Citation: Hydril Company (Re), 2023 CACP 19 Commissioner's Decision # 1652 Décision du Commissaire nº 1652 Date: 2023-07-17

TOPIC: 000 Obviousness

SUJET: O00 Évidence

Application No.: 2,777,477 Demande nº 2 777 477

IN THE CANADIAN PATENT OFFICE

DECISION OF THE COMMISSIONER OF PATENTS

Patent application number 2,777,477, having been rejected under subsection 199(1) of the *Patent Rules* (SOR/2019-251) (*"Patent Rules"*) has consequently been reviewed in accordance with paragraph 86(7)(c) of the *Patent Rules*. The recommendation of the Patent Appeal Board and the decision of the Commissioner are to refuse the application.

Agent for the Applicant:

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INTRODUCTION

[1] This recommendation concerns the review of rejected Canadian patent application number 2,777,477 ("the instant application"), which is entitled "WEDGE THREADS WITH A SOLID LUBRICANT COATING" and is owned by HYDRIL COMPANY ("the Applicant"). A review of the rejected application has been conducted by the Patent Appeal Board ("the Board") pursuant to paragraph 86(7)(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 on the basis that the claims on file would have been obvious.

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 October 12, 2010. It was laid open to public inspection on April 21, 2011.
- [3] The instant application relates to a threaded pipe connection used commonly in the oil industry, namely wedge thread pipe connections where an inner "pin" member has external wedge threads that are mated to the internal wedge threads of an outer "box" member. Wedge threads differ from other threads in that the thread width varies with distance along the pipes. A flowing joint compound known as "pipe dope" is normally used to improve the thread seal and to provide lubrication during "make-up" (i.e., forming of the pipe connection). However, the pipe dope can lead to issues such as excess pipe dope not allowing for a fully tightened connection or even thread damage due to increased stress at the connection. The application seeks to address the problems of pipe dope use by instead permanently bonding a solid lubricant on one or both of the pin and box wedge threads. The solid lubricant may comprise one or two layers, one of which may be a corrosion-inhibiting coating.

Prosecution History

- [4] On February 23, 2021, a Final Action ("FA") was written pursuant to subsection 86(5) of the *Patent Rules*. The FA stated that the instant application is defective on the ground that all of the claims 1-33 on file at the time of the FA ("claims on file") would have been obvious to a person skilled in the art at the relevant date.
- [5] In a June 22, 2022, response to the FA ("R-FA"), the Applicant provided a proposed set of amended claims 1-30 ("proposed claims") and arguments in favor of patentability that focussed on the proposed claims.
- [6] As the Examiner considered the application not to comply with the *Patent Act*, pursuant to subsection 86(7) of the *Patent Rules*, the application was forwarded to the Board for review on October 25, 2022, along with an explanation outlined in a Summary of Reasons ("SOR"). The SOR indicated that the claims on file remained defective for obviousness and that the proposed claims would not overcome this defect.
- [7] In a letter dated October 26, 2022, 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 January 19, 2023, the Applicant indicated their desire for the Board to proceed with a review of the application.
- [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") sent April 12, 2023, the Panel set out its preliminary analysis of the obviousness issue with respect to the claims on file and the proposed claims. The Panel was of the preliminary view that the claims on file would have been obvious to the person skilled in the art and that the proposed claims would not overcome this defect.
- [11] The PR letter also provided the Applicant with an opportunity to make oral and/or written submissions.

- [12] In a telephone conversation on April 26, 2023, the Applicant declined the opportunity for an oral hearing and requested that the deadline for making written submissions set out in the PR letter be extended.
- [13] A letter confirming the extension of time granted for making written submissions and confirming the declining of an oral hearing was sent to the Applicant on May 2, 2023.
- [14] On May 30, 2023, the Applicant provided written submissions ("R-PR") in response to the preliminary opinion set out in the PR letter. No further amendments to the application were proposed.
- [15] The Panel has completed a review of the instant application and provides its final analysis below.

ISSUE

- [16] The issue to be addressed by the present review is whether the claims on file would have been obvious to the person skilled in the art.
- [17] After considering the claims on file, we review the proposed claims from the R-FA to determine if they would be considered a necessary amendment under subsection 86(11) of the *Patent Rules*.

PURPOSIVE CONSTRUCTION

Legal principles

[18] 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.

[19] All elements set out in a claim are presumed essential unless it is established otherwise, or such presumption is contrary to the claim language.

Analysis

The person skilled in the art

[20] In the PR letter at page 4, we set out our preliminary view as to the identification of the person skilled in the art, modifying it somewhat from what had been proposed in the FA:

In the FA at page 2, the person skilled in the art was set out:

The person skilled in the art is a technical team of individuals knowledgeable in oil extraction pipes.

The Applicant did not offer any comments on the above in the R-FA.

Our preliminary view is that the above definition should be slightly modified. Considering the nature of the invention disclosed and claimed—namely, a coating for a type of pipe joint—and the information set out as Background Art in the application, we preliminarily define the skilled person as:

- a technical team of individuals knowledgeable in oil extraction pipe design, including pipe joint design and methods of reducing wear and erosion.
- [21] In the R-PR at page 5, the Applicant attempts to characterize the person skilled in the art based on the "objective technical problem" to be solved by the alleged invention. The Applicant states that "[t]he skilled person is generally skilled in the technical field of the objective technical problem" and that such a person is "skilled in the art of wedge thread connections…"
- [22] The identification of an "objective technical problem" is part of the assessment conducted by the European Patent Office in evaluating whether or not a claimed invention represents an inventive step (see <u>Guidelines for Examination in the</u> <u>European Patent Office</u>, March 2023 edition) and is part of an approach generally referred to as the "problem-solution approach." It is determined based on a comparison of the claimed invention and the closest prior art (see <u>5.2</u>.

