Intellectual Property Office

BL O/060/18

25 January 2018

PATENTS ACT 1977

APPLICANT Soliton Holdings Corporation Delaware Corporation

ISSUE Whether patent application number GB1613335.7 complies with section 1(1)(c)

HEARING OFFICER J Pullen

DECISION

Introduction

1 Patent application GB1613335.7 was filed on 2 August 2016 by Soliton Holdings Corporation, Delaware Corporation, being a divisional application of GB1609906.1 and claiming priority from both GB1604802.7 (filed on 22 March 2016) and GB1601094.4 (filed on 20 January 2016). The application was published as GB2546570 on 26 July 2017.

2 A combined search and examination was requested on 2 August 2016, however, the examiner did not perform a search and instead issued an abbreviated examination report stating that the invention was considered to be incapable of industrial application, primarily as it operated contrary to the second law of thermodynamics. Despite several rounds of correspondence, the applicant has been unable to convince the examiner that the operation of the invention is within the bounds of well-established physical laws. The examiner also noted that the description of the operation of the invention is flawed, in as much as it would not operate as described. It is noted that the question as to whether the application is capable of industrial application is the only issue that has been examined to date and the only matter to be decided. Consequently, should I find in favour of the applicant I will need to remit the application back to the examiner for further consideration.

3 The applicant requested a hearing to decide on this matter, which came before me on 23 November 2017. The applicant, represented by the inventor Mr Yuri Abramov, agent Mr Binyamin Koretz and translator Mr Yakov Abramov attended via telephone conference. Also present were the examiner Mr Peter Middleton and my assistant Mr Joseph Mitchell.

4 I am extremely grateful to the applicant's representatives for the skeleton arguments filed on 2 October 2017 and their submissions at the hearing which explained, in much detail, the intended operation of their invention. I confirm that I have taken

these (and all the arguments put forward in the correspondence) into account in reaching my decision.

The application

5 The invention is best understood with reference to the figures, consequently figure 5f of the application has been reproduced below. It shows one embodiment of the invention which, in its simplest form, includes 'jet-gear' which is a device (540) which may have a 'circular saw' type cross section, with some surfaces comprising fluid repellent material (541-548), the device is submerged in the fluid and operates such that the fluid (551-558) is repelled away from the fluid repellent material in a first direction (561-568), causing the device to rotate in a second, opposite direction (549). It is noted that in other embodiments the device may take different shapes.

