Intellectual Property Office

BL O/592/20

25 November 2020

PATENTS ACT 1977

APPLICANT	Corey Kaizen Reaux-Savonte
ISSUE	Whether patent application GB 1713132.7 complies with sections 14(3), 1(1)(c) and 4(1)
HEARING OFFICER	Dr S Brown

DECISION

Introduction

1 Patent application GB 1713132.7 ("the application") entitled "Hyper Quantum Bits", was filed on 16 August 2017 in the name of "Corey Kaizen Reaux-Savonte ("the applicant"). A request for combined search and examination was filed just under 12 months later, on 13 August 2018. It was published as GB2569086 on 12 June 2019.

2 The examiner was of the view at the initial stages of prosecution that the application was insufficient, and in his letter of 18 February 2019 invited the applicant to withdraw the application and request a refund of the search and examination fee. The applicant declined to do so, and simply provided a further explanation of his invention in his letter of 6 March 2019. As this information failed to satisfy the examiner's concerns, he issued a report under section 17(5)(b) on 8 April 2019, stating that a search would not serve a useful purpose. This was accompanied by an abbreviated examination report where he set out his reasoning that the specification does not meet the requirements of sufficiency of disclosure, as laid down by Section 14(3) of the Patents Act 1977 ("the Act"). He also argued that due to the lack of sufficiency, it follows that the invention is not capable of industrial application, as required by sections 1(1)(c) and 4(1) of the Act.

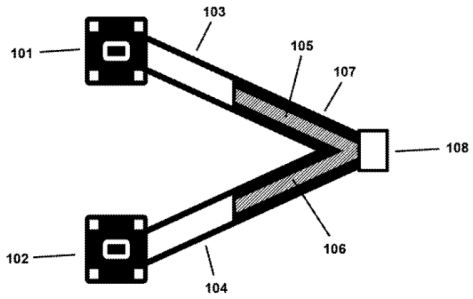
3 These objections were maintained in subsequent examination reports, and with the position unresolved, the applicant requested to be heard, and the matter came before me at a hearing conducted by telephone on 8 July 2020. The issues of sufficiency and industrial application before me were set out in the examiner's pre-hearing report of 8 June 2020. The applicant represented himself, and I was assisted by Dr Rowena Dinham.

The invention

4 The invention relates to a quantum bit system, which is capable of achieving three or more states (or bit values) for a single bit. The system functions by using switches to turn at least two object streams on and off, where the object streams are directed

towards a measuring device and that device attains a bit value based upon its measurement. The description of the present application discloses an embodiment based on light and pressure, depicted by Figure 1 below:

Figure 1



5 In this embodiment, two lasers (103, 104), each with their own switch (101, 102), are attached to vacuum tubes (107) through which the beams (105, 106) can travel to a pressure detector (108). The photons in the vacuum tubes constantly travel at the speed of light, such that they exert the same amount of pressure on the detector. The detector is calibrated to measure pressure exertion values and a bit value can then be determined based upon the pressure so measured. According to the application, such a set up can achieve three or four bit states, depending on the strength of the lasers:

Lasers same strength: 0- no laser on; 1- either laser on; 2- both lasers on

Different strengths: 0- no laser on; 1- weaker laser on; 2- stronger laser on; 3- both lasers on

6 As the applicant has made no amendments during the examination process, the current set of claims are those as filed with the application on 16 August 2017. There are two claims, both of which are independent, and they are set out below:

1. *A bit system, comprising*
   at least one type of object that can stream continuously;
   two or more separate object streams;
   switches to turn streams on and off; and
   a measuring device operating as a bit;
   wherein:
   the switches are used to turn each object stream on and off;
   the object streams are directed towards a measuring device; and
   the measuring device attains a bit value based on the current measurement.

2. *A method of attaining three or more bit values for a single bit, wherein the method comprises:*
   using switches to control two or more streaming objects;
   using a measuring device, operating as a bit, to measure the quantity of a property created by two or more streaming objects; and

calibrating the measuring device to represent a bit value based on the current measurement of the property.