Formulation of the objective technical problem (epo.org)). Canadian patent law and Patent Office practice involve no such assessment in the identification of the person skilled in the art or the relevant CGK. Likewise, there is no such assessment as part of the analysis of obviousness under the four-step approach set out in *Apotex Inc v Sanofi–Synthelabo Canada Inc*, 2008 SCC 61 [*Sanofi*], though the problem that the Applicant set out to solve and whether or not it was previously known may be relevant.

- [23] Despite the Applicant's attempt in the R-PR to link the objective technical problem to the identification of the person skilled in the art, even under the assessment of inventive step conducted by the European Patent Office, the person skilled in the art (and the CGK of such a person) is identified independently of the identification of any objective technical problem.
- [24] Recently, the basic characteristics of the person skilled in the art have been reiterated by the Federal Court in *Janssen Inc v Apotex Inc*, 2022 FC 996 at paragraphs 69-71:

69 The notional person of skill in the art or "skilled person" is a legal construct embodying a number of concepts that inform a proper approach to resolving issues of claim construction, infringement, and validity in a patent action.

70 The skilled person possesses a level of skill and knowledge necessary to appreciate the nature and description of the invention at a technical level: *Whirlpool* at para 53. This is the ordinary level skill of and knowledge of the particular art or science to which the patent relates: *Free World* at para 44. The skilled person embodies the "common general knowledge" (CGK) that is generally known and accepted in the field, and they are reasonably diligent in keeping up with advances: *Pfizer Canada Inc v Teva Canada Limited*, 2017 FC 777 at para 185.

71 Where a patent relates to multiple scientific or technical fields, the skilled person can comprise a team of people: *Amgen Inc v Pfizer Canada ULC*, 2020 FC 522 at para 172. However, the skilled person is not defined on a claim-by-claim basis: *Teva Canada Limited v Janssen Inc*, 2018 FC 754 at para 236, aff'd 2019 FCA 273, leave to appeal to SCC refused, 39007 (7 May 2020).

[25] As set out above, the person skilled in the art is skilled in the particular art or science to which the patent, or patent application, relates. In the R-FA at page 5, the Applicant limits the art to the "art of wedge thread connections." However, this was based on the alleged relationship between the objective technical problem and the person skilled in the art.

- [26] We acknowledge that in the instant application at paragraph [0001], the focus of the disclosure is indicated as being on wedge thread connections. The discussion of the Background Art focuses on wedge thread configurations and the well-known problems in using such connections, the purpose of the subjectmatter of the instant application being to address such problems.
- [27] However, as stated at paragraph [0002], "[o]ne type of threaded connection commonly used in oil country tubular goods is known as a wedge thread." [Emphasis added] Given that, as acknowledged by the Applicant in this passage, wedge thread connections are only one type of connection used in the oil extraction art, in our view, it would not be plausible that the person skilled in the art would be so specialized that they would only have skill and knowledge in one specific type of threaded connection. As various types of threaded connections would be part of such an art, a technician in such a field would be expected to encounter and have knowledge of several types of connections.
- [28] We also note that in the R-PR, the Applicant did not contest the relevant CGK as set out in the PR letter, which included more general knowledge of ground oil extraction and pipe threads in general. The limitation of the person skilled in the art to someone skilled only in wedge thread connections would be inconsistent with such knowledge.
- [29] In light of the above, we cannot accept the Applicant's view of the person skilled in the art set out in the R-PR. In our view, the identification of the person skilled in the art set out in the PR letter is more appropriate given the art to which the application relates. We proceed on that basis.

The relevant common general knowledge

[30] In the PR letter at pages 4 to 5, we set out the relevant CGK, which included points from the FA and additional points identified by the present Panel and taken from the Background Art section of the instant application:

In the FA at page 2, the relevant CGK was set out as including the following points:

- ground oil extraction.
- pipes threads, more specifically wedge threads.

- thread lubricant and thread dope.
- solid lubricants; and
- corrosion inhibition of oil extraction equipment.

To the above general points, we would add the following points taken from the Background Art section at pages 1 to 3 of the instant application and characterized as having been commonly known:

- the well-known use of wedge threads in the oil industry, which threads are characterized by in increase in width along their length in opposite directions on an outer pin member pipe section and an outer box member pipe section.
- that the rate of change of width along the length of a wedge thread is referred to as the "wedge ratio".
- that thread seal in a wedge thread is accomplished through contact pressure caused by interference between the flanks of the threads of the pin and box members during assembly of the connection (known as "make-up").
- that a flowing joint compound referred to as "pipe dope" is commonly applied to the wedge threads prior to make-up to improve thread seal and to act as a lubricant during make-up or during disassembly (known as "break-out").
- the well-known issues with the use of pipe dope in wedge threads, including excess pipe dope becoming trapped during make-up and giving false torque readings, leading to an improperly tightened joint and possible damage to the connection.
- attempts at alleviating the problems with the use of pipe dope such as pipe thread designs to alleviate the pressure buildup from excess pipe dope, restricting the amount of pipe dope used, controlling the speed of the joint make-up so as to allow excess pipe dope to be squeezed out before becoming trapped and applying the torque during make-up in more than one step so as to squeeze the pipe dope along the threads (known as "double bumping");
- the problems that can occur due to trapped pipe dope leading to an improper thread seal (known as "stand-off"), such as later bleeding off of the pressure and loosening of the joint. Further, under elevated temperature service applications, the trapped pipe dope may flow out from between the wedge threads and lead to seal leaks.
- that extra measures such as slower make-up speed and double bumping lead to longer assembly times and reduced productivity.

