Citation: Moncada Rodriguez, Oscar Edgardo (Re), 2023 CACP 4 Commissioner's Decision # 1637 Décision du Commissaire nº 1637 Date: 2023-01-30

TOPIC:	G00	Utility
	C00	Disclosure - Adequacy or Deficiency of Description

- SUJET: G00 Utilité
 - C00 Divulgation Caractère Adéquat ou Inadéquat de la Description

Application No. : 2,905,263 Demande nº 2 905 263

IN THE CANADIAN PATENT OFFICE

DECISION OF THE COMMISSIONER OF PATENTS

Patent application number 2,905,263, having been rejected under subsection 30(3) of the *Patent Rules* (SOR/96-423) as they read immediately before October 30, 2019 has consequently been reviewed in accordance with paragraph 199(3)(c) of the *Patent Rules* (SOR/2019-251). The recommendation of the Patent Appeal Board and the decision of the Commissioner are to refuse the application.

Applicant:

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INTRODUCTION

[1] This recommendation concerns the review of rejected Canadian patent application number 2,905,263 ("the instant application"), which is entitled "WATER GRAVITY LOOP POWER PLANT (WGLPP)" and is owned by Oscar Edgardo Moncada Rodriguez ("the Applicant"). A review of the rejected application has been conducted by the Patent Appeal Board ("the Board") pursuant to paragraph 199(3)(c) of the *Patent Rules* (SOR/2019-251) ("*Patent Rules*"). As explained in more detail below, the Board's recommendation is that the Commissioner of Patents refuse the application.

BACKGROUND

The Application

- [2] The instant application was filed under the provisions of the Patent Cooperation Treaty and has an effective filing date in Canada of March 3, 2014. It was laid open to public inspection on October 9, 2014.
- [3] The instant application relates to a power plant system that uses an elevated tank of liquid and the available potential energy of that liquid as a power source for an axial flow propeller connected to a generator that produces electricity. The liquid flowing from the elevated tank, according to the claimed subject-matter, passes through a U-shaped pipe, first downward towards the axial flow propeller where energy is extracted, then upward back into the elevated tank, without any additional energy being added, such as by means of a pump. The system is illustrated in Figure 1 of the instant application, reproduced below.



Prosecution History

- [4] On September 30, 2019, a Final Action ("FA") was written pursuant to subsection 30(4) of the *Patent Rules* (SOR/96-423) as they read immediately before October 30, 2019 ("former Rules"). The FA stated that the instant application is defective on the ground that all of the claims 1-3 on file at the time of the FA ("claims on file") lacked utility and are therefore non-compliant with section 2 of the *Patent Act*. The FA also noted a minor page numbering defect under subsection 73(1) of the former Rules (now subsection 50(1) of the *Patent Rules*).
- [5] In a February 14, 2020 response to the FA ("R-FA"), the Applicant provided a proposed amendment to the claims page to address the page numbering issue. No amendments were proposed to the language of the claims themselves. Arguments

were submitted in favor of the utility of the claims.

- [6] As the Examiner considered the application not to comply with the Patent Act and Patent Rules, pursuant to subsection 199(3) of the Patent Rules, the application was forwarded to the Board for review on August 4, 2020 along with an explanation outlined in a Summary of Reasons ("SOR"). The SOR indicated that the claims on file remained defective for lack of utility and the page numbering issue. However, the SOR indicated that the page numbering issue would be overcome by the proposed amendment to the claims page submitted with the R-FA.
- [7] In a letter dated August 21, 2020, the Board forwarded to the Applicant a copy of the SOR and requested that the Applicant confirm their continued interest in having the application reviewed.
- [8] In a response dated September 10, 2020, the Applicant indicated their desire for the Board to proceed with a review of the application. The Applicant also included further submissions in favor of the patentability of the claims on file.
- [9] The undersigned panel ("the Panel") of the Board was assigned to review the instant application and to make a recommendation to the Commissioner of Patents as to its disposition.
- [10] In a preliminary review letter ("PR letter") dated November 2, 2022, the Panel set out its preliminary analysis of the lack of utility and page numbering issues. The Panel was of the preliminary view that claims 1-3 on file lacked utility and that the specification was defective due to the page numbering issue. However, the Panel indicated that the proposed amendment to the claims page submitted with the R-FA would overcome the page numbering issue.
- [11] The PR letter provided the Applicant with an opportunity to make oral and/or written submissions.
- [12] On December 12, 2022, the Applicant provided written submissions ("R-PR") in response to the preliminary opinion set out in the PR letter.
- [13] An oral hearing was held via MS Teams on December 14, 2022.