The issues to be decided

7 The issue for me to decide is whether the disclosure of the invention is sufficient, as is required by section 14(3) of the Act, as well as whether the invention is capable of industrial application as required by sections (1)(c) and 4(1) of the Act. As I pointed out at the hearing, in my view sufficiency is the key point here and therefore it is likely that industrial application will stand or fall by that.

The law

8 The relevant provisions of the Act are reproduced below:

Industrial application

Section 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) the grant of a patent for it is not excluded by subsections (2) and (3) or section 4A below;

and references in this Act to a patentable invention shall be construed accordingly.

9 The manner in which condition (c) is to be assessed is set out in section 4, which reads:

Section 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.

Sufficiency

Section 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

10 The purpose of section 14(3) of the Act is to prevent an applicant from laying claim to products or processes which the teaching of the specification does not allow the skilled addressee to perform. Essentially it asks whether the patent application provides enough information for a person with a reasonable knowledge and understanding of the technical area described to be able to carry out the invention.

11 In *Eli Lilly v Human Genome Sciences [2008] RPC 29*, Kitchin J, at [239], gave the following summary of the relevant principles to be applied when assessing whether an invention satisfies this section of the Act:

> *"The specification must disclose the invention clearly and completely enough for it to be performed by a person skilled in the art. The key elements of this requirement which bear on the present case are these:*
>
> *(i) the first step is to identify the invention and that is to be done by reading and construing the claims;*
>
> *(ii) in the case of a product claim that means making or otherwise obtaining the product;*
>
> *(iii) in the case of a process claim, it means working the process;*
>
> *(iv) sufficiency of the disclosure must be assessed on the basis of the specification as a whole including the description and the claims;*
>
> *(v) the disclosure is aimed at the skilled person who may use his common general knowledge to supplement the information contained in the specification;*
>
> *(vi) the specification must be sufficient to allow the invention to be performed over the whole scope of the claim;*
>
> *(vii) the specification must be sufficient to allow the invention to be so performed without undue burden."*

12 Whilst there is only one provision under the Act, it is now settled law that sufficiency of disclosure can be approached in three different ways:

> *(1) Classical insufficiency*
>
> *(2) Insufficiency by ambiguity*
>
> *(3) Insufficiency by excessive claim breadth*

13 In this instance, the examiner considers the disclosure to be insufficient by classical insufficiency, which relates to the situation where there is no enabling disclosure. This has been usefully summarised by Floyd J in *Zipher Ltd v Markem Systems Ltd [2009] FSR1*:

> *"Classical insufficiency arises where the express teaching of the patent does not enable skilled addressee to perform the invention. This type of insufficiency requires an assessment …of the steps to which it would be necessary for the skilled reader or team to take in following the teaching of the specification and in order to arrive within the claim. Plainly the steps should not include inventive*

ones. But a patent can also be found insufficient if the steps can be characterised as prolonged research, enquiry or experiment."

Arguments and analysis

14 Given that I am of the opinion that the industrial application of the invention will depend upon whether it is sufficient, I will consider sufficiency first. In order for an application to be sufficient, it must include at a minimum something amounting to one embodiment or example that can be put into effect. As noted in *Kirin-Amgen Inc v Hoescht Marion Roussel [2005] RPC 9*:

> "*Whether the specification is sufficient or not is highly sensitive to the nature of the invention. The first step is to identify the invention and decide what it claims to enable the skilled man to do. Then one can ask whether the specification enables him to do it."*

15 Before I begin, I therefore need to identify the invention and what the skilled person would understand the claims to enable him to do. This involves applying a purposive construction to the claims, interpreting them in light of the description and drawings.

Identifying the Invention

16 At this point it is worth noting that throughout the specification it appears that the terms 'bit', 'hyper quantum bit', 'hyperbit' and 'quantum bit' are used interchangeably. At the hearing I confirmed with Mr Reaux-Savonte that the reference to a 'bit system' in claim 1 was intended to mean a 'quantum bit system', which I will also take to include 'hyper quantum bits' and 'qubits'. For consistency and clarity, I will refer henceforth to the system as a 'quantum bit' system.