The Applicant did not offer any comments in the R-FA with respect to the relevant CGK. We proceed on the basis of the above.

[31] In the R-PR at pages 2 to 5, the Applicant presents information regarding commonly known characteristics of, and considerations in designing and fabricating, wedge threads and non-wedge threads.

- [32] In particular, the Applicant submits at page 3 of the R-PR that wedge threads are very sensitive to variations in the thread design, that "[v]ariations of the stab and load flanks from the nominal along the length of the thread may result in variations of the contact pressure that are amplified by the axial lock-up of the wedge thread between the load and stab flanks" and that "[t]o keep the contact pressure constant in order to maintain the energy in the connection after make-up, it is thus important in wedge thread to keep variations of the flanks from nominal as small as possible."
- [33] In respect of non-wedge thread connections, at page 3 to 4 of the R-PR, the Applicant contends that such connections do not have the same concerns as for wedge thread connections. For example, the Applicant states that among other characteristics, in non-wedge thread connections there is not the same thread interference at the load flanks and the stab flanks generated during a small angular displacement in the final stage of make-up. In non-wedge thread connections "after make-up there typically is a clearance at the stab flanks and at the pin crests and box roots." According to the Applicant, "less contact pressure and less torque are required compared to a wedge thread connection that relies on thread interference at the load flanks and the stab flanks."
- [34] As stated at page 4 of the R-PR:

Due to the clearance at the stab flanks in there is no "amplification" of the contact pressure that results from axial lock-up of the thread as with wedge thread. Consequently, non-wedge thread shouldered connections are generally far less sensitive to variations from nominal in the flanks than wedge thread connections.

[35] The Applicant proceeded to compare wedge thread connections and non-wedge thread connections, ultimately concluding that:

...designing of wedge thread connections involves considering different requirements and problems than designing non-wedge threads. In particular, the tolerance requirements for a wedge thread connection are high.

[36] At page 5 of the R-PR, the Applicant sets out concerns that the person skilled in the art would have had in making any changes to a wedge thread connection:

This skilled person would also be aware that any disturbance, that is permanently present on the threads might affect the accuracy of the flanks and thus introduce a

further potential cause of a premature reading of make-up. A permanently bonded coating is such a disturbance.

Therefore, the skilled person would be seriously concerned about applying a permanent coating to a wedge thread connection, in particular about the uniformity of the layer thickness and the way of applying the layer, which would introduce further variations and affect the connection. Moreover, the addition of a permanent layer would require redesigning the connection, especially to establish the flank-to-flank contact at the appropriate time.

- [37] Despite the fact that many of the details set out in the R-PR are not found in the relevant CGK of record, we have no reason to doubt that the characteristics of wedge thread and non-wedge thread connections detailed by the Applicant in the R-PR were well-known. Nor do we have reason to doubt that the person skilled in the art, which as set out above is not limited to the field of wedge thread connections, would have been aware of the concerns in making changes to wedge thread connections set out at page 5 of the R-PR and set out above.
- [38] However, we disagree with the Applicant as to the effect of such knowledge on whether or not the subject-matter of the claims on file would have been obvious, as discussed in the assessment of obviousness below.

The claims on file

- [39] The instant application contains independent claims 1, 13 and 21 directed to a tubular connection using wedge threads with a solid lubricant coating applied to at least one of the pin and box threads. Claim 1 additionally specifies that the coating has at least two layers and that one of them comprises a solid dry corrosion-inhibiting coating with particles of zinc. Claim 13 additionally specifies that the coating has at least two layers and that one of them is a mixture of two different lubricants, one of them being molybdenum disulfide.
- [40] Independent claims 14 and 17 are directed to a method of manufacturing a wedge thread connection where a solid lubricant coating is applied to at least one of the pin and box threads. Claim 14 additionally specifies that the solid lubricant coating comprises two material layers.
- [41] Claims 17 and 21 represent the broadest claims of each group and are reproduced below as examples of the claimed subject-matter:

17. A method of manufacturing a connection having wedge threads, the method comprising: machining internal wedge threads on a box member and external wedge threads on a pin member, wherein the internal and external wedge threads are configured to correspond; permanently bonding a solid lubricant coating of uniform composition over substantially all of one or both of the internal and external wedge threads; and after the solid lubricant coating has cured, making a sealed connection by mating the internal wedge threads with the external wedge threads, wherein the solid lubricant coating remains solid throughout said making the sealed connection.

21. A tubular connection comprising: a pin member having external wedge threads; and a box member having internal wedge threads, wherein one or both of the internal and external wedge threads has permanently bonded thereto a solid lubricant coating that has a uniform composition over substantially all of the one or both of the internal and external wedge threads, wherein the solid lubricant coating is cured, and wherein, while the solid lubricant remained solid, the internal wedge threads have been mated with the external wedge threads to make a sealed connection between the pin member and the box member.

[42] Figure 2 of the instant application, reproduced below, illustrates a wedge threaded pin member with the solid lubricant coating of the claims on file. For reference purposes, the general prior art arrangement of pin and box member is illustrated by Figure 1A, also reproduced below.





Meaning of claim terms

[43] In the PR letter at page 7, we indicated that despite there having been no issues raised in the FA in relation to the clarity or scope of the claims, two minor clarifications of the claim language became relevant during our preliminary review:

Firstly, "solid lubricant coating", as used in the claims may include a layer comprising a dry corrosion-inhibiting coating, which is not itself a lubricant. This is evident from claim 1 itself, which specifies a solid lubricant coating with at least one of the layers being a dry corrosion-inhibiting coating.

