spacecraft (reproduced below) with electrical power supply or nuclear reactor 1s1, co-axial drive antenna 1s2 and 1s3 and co-axial coils 1s6, 1s7. The specification explains that the spacecraft is capable of photonic propulsion and 'is attractive since its nuclear power source allows for missions to the outer solar system and beyond'. Alternatively, plasma propulsion may achieve 'non-trivial subluminal velocities'. The specification then explains that the spacecraft can 'activate its magnetic dipole fields' by energising the coils 1s6, 1s7 prior to or shortly after 'atmospheric entry'. This produces the required 'boost field' due to warp propulsion. We are told that Fig. 9 (reproduced below) 'shows the spacecraft enter the atmosphere, the dipole magnetic field excludes ionised matter from the atmosphere as labelled in a region of low gravitational field energy density, giving rise to an annular region of negative energy density, the resulting expansion of space rearwards of the spacecraft is labelled, the resulting contraction of space ahead of the spacecraft is shown'.



### Industrial application

- 13 Dr Quaw explains in his letter of 19 May 2021 that: 'As an invention in a cutting-edge field of science, the spacecraft and ground apparatus would undoubtedly be experimental in their nature, and most likely for the two-decade life of the patent.' However, he explains in his later letter of 15 June 2021 that this is not a concession. In contrast, 'experimentation in this field – and with the disclosed apparatus – is what the application aims to protect'. He submits that the required apparatus 'comprising two or three electromagnetic coils and a power supply' is available now. He emphasizes that warp drive technology does not contravene the laws of physics and there is an 'industry involved in the development of its technology'. Dr Quaw explains in his letter of 19 May 2021 that other researchers are active in this field for example using 'laser-light phase differences to observe spacetime warping'. He refers to a recent paper by Bobrick et al.<sup>2</sup> that concludes that 'a class of subluminal, spherically

<sup>2</sup> Alexey Bobrick and Gianni Martire, 2021, "Introducing Physical Warp Drives", Classical and Quantum Gravity, 38 105009. IOP Publishing Ltd

symmetric warp drive spacetimes, at least in principle, can be constructed based on the physical principles known to humanity today’.

### Clarity

- 14 Claim 1 is divided into nine paragraphs. At the hearing Dr Quaw explained that the first paragraph is a general section that defines a relocation unit, typically a spacecraft, that is constructed to test a warp-drive theory by manipulating spacetime according to the laws of general relativity. In particular, in his letter of 15 June 2021, he submits that: ‘New claim 1 outlines the stress-energy tensor of general relativity’. He explained at the hearing that the four elements in the second paragraph, ‘time-time’, ‘time-space’, ‘space-time’ and ‘spatial’, are four components of a matrix which would be familiar in this field. Dr Quaw went on to explain that paragraphs 3-6 specify how the invention relates to each of these components in turn. Dr Quaw explained that the resulting motion described in paragraph 7 does not need to be superluminal but just amplified by the warp effect. Paragraphs 8 and 9, although not discussed specifically at the hearing, appear to refer to the application of the invention to regions between galactic superclusters and its proposed industrial application to scientific research and development.

### Discussion

- 15 From section 14(5)(c), the claims that define the invention must be clear. In the current application, claim 1 has been drafted broadly. Even though I can see from Dr Quaw’s explanation that claim 1 is related to known physical laws or theories, particularly, general relativity, it would not be clear to the skilled person which aspects of the invention he is trying to protect. I agree with the examiner that it is unclear how the ‘relocation unit ... comprising density-distribution means for arranging or confining mass-energy across large distances’ in paragraph 1 of claim 1 is related to the four components detailed in paragraphs 3-6 in any practical way. There is mention of a magnetic field generator that radiates into the surrounding plasma and the effect of an object moving rapidly through a fluid, but without any further technical features it would not be clear to the skilled person what these paragraphs are attempting to define. Similarly, paragraphs 7-9 appear to be general statements that state the intended result of amplified velocity without defining how it will be achieved in practice.
- 16 Moreover, despite Dr Quaw’s explanations, I am struggling to understand how the invention could be put into effect. In order to satisfy section 1(1)(c) the invention must be capable of industrial application and not have a merely speculative use. Related to this (section 14(3)), the specification must 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 without undue burden. I understand that warp effects have moved from the realms of science fiction into active areas of research and Dr Quaw is hoping to contribute to this endeavour. To this goal, Dr Quaw has proposed a warp-drive mechanism which seems to rely on the effect of a spacecraft (or similar unit) producing electric and/or magnetic fields whilst moving through the atmosphere surrounding an astronomical body. However, Dr Quaw has not explained how the skilled person could produce this warp effect in practice. Key details of the apparatus are missing. For example, there are no details in the specification of the magnitude of the electric or magnetic fields required nor the speed of the spacecraft as it enters the atmosphere. There is also no analysis of the expected magnitude of the resulting warp effect for different key parameters.

- 17 By Dr Quaw's own admission the patent application is a means to put down ideas which will then be the subject of further investigation for many years. Indeed, there are several instances in the specification that state that further research is required. I agree that it is possible to have patentable inventions for experimental equipment designed to test new theories and effects. However, the skilled person must be able to put the invention into practice using reasonable skill and their common general knowledge. It should not be necessary for the skilled person to engage in prolonged research, enquiry and experiment. The skilled person here would not be able to construct a relocation unit according to the invention which could test the validity of a warp-drive theory based only on the patent application and their common general knowledge. They would need to carry out further significant investigation to determine key parameters of the apparatus and its operation.

### **Conclusion**

- 18 I have found that the claims are not clearly defined as is required by section 14(5)(b) of the Act. To the extent that the invention can be understood, I find the proposed invention to be speculative in nature and not capable of being put into practice without the skilled person engaging in extensive research and experimentation. Specifically, I find the invention to be incapable of industrial application as required by section 1(1)(c) and the specification to be insufficient as required by section 14(3). I can see no amendment that might remedy these issues. The application is refused under section 18(3).

### **Appeal**

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

**Huw Jones**

Deputy Director, acting for the Comptroller