17 There appears to be some disagreement between the examiner and Mr Reaux-Savonte regarding what the invention actually is. From his examination reports, and particularly the pre-hearing report dated 8 June 2020, the examiner considers that the invention extends beyond the system defined in claim 1 to a method of quantum computing and/ or a quantum computing apparatus. Some of this is borne from Mr Reaux-Savonte's comments in his letter of 13 January 2020 that states that the 'invention is only supposed to be limited to quantum computing'.

18 However, in his skeleton arguments, Mr Reaux-Savonte considers that the examiner misunderstood the invention. The quantum bit system may be used as part of a quantum processor but it is not the processor itself. Therefore, contrary to the examiner's belief, the quantum bit system does not extend to a quantum computing apparatus.

19 I agree with Mr Reaux-Savonte here. As he points out in his letter dated 30 July 2019, his invention relates to the quantum bit system, and comprises the lasers, the switches, and the measuring device (specifically a 'pressure' detector) which can determine the value of the bit. This is in line with the disclosure of the application, which states that there are four requirements for the creation of a hyper [quantum]

bit: at least one object that can stream continuously; two or more separate object streams; switches to turn streams on and off; and a measuring device operating as a bit. Even if the system is to be limited to quantum computing only, the claims do not make this limitation, and moreover the specification does not make this limitation clear either. The skilled person reading the specification would, in my opinion, reach the same conclusion.

20 I thus construe the invention to be a system for generating quantum bits. While the claims themselves only refer to 'bits', in the context of the application as a whole, I believe these are clearly intended to be 'quantum bits' and that the skilled person would understand them to be so limited. As mentioned above, Mr Reaux-Savonte confirmed as much at the hearing. I do not believe, however, that the invention extends beyond this to how such a system might be used to enable quantum computing. It is concerned only with generating quantum bits, no more, no less.

What the skilled person learns from the specification

21 Next, I will consider what the skilled person would deem the specification enables them to do. I will begin by giving some consideration as to the identity of said skilled person.

22 The concept of the skilled person is well established for the purposes of assessing inventive step, and the same is applied here: they are an uninventive but technically competent person. Aldous J gave some consideration to who the skilled person is for the purpose of sufficiency in *Mentor Corporation v Hollister Inc* [1991] FSR 557 (at page 561):

> *"The section requires that the skilled man be able to perform the invention. Such a man is the ordinary addressee of the patent. He must be assumed to be possessed of the common general knowledge in the art and the necessary skill and expertise to apply that knowledge. He is the man of average skill and intelligence, but is not expected to be able to exercise any invention. In some arts he may have a degree, in others he will be a man with practical experience only. Further, in circumstances where the art encompasses more than one technology, the notional skilled addressee will be possessed of those technologies which may mean that he will have the knowledge of more than one person."*

23 In the present case it can be reasonably assumed that the skilled person would have a degree such that they have some understanding of quantum mechanics, but it must still be borne in mind that they would not need to exercise any degree of invention when applying this knowledge. I believe that in the present case, the skilled person reading the specification would deem that it *should* enable them to use the disclosed system of two or more lasers directed at a measuring device to generate a measurement based on the 'pressure' exerted by different combinations of beams. Next, and this is the key stage, in my opinion, that the pressure measurement generated in this way represents a *quantum* bit, which may have three or more values. The question, therefore, is does what is disclosed enable the skilled person

to do this? Furthermore, to be able to do so with no significant degree of invention or research required?

24 In his pre-hearing report dated 8 June 2020, the examiner argued that whilst the specification provides a disclosure of the hardware needed, it does not describe how this hardware is operated such that the states can be mapped to bits that are indicative of a quantum-mechanical computing process. Without an explanation of how the photon states are brought into a quantum mechanical interaction, the examiner argues that the skilled person would not be able to use the claimed apparatus for quantum computing. In particular, he asserts that there is no enabling disclosure of how to operate the apparatus in order to bring the claimed states into superposition, which is a requirement for generating a quantum bit.

25 He goes on to point out that, in the same way that many computer-implemented inventions rely on the same conventional hardware but differ in the way the hardware is operated, the claims of the present application define conventional pieces of hardware that are brought together to provide a system where switches are controlled to direct either one, both, or none of the two laser beams to a detector which samples the resulting signal. In his opinion, there is no disclosure telling a skilled person how the hardware of the invention is used to attain measurements that are the result of quantum computation, and they would not be able to resolve this using their common general knowledge. Instead, the skilled person would need to embark on a research project to use the disclosed hardware to generate a quantum bit.