Secondly, "permanently bonded" is taken to have the meaning set out at page 5 of the instant application:

•adhesion of the solid lubricant coating to the wedge thread surfaces after the coating is properly cured, such that the solid lubricant coating 310 does not "flow" during makeup of the connection, but rather, remains as a rigid structure.

The relevance of these clarifications becomes clear in the later obviousness analysis at *Sanofi* step 3.

[44] The Applicant did not comment on the above. We apply the above interpretations in our analysis of obviousness below.

The essential elements

- [45] As stated in the PR letter at page 7, the FA did not present an analysis of the purposive construction of the claims on file. Given that the person skilled in the art would have understood that there was no use of language in any of the claims indicating that the elements in each claim were optional, alternatives or a preferred embodiment, it was our preliminary view that all the elements of the claims on file are to be considered essential and would be taken into account in our obviousness analysis.
- [46] The Applicant did not comment on the above position. We proceed on the basis that all elements of the claims are essential.

OBVIOUSNESS

Legal principles and office practice

[47] Section 28.3 of the *Patent Act* requires claimed subject matter to not be obvious:

The subject-matter defined by a claim in an application for a patent in Canada must be subject-matter that would not have been obvious on the claim date to a person skilled in the art or science to which it pertains, having regard to

(a) information disclosed before the one-year period immediately preceding the filing date or, if the claim date is before that period, before the claim date by the applicant, or by a person who obtained knowledge, directly or indirectly, from the applicant in such a manner that the information became available to the public in Canada or elsewhere; and

(b) information disclosed before the claim date by a person not mentioned in paragraph (a) in such a manner that the information became available to the public in Canada or elsewhere.

- [48] In *Sanofi*, the Supreme Court of Canada stated that it is useful in an obviousness inquiry to follow the following four-step approach:
 - (1) (a) Identify the notional "person skilled in the art".
 - (b) Identify the relevant common general knowledge of that person.
 - (2) Identify the inventive concept of the claim in question or if that cannot readily be done, construe it.
 - (3) Identify what, if any, differences exist between the matter cited as forming part of the "state of the art" and the inventive concept of the claim or the claim as construed.
 - (4) Viewed without any knowledge of the alleged invention as claimed, do those differences constitute steps which would have been obvious to the person skilled in the art, or do they require any degree of invention?
- [49] We have applied the *Sanofi* four-step approach in the PR letter and in our analysis below.

Analysis

[50] In the PR letter at page 8, we indicated that after reviewing the prior art documents used in the FA, we considered one of them, D4, to be the most relevant and that the obviousness defect presented in the PR letter was based on D4 and the relevant CGK:

The FA at pages 2 to 4 set out an analysis indicating that all of the claims on file would have been obvious in view of prior art document D6 in view of prior art document D4, identified below:

D4:US20040113423A1Dell'Erba et al.Published: June 17, 2004D6:US20070170722A1Reynolds, JR. et al.Published: July 26, 2007

The FA also referred to the following prior art document that was referred to in D4:

D8:US4414247A Hübecker et al. Published: November 8, 1983

After a review of all of the prior art documents, it is the Panel's preliminary view that D4 is the most relevant prior art document. The obviousness of the claims on file based on a combination of D6 and D4 is no longer being pursued. We also do not refer to prior art document D8 in our analysis.

Prior art document D4 in combination with the relevant CGK forms the basis of the obviousness analysis below, which is set out using the *Sanofi* four-step approach.

- [51] We also noted that the submissions provided by the Applicant in the R-FA focussed on the proposed claims and that, as such, these submissions would be addressed as part of the assessment of the proposed claims, as they are in this recommendation.
- (1)(a) Identify the notional "person skilled in the art"
- [52] The person skilled in the art has been identified above under Purposive Construction. We apply the same characterization here.
- (1)(b) Identify the relevant common general knowledge of that person
- [53] The relevant CGK has also been identified under Purposive Construction and we apply the same CGK here.

(2) Identify the inventive concept of the claim in question or if that cannot readily be done, construe it

[54] In the PR letter at pages 8 to 9, we indicated that whereas the FA had identified a common inventive concept for the claims on file, we have taken the combination of essential elements of each claim to represent their individual inventive concepts:

In the FA at page 2, a common inventive concept of the claims was set out:

• The inventive concept common to all claims pertains to using a cured solid lubricant on a wedge thread instead of "pipe dope" in order

to prevent false elevated torque reading or damaging the connection due to trapped or built-up pressure of pipe dope.

As stated under Purposive Construction, we have taken all the elements of the claims to be essential and for the purposes of this assessment we take the combination of the essential elements of each claim to represent its inventive concept.

[55] The Applicant did not comment on the above position in the R-PR. We proceed on the same basis here.

(3) Identify what, if any, differences exist between the matter cited as forming part of the "state of the art" and the inventive concept of the claim or the claim as construed

[56] In the PR letter at pages 9 to 11, we reviewed prior art document D4 and identified the differences between the independent claims on file and D4. We were of the preliminary view that there was a common difference between the independent claims and D4, namely that D4 related to a regularly spaced thread arrangement, whereas the claims on file related to a wedge thread arrangement (both being part of a pin and box structure):

Prior art document D4 discloses a threaded metallic pipe for use in the oil extraction industry. The pipe is provided with surface protection on the threaded portion to increase corrosion and galling (portions of the threads removed by excessive friction on make-up or break-out) resistance under a range of environmental and operational conditions, even after several assembling (make-up) and disassembling (break-out) operations (D4 at paragraph [0013]). Figure 1 of D4, reproduced below, illustrates the basic pipe connection arrangement disclosed wherein an outer threaded member is mated to an inner threaded member, as in the pin and box arrangement of the claims on file.