[14] The Panel has reviewed the record for the instant application, including the oral and written submissions in response to the PR letter and provide our final analysis below.

ISSUES

- [15] The issues to be addressed by the present review are whether:
 - the claims on file lack utility; and
 - the specification is defective due to the numbering of the page containing the claims.
- [16] After considering the claims on file, we review the proposed amendment from the R-FA to determine if it would be considered a necessary amendment under subsection 86(11) of the *Patent Rules*.

LEGAL PRINCIPLES AND OFFICE PRACTICE

Purposive Construction

- [17] In accordance with Free World Trust v Électro Santé Inc, 2000 SCC 66 and Whirlpool Corp v Camco Inc, 2000 SCC 67, purposive construction is performed from the point of view of the person skilled in the art in light of the relevant common general knowledge ("CGK"), considering the whole of the disclosure including the specification and drawings. In addition to interpreting the meaning of the terms of a claim, purposive construction distinguishes the essential elements of the claim from the non-essential elements. Whether or not an element is essential depends on the intent expressed in or inferred from the claim, and on whether it would have been obvious to the skilled person that a variant has a material effect upon the way the invention works.
- [18] All elements set out in a claim are presumed essential unless it is established otherwise or such presumption is contrary to the claim language.

Utility

[19] Utility is required by section 2 of the Patent Act.

invention means any new and useful art, process, machine, manufacture or composition of matter, or any new and useful improvement in any art, process, machine, manufacture or composition of matter.

- [20] In AstraZeneca Canada Inc v Apotex Inc, 2017 SCC 36 at para 53, the Supreme Court of Canada stated that the "[u]tility will differ based on the subject-matter of the invention as identified by claims construction" and outlined the approach that should be undertaken to determine whether a patent discloses an invention with sufficient utility under section 2 of the Patent Act:
 - [54] To determine whether a patent discloses an invention with sufficient utility under s. 2, courts should undertake the following analysis. First, courts must identify the subject-matter of the invention as claimed in the patent. Second, courts must ask whether that subject-matter is useful—is it capable of a practical purpose (i.e. an actual result)?
 - [55] The Act does not prescribe the degree or quantum of usefulness required, or that every potential use be realized—a scintilla of utility will do. A single use related to the nature of the subject-matter is sufficient, and the utility must be established by either demonstration or sound prediction as of the filing date (AZT, at para 56).
- [21] Therefore, utility must be established either by demonstration or sound prediction as of the Canadian filing date. Utility cannot be supported by evidence and knowledge that only became available after this date (see also Apotex Inc v Wellcome Foundation Ltd, 2002 SCC 77 at para 56 [AZT], cited in the passage above).
- [22] Where the utility of an invention is to be established by demonstration, the demonstration must have occurred as of the filing date but need not have been included in the description (see *Eli Lilly Canada Inc v Apotex Inc*, 2015 FC 1016 at paras 138–42). Information establishing the demonstrated utility as of the filing date may be provided after the filing date by the Applicant.
- [23] The doctrine of sound prediction allows the establishment of asserted utility even where that utility had not been fully verified as of the filing date. However, a patent application must provide a "solid teaching" of the claimed invention as opposed to "mere speculation" (*AZT* at para 69).
- [24] The soundness of a prediction is a question of fact (*AZT* at para 71). Analysis of that soundness should consider three elements (*AZT* at para 70):

- there must be a factual basis for the prediction;
- the inventor must have, at the date of the patent, an articulable and sound line of reasoning from which the desired result can be inferred from the factual basis; and
- there must be proper disclosure of the factual basis and line of reasoning.
- [25] These elements are assessed from the perspective of the skilled person to whom the patent is directed, taking into account his or her CGK, Further, with the exception of the CGK, the factual basis and line of reasoning must be included in the patent application (See *Bell Helicopter Textron Canada Ltée v Eurocopter* SAS, 2013 FCA 219 at paras 152–53).
- [26] Although a prediction does not need to amount to a certainty to be sound, there must be a prima facie reasonable inference of utility (*Gilead Sciences Inc v Idenix Pharmaceuticals Inc*, 2015 FC 1156 at para 251; *Mylan Pharmaceuticals ULC v Eli Lilly Canada Inc*, 2016 FCA 119 at para 55).

Page numbering of the specification

[27] Subsection 50(1) of the *Patent Rules* states that the page numbering of the claims, being part of the specification, must be consecutive with those of the description portion:

The pages of the specification must be numbered consecutively.