26 On the other hand, Mr Reaux-Savonte argues that when two or more lasers are used according to his design, the photons in each laser beam will be superpositioned at the detector. Further he argues that the application makes it clear how switching the lasers on and off results in different combinations of photon streams that create different measurement values, which in turn represent different quantum bit states.

27 Specifically, at the hearing, Mr Reaux-Savonte reiterated that in his opinion, the alignment of the lasers onto the same point results in the superposition of their photons, and the resultant measurement of this generates a quantum bit. In Mr Reaux-Savonte's opinion, firing of both lasers together naturally results in the superpositioning of photons because the photons from the two streams combine together as a single photon packet. As such, this qualifies as a quantum level phenomena and gives rise to a quantum bit.

28 I am afraid I am not convinced by this argument. Reading the application, what I find disclosed is a system working in the classical, i.e. non-quantum, sense. Two beams of light are shone onto a detector which detects three levels of intensity (or 'pressure' as Mr Reaux-Savonte prefers to call it) depending on how many of the beams are switched on. This is standard classical behaviour for an optical system. While modern physics teaches us that the beams are made up of photons that does not mean that quantum level phenomena can easily be observed at our, macro, scale. Something more is required.

29 Using laser beams is also not enough, in my view. While the photons in laser beams are *coherent*, this merely means that their frequency and waveform are identical and that their phase difference is constant. Simply *superimposing* two laser beams does

not, I believe, lead to the *superposition* of states required to generate quantum level phenomena. The two terms have very different meanings and I feel that Mr Reaux-Savonte may be conflating the two terms unintentionally.

30 My point may be further illustrated by defining what is usually meant by a quantum bit. A quantum bit may be defined as[1]:

> *A qubit or quantum bit is the basic unit of quantum information—the quantum version of the classical binary bit physically realized with a two-state device. A qubit is a two-state (or two-level) quantum-mechanical system, one of the simplest quantum systems displaying the peculiarity of quantum mechanics. Examples include: the spin of the electron in which the two levels can be taken as spin up and spin down; or the polarization of a single photon in which the two states can be taken to be the vertical polarization and the horizontal polarization. In a classical system, a bit would have to be in one state or the other. However, quantum mechanics allows the qubit to be in a coherent superposition of both states simultaneously, a property which is fundamental to quantum mechanics and quantum computing.*

31 Thus, superposition is not achieved by *superimposing* two streams of photons. Rather it is the ability of an individual quantum level object, e.g. an electron or a single photon, to exist in two quantum states simultaneously.

32 I can see nothing in the specification, or in Mr Reaux-Savonte's arguments, that could create such a quantum phenomenon. Thus, while the skilled person could recreate the hardware disclosed in the application and make it work in the described manner, it will not, in my view, create a quantum bit. To reach that goal the skilled person would need to do something beyond what is disclosed and beyond the ordinary skilled person's knowledge.

33 Even if I am wrong in this, and combining two lasers as specified may somehow produce a quantum-level superposition of states, then the specification is also lacking in a method of measuring these states. This is not a trivial problem and it is not the same as measuring the combined optical 'pressure'. I believe that even with a degree-level knowledge of quantum mechanics, the skilled person would be facing an undue burden in determining how to measure such a superposition and would most certainly need to embark on a research project to do so.

34 I thus conclude that the invention has not been sufficiently disclosed, as required by section 14(3), and is therefore classically insufficient. Furthermore, as there is no invention disclosed that can be worked by a skilled person, it follows that there is nothing in the specification that is capable of industrial application, as is required by section 1(1)(c).

[1] https://en.wikipedia.org/wiki/Qubit

Conclusion

35 I have concluded that the specification does not sufficiently disclose an invention such that a person skilled in the art would be enabled to perform it. Furthermore, it follows from this that the specification does not disclose an invention that is capable of industrial application. I therefore refuse this application under section 18(3).

Appeal

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

STEPHEN BROWN

Deputy Director, acting for the Comptroller