D4 discloses that the threaded portion of the piping has a surface roughness (Ra) of between 2.0 and 6.0 μ m. The thread surface is covered by a first uniform layer of a dry corrosion-inhibiting coating and a second uniform layer of a dry lubricant coating (D4 at paragraph [0016]). D4 also discloses that the coating layer on the threaded

portion may comprise a first uniform layer of a dry corrosion-inhibiting coating containing a dispersion of solid lubricant particles (D4 at paragraph [0023]). A further embodiment contemplates a first layer of a dry corrosion-inhibiting coating comprising an epoxy resin containing particles of zinc and having a thickness of between 10 and 20 μ m, preferably between 10 and 15 μ m (D4 at paragraph [0024]). Another embodiment comprises a second layer of dry lubricant coating made of an inorganic binder and a mixture of particles of solid lubricants, one of which is molybdenum disulfide, having a thickness of between 10 and 20 μ m (D4 at paragraph [0024]).

It is disclosed that the desired metal surface roughness can be achieved by several methods, including abrasive blasting, phosphate coating or other equivalent mechanical or chemical processes (D4 at paragraph [0029]).

The layer of dry corrosion-inhibiting coating containing the dispersion of particles of solid lubricant can be applied by spraying, brushing, dipping or any other method that gives a controlled coating thickness (D4 at paragraph [0040]).

Tests were conducted on two different sizes of pipes, both using a dry corrosioninhibiting coating (an epoxy resin containing zinc) and a dry lubricant coating comprising an inorganic binder with molybdenum disulfide and solid lubricants. The surface preparation was substantially the same. The number of make-up and breakout cycles was 5 and 10, respectively (D4 at paragraphs [0042]- [0050]).

D4 indicates that as a result of the tests, which involved multiple make-up and break-out cycles, no galling was observed on the connection and the connection had a very stable make-up behavior.

Differences with respect to claim 1

Focusing first on independent claim 1, D4 clearly discloses a pin and box member with external and internal threads, respectively. D4 also clearly discloses a solid lubricant coating that may comprise two layers, one of which may be a dry corrosion-inhibiting coating made of epoxy resin containing particles of zinc, consistent with the meaning of this term set out under Purposive Construction and evident from the language of claim 1 itself.

In respect of the coating of D4 being "permanently bonded," as discussed above, the coating of D4 is intended to endure multiple make-up and break-out cycles with no thread or seal damage, which in our preliminary view indicates to the skilled person that the coating remains intact. In that respect, the skilled person would understand D4 to disclose that the coating remained as a rigid structure, in compliance with the definition set out in the instant application and referred to above under Purposive Construction.

Further, although D4 does not explicitly indicate that the epoxy resin is cured, in our preliminary view the skilled person would understand from D4 that in order for the coating to remain intact after multiple make-up and break-out cycles, the epoxy must be cured.

In our preliminary view, the only difference between claim 1 and D4 is that claim 1 specifies that the threads are wedge threads, D4 disclosing a regularly spaced

thread arrangement with teeth having one side perpendicular to the thread root surface and one side at an oblique angle to it.

Differences with respect to claim 13

Claim 13 differs from claim 1 in that rather than reciting details of a dry corrosioninhibiting coating, claim 13 specifies that one of the two material layers comprises a mixture of solid lubricants in an inorganic binder, one of the lubricants being molybdenum disulfide.

As discussed above and set out at paragraph [0025] of D4, the second layer of the coating disclosed therein may comprise such materials.

In our preliminary view, the difference between claim 13 and D4 is the same as that for claim 1, namely that the threads are wedge threads.

Differences with respect to claim 14

Claim 14 specifies a method of manufacturing a connection having a pin and box member with wedge threads and forming a solid lubricant coating of at least two material layers on the threads. The connection is then formed, and the coating remains solid during the connection process.

We have already discussed how D4 discloses the pin and box threaded members and how a solid lubricant coating that comprises two layers is formed on the threads that remains intact after multiple make-up and break-out cycles. The method of forming the connection is evident given the description of make-up and break-out steps.

Therefore, the difference with respect to claim 14 is again that the threads are wedge threads.

Differences with respect to claim 17

Claim 17 differs from claim 14 in that claim 17 only specifies a solid lubricant coating, without the further detail of it having at least two layers. D4 discloses a solid lubricant coating bonded to the threaded pin and box members.

Again, the only difference with respect to D4 is that the threads of claim 17 are wedge threads.

Differences with respect to claim 21

Claim 21 is directed to a tubular connection having the characteristics set out in the manufacturing method of claim 17. For that reason, the difference with respect to D4 is also that the threads are wedge threads.

The dependent claims add further features to the independent claims whose obviousness will be addressed at Sanofi step 4.

[57] The Applicant did not dispute the common difference between the independent claims and prior art document D4. However, in the R-PR at pages 5 to 6, the Applicant contends that the skilled person, in searching for a solution to the

objective technical problem in the technical field of wedge thread connections, would not have found D4 since it is not in the same technical field.

- [58] We have already set out above our views on the applicability of the objective technical problem in this assessment. Further, we have explained our reasons as to why we do not agree that the person skilled in the art is limited to having skill or knowledge in the field of wedge thread connections. Rather, the team of individuals that would have formed the person skilled in the art would have been knowledgeable in oil extraction pipe design generally, including pipe joint design and associated methods of reducing wear and erosion. As such, a prior art document such as D4, which discloses a threaded pipe connection used in the oil extraction industry, in particular of the pin and box type as in the claims on file, would have fallen within the art field of the skilled person.
- [59] Further, for the purposes of stage 3 of the Sanofi four-step approach, whether a document would be found or not is not a reason to exclude it from consideration (Hospira Healthcare Corporation v. Kennedy Trust for Rheumatology Research, 2020 FCA 30 at paragraphs 86 to 87).
- [60] The Applicant's submissions regarding what the person skilled in the art, even having knowledge of D4, would have done, will be addressed at step 4.
- [61] The additional subject-matter of the dependent claims will also be addressed at step 4, as they were in the PR letter.