ANALYSIS

Purposive Construction

[28] As stated in the PR letter at page 5, before any assessment of claim patentability, including in relation to utility, it is first necessary to perform a construction of the claims to resolve any issues of claim scope or meaning and to identify the essential elements. This assessment includes an identification of the person skilled in the art and the relevant CGK. Though there were no claim construction issues in this case, for completeness we set out below the required assessment steps.

The person skilled in the art

[29] In the PR letter at page 5, we set out a preliminary view as to the identification of the person skilled in the art:

The FA did not provide an identification of the person skilled in the art. In our preliminary view, the person skilled in the art is suitably represented as a person or team skilled in power generation, particularly hydroelectric power generation, with experience in the design and implementation of such systems. The person or team would have a background in electrical and mechanical engineering.

[30] The Applicant made no submissions in respect of the above in the R-PR. We proceed on the basis that the skilled person is as identified in the PR letter.

The relevant common general knowledge

[31] In the PR letter at page 5, we also set out our preliminary view as to the relevant CGK that would have been possessed by the person skilled in the art:

The FA also did not identify the relevant CGK. In our preliminary view the following points would have formed part of the relevant CGK of the person skilled in the art:

- knowledge of conventional power generation systems, particular those associated with hydroelectric power;
- knowledge of the principles of fluid mechanics, including the first law of thermodynamics (conservation of energy); and
- knowledge that conventionally accepted energy conversion efficiency is never greater than unity (i.e., is less than 100% efficient) and that an overall system efficiency is the product of the efficiencies of each energy conversion stage, with losses expected at each stage due to heat, friction, resistance, etc.
- [32] The Applicant made no submissions in the R-PR in relation to the identified relevant CGK. We therefore proceed based on the points set out in the PR letter.

The claims on file

[33] The instant application contains three claims, including independent claim 1. They are reproduced below:

1. A Water Gravity Loop Power Plant (WGLPP) to generate clean, continuous, resilient, portable, and renewable electricity comprising:

an elevated covered cone shaped bottom tank of a first volume configured to contain a liquid, the elevated covered cone shaped bottom tank comprising a bottom outlet and a side inlet, the elevated covered cone shaped bottom tank configured to provide a hydraulic head pressure of said liquid based on the height and shape of the elevated covered cone shaped bottom tank, the elevated covered cone shaped bottom tank controlled by its comprised monitoring and control system and protected by its insulation;

a U shaped pipe comprising a first end and a second end, the first end coupled to the bottom outlet of the elevated covered cone shaped bottom tank and the second end coupled to side inlet of elevated covered cone shaped bottom tank;

a pressurized liquid flow loop coupled from the bottom outlet of elevated covered coned shape bottom tank to the side inlet of elevated covered coned shape tank;

a metal or its steel equivalent structure supporting and integrating the Water Gravity Loop Power Plant;

at least two strut-bearing mounting assemblies and systems comprising struts and bearings coupled to points on the U shaped pipe and coupled to the high performance axial flow propeller;

a high performance axial flow propeller mounted within the U shaped pipe, the high performance axial flow propeller configured to be driven by fluid flow from the bottom outlet of the elevated covered cone shaped bottom tank;

a shaft coupled to the high performance axial flow propeller and further coupled to an electricity generator, the generator comprising a nacelle and its supply and interface system;

a voltage regulator coupled to the electricity generator;

a one direction control valve and sensor coupled to the U shape pipe that are comprised in its monitoring and control system and configured to control the flow of liquid through the U shape pipe; and insulation protecting nacelle and U shaped pipe.

2. The Water Gravity Loop Power Plant (WGLPP) of Claim 1, further comprising:

a vehicle propulsion system comprising an electric motor, power supply coupled to the generator, and further coupled to the voltage regulator;

a battery coupled to the generator and the battery configured to be charged by the generator, the battery configured to provide power to the vehicle propulsion system.

3. The Water Gravity Loop Power Plant (WGLPP) of Claim I, further comprising:

an electric motor configured to be powered by the generator, the electric motor configured to power an industrial machine.

[34] As we stated in the PR letter at page 6, there were no issues raised in the FA in relation to the clarity or scope of any of the claims on file and we proceeded on the basis that the meaning and scope of the claims would have been clear to the person skilled in the art. We do the same here.