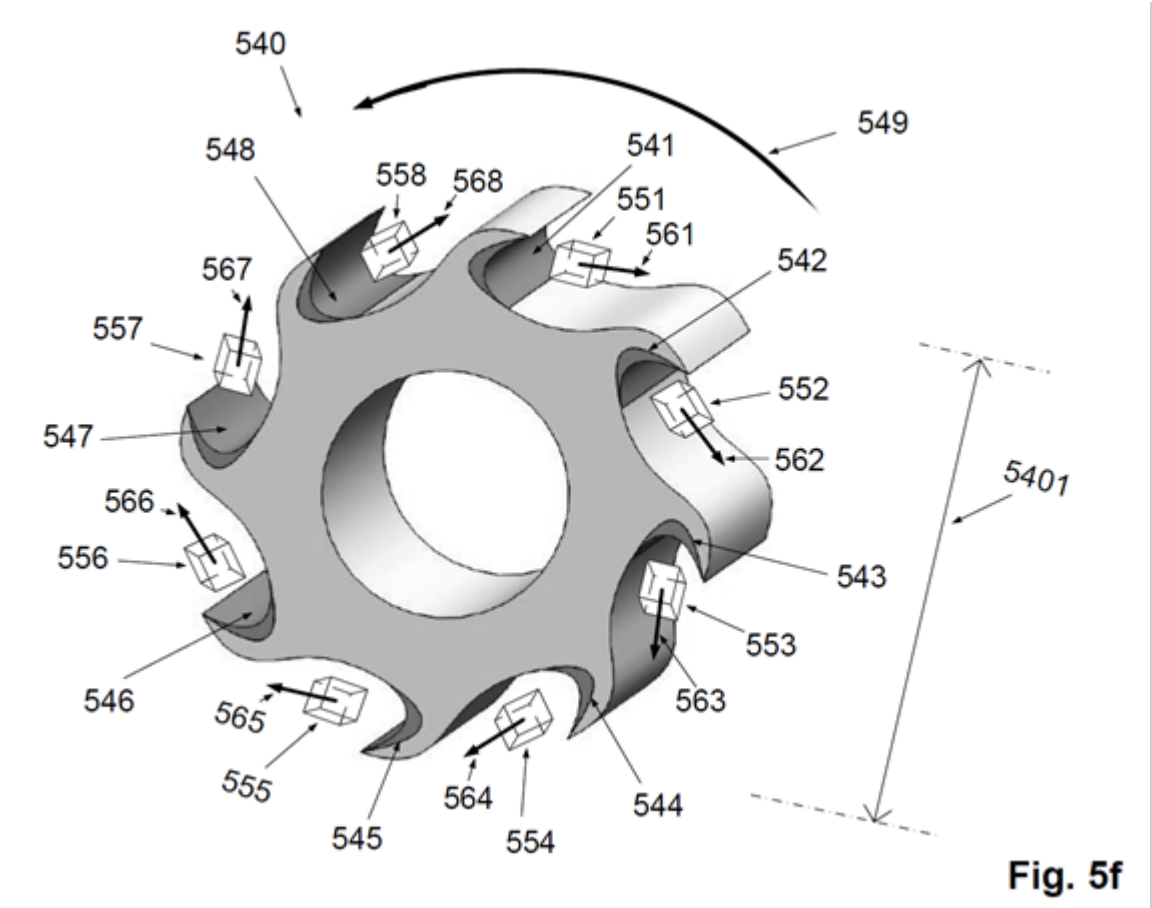

Fig. 5f

6 The most recent amendments to the claims were filed on 9 January 2017 and contain a single independent claim which reads:

> *A corpus of a fluid-repellent jet-gear, submerged in a fluid;*
> *wherein a phobic-repulsing jet-effect is defined as a kind of jet-effect, occurring in a fluid near to a surface made from a fluid-repellent material; said kind of jet-effect occurring, when nearby fluid portions, contacting with the surface, become substantially subjected to a repelling action of phobic-repulsive van der Waals forces originated by the fluid-repellent material, wherein said repelling action being appeared as an acceleration of the nearby fluid portions; said acceleration occurring at the expense of said nearby fluid portions' internal heat energy, thereby said acceleration being inevitably accompanied by said nearby fluid portions' temperature decrease, thereby creating a temperature difference between an original temperature of said fluid's portions, yet to be subjected to said phobic-repulsing jet-effect, and*

a decreased temperature of said nearby fluid portions, already subjected to said phobic-repulsing jet-effect, and wherein said repelling action being at least one of an inherent property of the fluid-repellent material and controlled by an external power source;
said fluid-repellent jet-gear corpus comprising at least an outer layer, made from a fluid-repellent material; wherein said outer layer having a relief-structured surface, contacting with nearby portions of said fluid;
wherein said relief-structured surface comprising asymmetrically shaped and co-oriented protrusions thereby providing a cumulative repelling action of said phobic-repulsive van der Waals forces on said nearby fluid portions in unison and co-oriented in a prevalent direction, thereby causing said nearby fluid portions motion in said prevalent direction; wherein said asymmetrically shaped and co-oriented protrusions having a form of at least one of saw-like teeth, curved cogs having concave sides with parabolic sectional profiles, teeth-like fins, fish-scales, humps, airfoil convexities, screwed blades, convex airfoil withers, and spiral turns;
wherein an overall configuration of said fluid-repellent jet-gear corpus having a substantially-airfoil orientation, aligned to said prevalent direction;
wherein said overall configuration of said fluid-repellent jet-gear corpus is in a form of at least one of:

- *a bar, shaped as saw, having said substantially-airfoil orientation along said bar;*
- *a wheel, shaped as circle-saw, having said substantially-airfoil orientation being at least one of clockwise and inverse-clockwise;*
- *a convex-concave configuration, wherein a convex side has said substantially-airfoil orientation, and a concave side comprises said outer layer, made from said fluid-repellent material;*
- *a spiral staircase, having said substantially-airfoil orientation along a helical contour;*
- *a screw of Archimedes, having airfoil turns;*
- *a set of streamlined wings;*
- *a propeller; and*
- *a capillary tube; wherein an inner side of said capillary tube comprising said outer layer, and wherein said protrusions, being asymmetrically shaped and co-oriented and located within said capillary tube, thereby providing said cumulative repelling action of said phobic-repulsive van der Waals forces on said nearby fluid portions, located within said capillary tube, in unison and co-directed along said capillary tube, thereby resulting in said nearby fluid portions motion along said prevalent direction along and within said capillary tube;*