(4) Viewed without any knowledge of the alleged invention as claimed, do those differences constitute steps which would have been obvious to the person skilled in the art, or do they require any degree of invention?

[62] In the PR letter at pages 12 to 13, we set out our preliminary reasons as to why the subject-matter of the independent claims on file would have been obvious to the person skilled in the art in view of prior art document D4 and the relevant CGK:

Independent claims 1, 13, 14, 17 and 21

As discussed above in relation to the relevant CGK, the instant application described the problems that were well-known in association with the use of conventional pipe dope to seal a wedge thread, such as pipe stand-off that may later lead to failure of the connection due to pressure bleed off and pipe dope flowing out at elevated temperatures. Further, the excess pipe dope trapped during make-up can give false torque readings, leading to an improperly tightened joint and possible damage to the connection. These are the problems that the instant application sought to address. The instant application also described past attempts at alleviating these problems, such as double bumping (repeated torquing) of the joint to ensure a tight connection.

It is possible that the identification of a problem is in and of itself enough to supply the inventive ingenuity necessary to justify a patent (*Cabot Corp v 318602 Ontario Ltd* (1988), 20 CPR (3d) 132 (FCTD), citing H.G. Fox in his book *Canadian Law and Practice Relating to Letters Patent for Inventions*, 4th ed. (Toronto: Carswell, 1969) at pages 70 and 71). However, in this case the general problem was part of the relevant CGK and D4 already provided a solution to it.

In particular, D4, though not discussing wedge threads, describes the issues that led to the disclosed solid coating configurations that fall within the scope of the independent claims on file.

D4 at paragraph [0006] discusses the issue of galling that occurs with threads in sliding contact and that it is common practice to use pipe dope as a lubricant to avoid this issue. However, D4 at paragraph [0008] also discusses the known issue at the time of "overdoping" where applying too much pipe dope leads to it not being properly evacuated during make-up of the connection. The trapped dope can develop high pressure in the connection which may lead to pipe damage. The surface treatments of D4, which are also those set out in the independent claims on file, were developed to address these issues. In this way, D4 discloses the same solution to the same problem as in the instant application, with the one exception that the instant application focusses on the problem as it applies to wedge threads, while D4 does not focus on a particular thread type (D4 illustrates an example thread in Figures 1 and 2 but does not describe it).

As the Applicant has acknowledged in the Background Art section of the instant application (instant application at paragraph [0002]), wedge thread type pipe connections were well-known in the oil industry, as were the issues surrounding the use of pipe doping with them.

In our preliminary view, the skilled person, having knowledge of the information disclosed by D4, including the well-known problems that led to it, and faced with in essence the same problems in the use of common wedge type threads, would have immediately recognized that the solid coating configurations of D4 would address [...] these problems. In doing so, the skilled person would have come directly and without difficulty to the claimed subject-matter (the classic test for obviousness from *Beloit Canada Ltée/Ltd v Valmet Oy*, 8 CPR (3d) 289 at page 294, recently cited with approval in *Janssen Inc v Sandoz Canada Inc*, 2022 FC 715 at paragraph 95).

- [63] In the R-PR at pages 6 to 7, the Applicant alleges that if the person skilled in the art were to consider D4 there would have been several prejudices and technical problems to be overcome in using the permanent solid coating of D4 on a wedge thread connection, which allegedly would have prevented the person skilled in the art from using such a coating. These include:
 - The permanent coating may be expected to amplify machining tolerances across the thread flanks and could affect interference at the flanks in a wedge thread connection, thus negatively influencing connection reliability.
 - A permanent dry lubricant coating would have been an undesirable obstructing barrier that prevents full interference at the load and stab flanks and therefore final make-up (i.e., sealing) of the connection. The permanent dry lubricant would act as a "permanent dope-entrapment" that would not be squeezed out as regular pipe dope would.
 - The wedge threads may require accurate redesigning since the thickness of a solid lubricant coating would affect the ability to reach the final make-up position to be reached with the required amount of torque and reduce sealing capacity due to loss of proper sealing surface contact.
 - A wedge thread connection with a permanent coating could require more torque to reach a make-up position, which would introduce additional stresses on the threads and may require some redesigning of the wedge thread connection to take into account the presence of a solid lubricating layer.
 - The skilled person, based on the relevant CGK, or the CGK in combination with D4, would not come to the subject-matter of the independent claims on file and a properly functioning wedge thread connection, without undue burden. [Emphasis added]

"Undue burden" as a barrier

[64] We have highlighted the passage in the list above since the Applicant's position in this regard is problematic. If, based on the relevant CGK and D4, a skilled person could not arrive at the subject-matter of the independent claims (or the dependent claims) without undue burden, then one would expect a level of disclosure in the instant application beyond that of D4, which discloses the same types of coatings, surface preparation methods and overlapping coating thicknesses, though not applied to wedge threads. If what the Applicant says were true, then details would have been provided in the instant application as to how the alleged problems were overcome in applying coatings such as those of D4 to a wedge thread connection. Otherwise, the instant application would be defective under subsection 27(3) of the *Patent Act* as lacking sufficiency in that the invention could not be practiced without undue burden or experimentation (*Aventis Pharma Inc v Apotex Inc*, 2005 FC 1283; *Mobil Oil Corp v Hercules Canada Inc*, [1995] FCJ No 1243; *Merck & Co v Apotex Inc*, [1995] 2 FC 723). The Applicant did not point to any details in the instant application that would address the problems that they allege would arise. We cannot accept that there would have been any undue burden in overcoming any problems arising from using a solid lubricant coating that would have made the use of such a coating unobvious.