The essential elements

[35] In the PR letter at page 7, we reviewed the issue regarding the inclusion of a pump element in the claims on file to pump the water back up to the elevated tank, being of the preliminary view that, contrary to the view expressed in the FA and SOR, the claims on file do not include a pumping element:

The FA did not present an analysis of the essential elements of the claims on file. However, the FA, R-FA, SOR and R-SOR indicate that there was disagreement about the presence of a pump in the claimed invention.

The FA at page 1 asserted that the invention included a pump to send fluid back up to the elevated tank once it has passed through the axial flow propeller connected to the generator. The SOR at pages 1-2 pointed to passages from the description that refer to a "pumping section" and an axial flow propeller (13) which pumps liquid back up to the elevated tank, which propeller is in addition to the axial flow propeller (8) that is driven by the liquid descending from the elevated tank and connected to the generator to generate electricity.

In the R-FA at page 1, the Applicant asserts that the description/claims do not include a pump. In the R-SOR the Applicant asserts that there is no pump in the claims and that none is described.

In our preliminary view, we agree with the Applicant that the claims do not include a pump. The claims do include an axial flow propeller (8) mounted in the U-shaped pipe that is driven by the liquid from the elevated tank. This axial flow propeller does not drive the fluid back up to the elevated tank.

While there is disclosed another axial flow impeller (13) that allegedly is part of a pumping section to move the liquid back up to the elevated tank after passing through axial flow propeller (8), this element is not set out in the claims on file.

In light of the above, it is our preliminary view that claims 1-3 on file do not specify the inclusion of a pump or pumping device to move the liquid back up to the elevated tank.

[36] We then set out our preliminary view that all the elements set out in the claims on file are essential:

Given that the person skilled in the art would understand that there is no use of language in any of the claims indicating that the elements in each claim are optional, alternatives or a preferred embodiment, in our preliminary view, all the elements present in the claims on file are considered to be essential and are taken into account in our analysis of utility below.

[37] At the oral hearing, the Applicant suggested that the axial flow propeller had two

functions, including a pumping function. We address this issue later under our assessment of utility. We proceed on the basis that the claims on file do not include a pumping element and that all of the elements recited in the claims are essential.

Utility

[38] The assessment of utility involves two overall steps. First, the subject-matter of the invention as claimed must be identified. Second, it must be determined whether that subject-matter is useful - is it capable of a practical purpose (i.e. an actual result).

What is the subject-matter of the invention as claimed?

[39] In the PR letter at page 8, we set out the subject-matter of the invention as claimed:

In light of the essential elements identified earlier, which in this case include all the elements of the claims, the subject-matter of claim 1 is a water gravity loop power plant that is to generate clean, continuous, resilient, portable and renewable energy comprising:

- an elevated covered cone shaped bottom tank of a first volume configured to contain a liquid, the elevated covered cone shaped bottom tank comprising a bottom outlet and a side inlet, the elevated covered cone shaped bottom tank configured to provide a hydraulic head pressure of said liquid based on the height and shape of the elevated covered cone shaped bottom tank, the elevated covered cone shaped bottom tank controlled by its comprised monitoring and control system and protected by its insulation;
- a U shaped pipe comprising a first end and a second end, the first end coupled to the bottom outlet of the elevated covered cone shaped bottom tank and the second end coupled to side inlet of elevated covered cone shaped bottom tank;
- a pressurized liquid flow loop coupled from the bottom outlet of elevated covered coned shape bottom tank to the side inlet of elevated covered coned shape tank;
- a metal or its steel equivalent structure supporting and integrating the Water Gravity Loop Power Plant;
- at least two strut-bearing mounting assemblies and systems comprising struts and bearings coupled to points on the U shaped pipe and coupled to the high performance axial flow propeller;

- a high performance axial flow propeller mounted within the U shaped pipe, the high performance axial flow propeller configured to be driven by fluid flow from the bottom outlet of the elevated covered cone shaped bottom tank;
- a shaft coupled to the high performance axial flow propeller and further coupled to an electricity generator, the generator comprising a nacelle and its supply and interface system;
- a voltage regulator coupled to the electricity generator;
- a one direction control valve and sensor coupled to the U shape pipe that are comprised in its monitoring and control system and configured to control the flow of liquid through the U shape pipe; and insulation protecting nacelle and U shaped pipe.

The subject-matter of the invention of claim 2 is the water gravity loop power plant of claim 1, further comprising:

- a vehicle propulsion system comprising an electric motor, power supply coupled to the generator, and further coupled to the voltage regulator;
- a battery coupled to the generator and the battery configured to be charged by the generator, the battery configured to provide power to the vehicle propulsion system.