wherein said asymmetrically shaped and co-oriented protrusions are at least one of stationary and rotating relative to said fluid-repellent jet-gear corpus;
wherein said fluid-repellent jet-gear corpus is at least one of stationary and moving relative to said fluid's portions, yet to be subjected to said phobic-repulsing jet-effect;
wherein said prevalent direction of said nearby fluid portions motion, being at least partially at least one of whirling, headway, and streaming along a helical trajectory; wherein said fluid is at least one of a water-based liquid, an oil-based liquid, an alcohol-based liquid, and an ionized gas or liquid; and wherein said fluid-repellent material is at least one of hydrophobic, oleophobic, omniphobic, and ion-repellent.

The law

7 The law regarding the industrial applicability of inventions is set out in section 1 of the Patents Act 1977 as follows:

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.

8 Section 4(1) of the Patents Act 1977 defines “capable of industrial application” as follows:

> *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 Processes or articles alleged to operate in a manner which is clearly contrary to well-established physical laws, such as those often referred to as perpetual motion machines, are regarded as not being capable of industrial application.

Arguments and assessment

10 At the hearing the applicant’s representatives explained the intended operation of the invention, with reference to figure 5f. When the ‘jet gear’ 540 is submerged in a fluid, the fluid repelling surfaces 541-548 act to repel first portions of fluid 551-558 in the direction of arrows 561-568. This action causes an opposing force on the jet-gear 540 which rotates in the direction of arrow 549. In operation, ‘new’ portions of fluid move in to replace the first fluid portions 551-558. The acceleration and movement of the first portions of fluid 551-558 is said to be responsible for a drop in temperature of both the first portions of fluid 551-558 and the fluid repelling surfaces 541-548. The ‘new’ portions which move in to replace the first portions 551-558 consequently have a higher temperature than both the first portions 551-558 and the fluid repelling surfaces 541-548. The process is repeated continuously, providing rotation of the jet-gear 540, with a corresponding continuous reduction in the temperature of the fluid and the jet-gear 540 over time until the fluid freezes, unless heat is transferred to the fluid and the jet-gear 540, for example, from the surrounding environment.

11 Overall, the independent claim describes the operation of the invention much as was explained. Clarification of some of the terms used in the claim which directly affected by understanding of the operation was requested.

12 The reference to ‘*and wherein said repelling action being at least one of an inherent property of the fluid-repellent material and controlled by an external power* source’ was clarified to refer only to the operation of the fluid repellent materials used. The applicant’s representatives explained that fluid repellent materials may function inherently, or may function only when power is applied. The control by an external power source was intended to apply only to making the surfaces fluid repellent. It is not intended to refer to some additional input of electrical power to control or otherwise operate the invention.

13 Most of the references to ‘*fluid near to a surface’*, ‘*fluid portions’*, ‘*nearby fluid portions*’ and ‘*nearby portions of said fluid’* are understood to refer solely to the portions of fluid (551-558 in Fig. 5f above) which are either in contact, or have been in contact (after being repelled), with the fluid repellent surfaces. It is unclear whether the reference to ‘*fluid’s portions’* in the penultimate paragraph of claim 1 is intended to mean the fluid portions which have been moved, or the ‘new’ fluid portions. In light of the explanation provided I understand this particular reference to mean the ‘new’ fluid portions.

14 The system of the invention is a ‘jet-gear’ submerged in fluid. Although not stated, it seems fair to assume (and the applicant’s representatives agreed) that the fluid is at

an average ambient temperature. The applicant's representatives explained that the body of fluid at an average temperature is able, via the interaction of the fluid at a fluid repellent surface, to generate useful work in the form of movement of the 'jet-gear', due to a localised temperature reduction of the fluid which has moved away from the 'jet-gear'. What is proposed is that the heat energy of the fluid has produced useful work in the form of movement of the fluid and also movement of the 'jet-gear'.

15 There was considerable discussion of the operation of the invention at a molecular level. I agree with the applicant's representatives that there will be Brownian motion of the molecules of the fluid in which the 'jet-gear' is positioned. This will be continuously occurring and the motion of the molecules will impact upon the whole of the 'jet-gear'.

16 However, the effect of the Brownian motion of a fluid on an object placed therein is entirely dependent upon the relative size and mass of the object. Objects being small and light enough (such as pollen grains) may be effected. Objects larger and heavier would not. I note that there is no limitation in the claim (or the description as a whole) regarding the size or mass of the jet-gear.