Permanent dry lubricant as a "permanent dope-entrapment"

- [65] The Applicant also contends that the permanent dry lubricant coating would have been an undesirable obstructing barrier that prevents final make-up (i.e., sealing) of the connection, that it would act as a "permanent dope-entrapment" that would not be squeezed out as regular pipe dope would. This position appears to be at odds with the well-known manner in which traditional pipe dope is used in wedge threads, as set out in the Background Art section of the instant application and set out above as part of the relevant CGK. It was part of the relevant CGK that pipe dope was applied to wedge threads to improve thread seal and act as a lubricant during connection make-up and break-down. This would have meant that some of the pipe dope would have remained when the connection was in place. Further, the CGK included the idea of "excess" pipe dope being squeezed out during make-up, again suggesting that some of the pipe dope remained when the connection was in place.
- [66] In our view, the person skilled in the art, being aware that pipe dope already formed some kind of coating on a wedge thread connection when used, would not see an alternative coating, such as a solid lubricant coating that remains on the thread, as a reason to dismiss its use on a wedge thread.

Other prejudices and problems

- [67] In regard to other potential issues, such as the coating potentially negatively influencing connection reliability, possible redesign of the wedge thread configuration due to the thickness of the coating and the possible need for increased torgue to achieve connection make-up, all of these issues are characterized in the R-PR as things that the person skilled in the art would consider in applying a solid lubricant coating to a wedge thread. Assuming as we have that undue burden would not have been required, the person skilled in the art would have been capable of taking those issues into account and adapting the wedge thread connection as necessary in view of such concerns. We note that one of the points of relevant CGK taken from the Background Art section of the instant application includes past attempts at changing the pipe thread design to alleviate excess pipe dope issues. Therefore, in our view, altering wedge thread design to accommodate a coating such as that due to the pipe dope was already well-known to the person skilled in the art and not a barrier to use of an alternative thread coating.
- [68] Proceeding on the basis that the instant application is sufficient under subsection 27(3) of the *Patent Act*, we cannot accept that the prejudices and problems the Applicant suggests would arise in applying a solid lubricant coating to a wedge thread connection would prevent that person from using such a coating or be beyond the skill and knowledge of the person skilled in the art to address, once the idea of applying such coatings became evident to them (as it would have been from D4).

Combining D4 and the relevant CGK

[69] As we stated in the PR letter, the well-known problems that were part of the CGK in association with the use of pipe dope in wedge thread connections, such as excess pipe dope becoming trapped and causing issues such as improper make-up, were shared by other thread configurations in pin and box pipe structures, in particular D4 (D4 at paragraph [0008]). In our view, given that the person skilled in the art is knowledgeable in oil extraction pipe design in general, including pipe joint design and methods of reducing wear and erosion and based on the well-known issues of using pipe dope on wedge thread connections, this person, seeking a solution to these well-known issues, would have become aware of D4,

which is in the same oil extraction field. It is our view that such a person would have immediately recognized the applicability that the solid coatings of D4 would have to wedge thread connections in the same type of pin and box structure and facing the same issues. Of course, adaptations may have had to be made to the threads, but as discussed above, this was something the person skilled in the art already had to consider when applying a coating.

[70] As we stated in the PR letter, in our view, the person skilled in the art would have come directly and without difficulty to the claimed subject-matter (the classic test for obviousness from *Beloit Canada Ltée/Ltd v Valmet Oy*, 8 CPR (3d) 289 at page 294, recently cited with approval in *Janssen Inc v Sandoz Canada Inc*, 2022 FC 715 at paragraph 95).

The dependent claims

[71] In the PR letter at pages 13 to 14, we set out our preliminary view that the additional subject-matter of the dependent claims would not render the claims to which they refer unobvious:

Dependent claims 2 and 23 specify that one of the material layers of claims 1 and 22 is a dry lubricant coating. As discussed in step 3, this feature was disclosed by D4 and therefore it would not represent the introduction of a feature that makes the claims non-obvious. We further note that claim 23 depends on claim 22, which specifies that the lubricant coating of claim 21 comprises at least two layers. This feature was also disclosed by D4.

Claims 3 to 5 specify the thickness of at least one of the material layers of claim 1, with the preferred thickness narrowing from claims 3 to 5. Thicknesses of between 15 and 35 μ m, 20 and 30 μ m and 10 and 20 μ m are claimed. D4 discloses a thickness of the dry corrosion-inhibiting coating of between 10 and 20 μ m, preferably between 10 and 15 μ m. The thickness of the dry lubricant coating layer is specified in D4 as being between 10 and 20 μ m. Since the most preferred thickness for at least one of the layers (claim 5, between 10 and 20 μ m) is disclosed by D4 and the instant application attaches no significance to the other thickness ranges, in our preliminary view, these variations would have been obvious to the skilled person, the choice of thickness depending on the particular materials and service application. Claims 24 to 26 add the same thickness parameters to claims 22 or 23 (22 and 23 being obvious for the reasons above) and would similarly have been obvious.

Claim 6 specifies that at least one of the material layers is a mixture of at least two different solid lubricants in an inorganic binder and that one of them is molybdenum disulfide. This feature was disclosed in D4 at paragraph [0025] and therefore its

addition to the previous claims does not make them non-obvious. Claim 27, which adds the same features to any of claims 22 to 26 would have been obvious for the same reason.