The subject-matter of the invention of claim 3 is the water gravity loop power plant of claim 1, further comprising:

- an electric motor configured to be powered by the generator, the electric motor configured to power an industrial machine.
- [40] The Applicant made no submissions in respect of the subject-matter of the claims in the R-PR. We proceed on the basis of the subject-matter as set out in the PR letter.

Was the subject-matter useful – is it capable of a practical purpose?

[41] As we stated in the PR letter on page 9, the answer to this question involves a determination as to whether the utility of the claimed subject-matter was established by demonstration or sound prediction as of the filing date. We set out our determination below.

Was utility established by demonstration as of the filing date?

[42] In the PR letter at page 9, we set out our preliminary opinion that utility of the claimed subject-matter was not established by demonstration:

The instant application discusses the principles behind the water gravity loop power plant in association with Figures 1-6. At page 1 some fluid mechanics principles involved are discussed, while at pages 2-3 the basic components of the sections of the power plant are set out. Pages 4-5 provide more detail on the components.

Pages 5-6 present guidelines on how to design such a plant, including guidelines to generally determine parameters and components such as hydraulic head, liquid tank volume, suitable propeller (axial flow propeller), U-shaped pipe size, location for elements, etc. Page 7 sets out some general instructions on the operation of such a plant.

There is nothing in the specification or drawings that would indicate that the Applicant has actually built such a plant or that even a detailed design has been prepared. There is no data disclosed that shows the results from any testing performed or any indication that any of the premises behind the claimed subject-matter has been tested in any way. The invention is based on the schematic illustrations of Figures 1-6 and a general discussion of the components and their functions, as well as some general design guidelines.

In light of the above, it is our preliminary view that utility of the subject-matter of the claims was not established by demonstration at the filing date.

- [43] In the R-PR, the Applicant did not dispute the above preliminary view or provide any evidence that the utility of the claimed subject-matter had been demonstrated as of the filing date. At the oral hearing the Applicant did make a claim that such a power plant had been constructed and demonstrated, but provided no evidence of it.
- [44] In light of our analysis in the PR letter and in consideration of the Applicant's submissions in the R-PR and at the oral hearing, we conclude that the utility of the subject-matter of the claims was not established by demonstration.

Was utility established by sound prediction as of the filing date?

[45] An assessment of sound prediction of utility requires assessing the three components set out in AZT, assessed below.

The factual basis

[46] At pages 9-10 of the PR letter, we set out our preliminary view as to the factual basis presented in the instant application:

The instant application describes some basic fluid mechanics principles, the general arrangement of the water gravity loop power plant, including commonly known

components such as the elevated water tank, support structure for the tank and other components, piping, sensors, control units, drains, valves, electric generator, shaft assemblies, axial flow propellers (including one driving the electric generator), as well as associated elements such as a battery and electric motor to be powered by the generator.

However, while such conventional components have been set out, as discussed above in relation to utility by demonstration, nothing in the specification or drawings sets out why the water gravity loop power plant would be able to generate continuous energy without some input of energy to raise the water back up to the elevated tank after energy having been extracted by the axial flow propeller/generator section.

- [47] In the R-PR at pages 1-2 and at the oral hearing, the Applicant contended that the Panel argued that the claimed invention lacked a source of power to supply the net power that is allegedly generated by the claimed power plant.
- [48] As set out above, our preliminary view was not that the system lacked a source of power, but that as claimed, it allegedly continuously generates energy from the hydraulic head energy that is available from the elevated water tank, while also raising the water back up into the elevated water tank.
- [49] Most of the Applicant's submissions in the R-PR seem to focus on the basis for an articulable and sound line of reasoning that the claimed power plant will be able to produce net electricity while extracting energy via the axial flow propeller and raising the water back up to the elevated tank, using just the energy available from the hydraulic head of the water in the elevated tank. As such, we will address the bulk of the Applicant's submissions in the next section.

Is there an articulable and sound line of reasoning from which the desired result can be inferred from the factual basis?

[50] In the PR letter at pages 10-12, we set out our preliminary view that we could not find any articulable and sound line of reasoning that would lead the person skilled in the art to believe that the claimed invention would function:

Other than a discussion of the general arrangement of the water gravity loop power plant and its components, the instant application does not set out how this device will somehow produce an excess of power after extraction of energy from the water at the axial flow propeller that drives the electric generator.

At pages 5-6 of the instant application, some general guidelines are set out to design and build the device, but the guidance is limited to generally determining

proper components and sizing to achieve desired performance parameters. No details or principles are set out that would lead a person skilled in the art to believe that excess energy is somehow generated by this arrangement.