17 I understand that, for example, when referring to 'fluid portions' the reference is to a portion of fluid at the molecular level, as opposed to any great mass or collection of fluid. The explanation of the operation of the invention has required movement of small groups of fluid molecules away from a fluid repellent surface and 'new' molecules being drawn in. The applicant's representatives explained that the various forces for the movement of the fluid portions are different depending upon whether they are being repelled or whether they are moving in to replace other fluid portions. They also explained that movement of the different portions do not act against each other.

18 I put it to the applicant's representatives that the 'new' portions of fluid which are entrained by the movement of the first fluid portions away from the fluid repellent surface would be subject to equal forces of repulsion as they approached the fluid repellent surface and consequently there would be very little, if any, movement of fluid as a result. The applicant's representatives did not agree with this, they were firm in their assertion that 'new' fluid portions would be brought into contact with the fluid repellent surfaces as a result of being entrained in the movement of the first fluid portions away from the surfaces and that this process would be self-perpetuating.

19 I cannot agree with the explanation given to me. I can agree that fluid portions, at the molecular level, which are positioned against or adjacent to the fluid repellent surface could move away from the surface and that 'new' molecules could, by necessity move in alongside the surface. What I do not agree with is that this process would operate in the manner described to me by the applicant's representatives. I do not consider that all, or even the majority, of the fluid molecules would move away from the surface in roughly the same direction, to be replaced by 'new' molecules moving in from the side. As I understand it, some fluid molecules would move away from the fluid repellent surface. Others would be prevented from moving away by the resistance caused by other molecules in their path. Yet others may begin to move away and may be pushed back. In essence, I can only find that the movement of the molecules away from the surface would not occur in the almost

linear and repetitive nature as described to me by the applicant's representatives. I consider that the repelling force of fluid molecules away from the surface would be roughly equally balanced by 'new' molecules resisting movement towards the fluid repellent surface. As such, I do not consider that a jet-effect would be created.

20 Even if I could agree that movement of the molecules occurred as explained, I cannot agree that the force generated to move the 'jet-gear' would be sufficient to overcome the frictional resistance to movement the 'jet-gear' would experience from being submerged in the fluid. The forces generated by the fluid repellent material and the fluid molecules would be tiny compared to the large frictional resistance provided by the fluid itself. Even if movement of the molecules could be directed in the manner explained, I cannot accept that any movement of the 'jet-gear' would occur. I consider this to be true regardless of the shape, size, or mass of the 'jet-gear'.

21 With regard to the second law of thermodynamics, there are numerous other systems referenced in the application which the applicant considers to be open and not to operate contrary to the second law of thermodynamics. A range of examples were also included in the skeleton arguments provided and some were referenced directly in the hearing.

22 I have given due consideration to these and I am in agreement with the applicant that none of the examples provided show a perfectly closed system from a thermodynamic point of view. The second law of thermodynamics will however apply to a system without a physical boundary if any changes in entropy and energy across a theoretical boundary containing that system are taken into account, and whatever the outcome, it must agree with the second law.

23 Consequently, although the applicant's representatives insist that their system should be classed as being open from a thermodynamic point of view, it must still comply with the second law of thermodynamics when considered to be surrounded by a theoretical boundary and when all energy and entropy changes across that boundary are taken into consideration.

24 The applicant's representatives stated that the energy and entropy changes can be accounted for by a temperature differential between the fluid at the fluid repellent surfaces, the temperature of the bulk of the fluid and the temperature of the environment surrounding the device. It was explained that the invention would operate until the fluid, if it were for instance water, froze.

25 As I do not agree that the invention will operate in the manner described, I do not agree that a temperature differential will be created between the surrounding environment and the regions of the fluid which is sufficient to energise the system in order to maintain motion of the 'jet-gear'. As such the invention does not meet the requirements of the second law of thermodynamics.

26 In summary, I do not agree with the explanation of how the invention operates provided by the applicant and their representatives, as aspects of this explanation are contrary to well-established physical laws. Consequently the invention is not patentable since it is not capable of industrial application contrary to section 1(1)(c)

of the Act. Having read the specification in its entirety I have not been able to identify any allowable amendment to overcome this issue.

Conclusion

27 Having considered all of the information available to me I find the application lacks industrial applicability under section 1(1)(c). I therefore refuse the application under section 18(3) of the Act.

Appeal

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

J Pullen

Deputy Director, acting for the Comptroller