The excess energy issue was the main point of contention between the Examiner and the Applicant in the FA and R-FA. In the FA at page 2, the basic problem with the claimed invention was set out:

Such a machine would be in contradiction with the first law of thermodynamics (the law of conservation of energy) and therefore cannot operate as claimed. This statement is sufficient to show that the machine cannot operate. However, for the benefit of the applicant, a more detailed analysis is provided.

The amount of power Pturb that can be extracted from a column of water of height h by a turbine is:

Pturb=npQgh

Where:

P is power in watts

n is the efficiency of the turbine

p is the density of water in kilograms per cubic metre

Q is the flow in cubic metres per second

g is the acceleration due to gravity

h is the height difference between inlet and outlet in metres

The amount of power Ppump needed to pump water to a height h is:

Where:

P is power in watts

n is the efficiency of the turbine

p is the density of water in kilograms per cubic metre

Q is the flow in cubic metres per second

g is the acceleration due to gravity

Therefore, considering at first that the pump and the turbine have an efficiency of 100% (n=1), it can be seen that all of the power extracted by the turbine is needed by the pump to send the water back. But given that the turbine and the pump have efficiency below 100% and the other losses (turbulence, friction, efficiency of the electric generator) in the machine, constantly re-circulating the water in the apparatus described in the claims requires a net input of power. Therefore, the claimed apparatus is not capable of producing net power, and actually needs an input of power to operate.

The FA at page 4 also discusses the basic premise of the utility issue:

It is an undisputed and scientifically proven fact that sending water (or any other mass) back to its original vertical position on a gravity field will take at least as much energy as the amount of energy that can be extracted from the falling of that water (or any other mass), regardless of the means used to extract or lift the water (mass). In other words, if a mass loses an amount of potential energy X by falling from point A to point B, it will have to give to the mass at least as much energy to bring it back from B to A.

The above summarizes the basic principle that whatever energy is lost in the stored elevated water being dropped over a vertical distance must be added back to it in order to raise that water back to its original height. That energy would normally be added by means of a pump that would raise the water back to its original height. With energy being absorbed by means of the axial flow propeller that is attached to the electric generator, even assuming no energy losses in the rest of the system, even more energy must be added by means of some type of pumping means to raise the water back up.

As discussed above under Purposive Construction, contrary to the view expressed in the FA, it is our preliminary view that the claims on file are not limited to embodiments where a pump or pumping device is included.

However, this preliminary view does not aid the Applicant in addressing the utility issue. With no pump, there is nothing in the Applicant's water gravity loop power plant system to compensate for the energy absorbed by the axial flow propeller and lost by the water descending from the elevated tank.

In the R-FA at page 2 and in the instant application at page 1, the Applicant contends that there are three sources of power in the system, namely, tank hydraulic head due to tank elevation, cone hydraulic head due to the cone shape of the bottom of the tank and the inverted syphon or U-shaped pipe that links the elevated tank outlet with its inlet.

While we preliminarily agree that the hydraulic head or tank elevation represents a source of power, we see no basis for the claim that the shape of the tank bottom is a further source. The available power depends on the hydraulic head, which itself depends on the elevation of the stored liquid. The shape of the container may affect the losses that occur as the liquid descends, but would not affect the available power.

Lastly, in our preliminary view, the inverted syphon or U-shaped pipe does not represent a source of power. In the R-FA at pages 3-4, the Applicant sought to support their argument by reference to "Stevin's Law", where the level of liquid in interconnected vessels exposed to the same atmospheric pressure will equalize at the same level. However, this principle applies to static systems, which is not the case with the system of the instant application, which according to claim is intended to produce "continuous" electricity.

At page 5 of the R-FA, the Applicant set out some sample calculations that allegedly are used to determine specifications for some of the power plant components.

However, these basic calculations still do not explain how the power plant can produce a net amount of energy with no external energy input, and constant energy extraction through the axial flow propeller/electric generator combination.

We further note the Applicant's assertion at page 3 of the R-FA that the axial flow propeller can at the same time both absorb energy from the water flowing down from the tank to drive the electric generator and pump the water back up to the elevated tank. In our preliminary view, the person skilled in the art would not consider it possible for the same axial flow propeller to be driven by the flowing water and pump the same water at the same time.

At page 4 of the R-FA, the Applicant referred to the external input of water to the elevated tank as not being a continuous supply of water, but rather small amounts to make up for any losses that may occur during operation of the power plant. We preliminarily accept that this is the function of such a water intake, consistent with the statement at the top of page 2 of the instant application. However, such a feature serves to maintain the water level in the elevated tank and does not explain the net output of energy.

The Applicant's submissions in the R-SOR focussed on the debate surrounding the inclusion of a pump in the claims on file, which has been addressed above under Purposive Construction.

- [51] Regarding the contentions in the R-PR and at the oral hearing where the Panel argued that the claimed invention lacked a "source of net power", or "source of power" (some of which have been addressed earlier within the factual basis discussion), as set out above in the passage taken from the PR letter, the Panel agreed that the elevated tank and the resulting hydraulic head represented a source of power for the power plant. However, we did not agree that the coned shape of the bottom of the elevated tank represented an additional source of power, since the hydraulic head depends on the height of the stored water volume, not on the shape of the tank.
- [52] In the R-PR at page 2, the Applicant questioned the use of the *Pturb* formula used in the FA and set out above, as not being applicable to the claimed power plant system. We note that although the formula above refers to a turbine as the energy extraction device, the theoretical potential energy that can be extracted from a column of water is independent of the extraction device, with the actual amount of energy that can practically be extracted depending on the energy conversion efficiency of the particular extraction device, be it a turbine or an axial flow propeller. Therefore the relationship would be more generally applicable than asserted by the Applicant.

- [53] In the R-PR at pages 2-3, the Applicant reproduced the calculations that were included with the R-FA and are referred to above. These calculations use a water volumetric flowrate through the power plant of 7877.4 gallons/minute. However, the source of this water flow, the elevated tank, is specified to have a capacity of 300 gallons, 3.8% of the flow rate per minute. As the Applicant stated at the oral hearing, the whole volume of water stored in the elevated tank needs to circulate through the entire plant approximately every 2 seconds. The Applicant was unable to explain at the hearing how water was able to circulate so rapidly and continually while energy was being extracted from it by means of the axial flow propeller/ generator combination.
- [54] Following from the calculations referred to above, in the R-PR at page 3, the Applicant asserted that a power plant with those specifications would achieve 135% efficiency, the implication being that more energy is produced than is input to the system. This would be contrary to the commonly known principle that an energy conversion system can never achieve more than 100% efficiency, and in practical terms cannot achieve 100% due to the inevitable losses in any given energy conversion process.
- [55] In the R-PR at page 3 and at the oral hearing, the Applicant pointed to the use of the inverted siphon or U-shaped pipe in the power plant as a means to raise the water that descends from the elevated tank and passes through the axial flow propeller, back up to the elevated tank level. In the R-PR the Applicant pointed to the use of such a configuration in Roman aqueducts and in the City of San Antonio, Texas, River Walk inverted siphon, pointing to websites illustrating both these applications. The Panel reviewed these websites, noting to the Applicant at the oral hearing that in neither of such applications is the water able to be raised back up to the original level at which it entered the inverted siphon. This is to be expected since energy losses due to friction accumulated during travel of water through such systems means that the water does not have enough energy to flow back up to its original elevation. This is even more so the case in the Applicant's power plant, where additional energy is absorbed by the axial flow propeller/generator combination. At the oral hearing the Applicant alluded to other applications where the fluid passes through such an inverted siphon and moves back up to the original elevation, but provided no particular references.

- [56] At the oral hearing, the Applicant also reasserted that the axial flow propeller driven by the flowing water and connected to the generator so as to generate electricity, both absorbs energy to drive the generator, and imparts energy to the flowing water to raise it back up to the elevated tank.
- [57] As we stated in the PR letter, the skilled person would not consider it possible for such a device to be both driven by the flowing water and to impart a pumping action at the same time. The water must exert a force on the axial flow propeller to cause it to rotate, with a resulting loss in kinetic energy of the flowing water. To effect a pumping action would require an external energy input of some kind in the form of a drive system.

Disclosure of the factual basis and line of reasoning

[58] At pages 12-13 of the PR letter, we set out the disclosure basis for the assessment of a sound prediction of utility:

As discussed above in relation to the factual basis, the instant application discloses some basic fluid mechanics principles, the basic components, their function and arrangement, as well as some basic guidelines on selection of suitable components and their anticipated operation.

In regard to any line of reasoning, we note that none of the attempted explanations set out in the R-FA are part of the specification or drawings, although some of the basic principles used, such as hydraulic head, would have been part of the relevant CGK. The three sources of power, discussed above, are identified in the specification at page 1.

[59] In the R-PR at page 1, the Applicant pointed to a passage from his "initial filing at CIPO" regarding three elements that formed part of his alleged invention and were established by that passage, namely, hydraulic head, U-shaped pipe (inverted siphon) and axial flow propeller":

The WGLPP is concerned with the driving of an electricity generator by the application of **axial flow propellers** to <u>convert</u> the liquid **hydraulic head** pressure <u>into mechanical energy</u> (torque) to generate electricity and to pump the liquid back to an elevated cone shaped bottom liquid tank by the use of **U shaped metal pipe**, which operates <u>under the same Fluid Mechanics principles</u> used by the **Roman Aqueducts Inverted Siphon and by the City of San Antonio in their River Walk design.** [emphasis in original]

[60] We note that this text is not part of the current version of the Applicant's disclosure

dated December 3, 2018, but was part of a previous version dated September 11, 2015.

[61] Nevertheless, we acknowledge that the elements included in this passage are described in the instant application. However, we do not agree that the skilled person would see the U-shaped pipe (inverted siphon) as a means to pump the liquid back up to the elevated tank, for the reasons set out above. Likewise, in our view, the skilled person would not see a basis for the earlier assertion that the axial flow propeller can both absorb energy from the flowing liquid to drive the generator and at the same time exert a pumping action on that liquid.

Conclusion on predicted utility

- [62] In light of the above, we are of the view that the factual basis and line of reasoning are insufficient for the person skilled in the art to have concluded that there is a prima facie reasonable inference of utility. In our view, the subject-matter of the invention as claimed cannot function to generate a continuous supply of electricity as set out in claim 1, for the reasons set out above.
- [63] The additional subject-matter of claims 2 and 3, which specify that a battery is charged by the generator and a motor is powered by the generator, respectively, do not alter our conclusion, as these elements simply represent uses of the produced electricity, the alleged production of which is the source of the lack of utility defect.

Page numbering of the specification

[64] In the PR letter at page 13, we set out the page numbering defect and our agreement that such a defect is present:

The FA at [page] 5 stated that because the claims started on page 5 and the rest of the specification ended on page 7 that the instant application was not compliant with what is now subsection 50(1) of the *Patent Rules*.

Having reviewed the pages of the specification, we agree with the FA that the pages are not numbered consecutively.

[65] The Applicant did not dispute the above and proposed an amendment with the R-FA in order to correct the defect, which we address below.

Proposed Amendments

[66] As noted in the PR letter at page 13:

With the R-FA, the Applicant proposed an amendment to the page containing the claims to renumber it to be consecutive with the rest of the specification. No other amendments were proposed.

We agree with the statement in the SOR that this proposed amendment would rectify the defect under subsection 50(1) of the *Patent Rules*. However, given our preliminary view in relation to the issue of utility, which would equally apply to the proposed claims, the utility defect would not be overcome.

Therefore the proposed amendments are not considered "necessary" for compliance with the Patent Act and Patent Rules as required by subsection 86(11) of the *Patent Rules*.

[67] We conclude that the amendment proposed in the R-FA would correct the page numbering defect. However, since the claims on the proposed renumbered claim page would still be defective due to a lack of utility and not be allowable, we cannot recommend that the Commissioner notify the Applicant under subsection 86(11) of the *Patent Rules* that the proposed amendment must be made.

CONCLUSIONS

[68] We conclude that the claims on file lack utility and are therefore non-compliant with section 2 of the *Patent Act*. Further, we conclude that the specification on file is non-compliant with subsection 50(1) of the *Patent Rules*.

RECOMMENDATION OF THE BOARD

- [69] In view of the above, the undersigned recommend that the application be refused on the grounds that:
 - Claims 1-3 on file lack utility and are therefore non-compliant with section 2 of the *Patent Act*; and
 - The specification on file is non-compliant with subsection 50(1) of the *Patent Rules*.

Stephen MacNeil Member

Lewis Robart Member Timothy Scheuermann Member

DECISION OF THE COMMISSIONER

- [70] I concur with the conclusions and recommendation of the Board that the application be refused on the grounds that:
 - Claims 1-3 on file lack utility and are therefore non-compliant with section 2 of the *Patent Act*; and
 - The specification on file is non-compliant with subsection 50(1) of the *Patent Rules*.
- [71] Therefore, in accordance with section 40 of the *Patent Act*, I refuse to grant a patent on this application. Under section 41 of the *Patent Act*, the Applicant has six months within which to appeal my decision to the Federal Court of Canada.

Konstantinos Georgaras Commissioner of Patents

Dated at Gatineau, Quebec

this 30th day of January, 2023