Claim 7 specifies that the connection includes a surface treatment, and that the treatment is applied to one of the internal and external wedge threads prior to application of the solid lubricant coating. Claim 8 further specifies that the surface treatment is selected from the group of abrasive blasting and phosphate coating. D4 at paragraph [0029] discloses that the surface treatment to give the desired surface roughness can be accomplished by these methods. Therefore, the additional features of claims 7 and 8 do not make the previous claims non-obvious. Claims 28 and 29, which add the same features to already obvious claims, would similarly have been obvious.

Claim 9 specifies that the material layers of solid lubricant coating can withstand temperatures of between 200°C and 350°C. While D4 does not set out any temperature limitations, D4 does relate to the same oil and gas industry, and as discussed above, discloses the same type of coatings on similar pipe connections. In our preliminary view, if D4 does not inherently provide for the same levels of temperature resistance, then any changes to the specific mixture and configuration of the material layers in D4 required for a specific service application would have been within the CGK of the skilled person. Therefore, in our preliminary view, claim 9 on file would have been obvious. The same reasoning would apply to dependent claim 30.

Claim 10 specifies that the wedge threads are generally dovetail-shaped in crosssection. While this configuration is illustrated in Figure 2 of the drawings, no mention of it is made in the description portion of the application. With no description of this particular embodiment and therefore no discussion of the significance of it, we take it to have been one of the known options of thread type available to the skilled person at the claim date, with the choice to use it or not based on its characteristics having been obvious to the skilled person. The same reasoning would apply to dependent claim 31.

Claim 11 specifies that the wedge threads have an average surface roughness of between 2 and 6 μ m. This feature is disclosed in D4 at paragraph [0016], [0018] and [0022] in association with surface preparation for the later application of the two coatings. Therefore, its addition to the subject-matter of the prior claims does make them non-obvious. For the same reasons, the addition of this feature in dependent claims 15, 19 and 32 does not make the claims to which they refer non-obvious.

Claim 12 specifies that the solid lubricant coating of the previous claims includes a dry corrosion-inhibiting coating containing a dispersion of particles of solid lubricant. This feature is disclosed in D4 at paragraph [0023] as an option for the first coating layer.

Therefore, it's addition to the subject-matter of the prior claims does not make them non-obvious. For the same reasons, dependent claim 33 would have been obvious.

Claim 16 specifies that the specific surfaced roughness of claim 15 is achieved by abrasive blasting or phosphate coating. The addition of such a feature was already

considered above in relation to claim 8 and would not make claim 16 non-obvious. The same is true of dependent claim 20.

Claim 18 specifies that the solid lubricant coating of claim 17 comprises at least two material layer coatings. The presence of this feature has already been considered in association with independent claims 1, 13 and 14 and therefore its addition does not make the claim non-obvious. The same is true of dependent claim 22.

- [72] The Applicant did not make any submissions in respect of the particular patentability of the subject-matter of the dependent claims.
- [73] In our view, for the reasons set out in the PR letter, the subject-matter of the dependent claims would have been obvious to the person skilled in the art.

Summary of Obviousness Assessment

[74] In summary, we are of the view that claims 1-33 on file would have been obvious in view of prior art document D4 and the relevant CGK and are therefore non-compliant with section 28.3 of the *Patent Act*.

PROPOSED CLAIMS

[75] In the PR letter at page 15 we set out our preliminary view that the proposed claims submitted with the R-FA would not overcome the obviousness defect:

The R-FA included a set of proposed claims 1 to 30. The proposed changes to the claims on file include the addition of the subject-matter of claims 2 and 9 (that one of the material layers is a dry lubricant coating and that the layers withstand elevated temperatures of between 200°C and 350°C) to independent claim 1. Further, independent claims 13, 14,17 and 21 are proposed to be modified by the addition of the same temperature resistance limitation proposed for claim 1. Consistent with the proposed modifications, the Applicant proposes the deletion of dependent claims 2, 9 and 30 on file.

In the R-FA, the Applicant argued that the proposed modifications would differentiate the claims from the closest prior art reference D6, which did not disclose several features of the claims, including those of dependent claims 2, 9 and 30 on file (see pages 3 to 4 of the R-FA). As already discussed above, our preliminary opinion does not include the use of D6 as a prior art document. The Applicant's arguments with respect to D6 are therefore not relevant to this assessment.

With respect to D4, the R-FA at page 4 asserts that D4 does not discuss the relevance of temperature resistance of the solid coatings described. As discussed above under the assessment of the claims on file, we agree. However, we also set

out our analysis in relation to dependent claims 9 and 30 on file as to why in our preliminary view, such subject-matter, in combination with the other claimed features, would have been obvious to the skilled person.

Considering that we have already expressed our preliminary view that the subjectmatter of dependent claims 2, 9 and 30 would have been obvious, the proposed claims would also have been obvious.

- [76] The Applicant made no comments on the patentability of the proposed claims in the R-PR.
- [77] In our view, for the reasons set out in the PR letter, the proposed claims would not overcome the obviousness defect of the claims on file and are therefore not considered a "necessary" amendment for compliance with the *Patent Act* and *Patent Rules* as required by subsection 86(11) of the *Patent Rules*.

CONCLUSIONS

- [78] We conclude that the claims on file would have been obvious in view of prior art document D4 and the relevant CGK and are therefore non-compliant with section 28.3 of the *Patent Act*.
- [79] Further, we conclude that the proposed claims submitted with the FA would not overcome the obviousness defect of the claims on file and are therefore not considered a "necessary" amendment for compliance with the *Patent Act* and *Patent Rules* as required by subsection 86(11) of the *Patent Rules*.

RECOMMENDATION OF THE BOARD

[80] In view of the above, the undersigned recommend that the application be refused on the ground that claims 1-33 on file would have been obvious and are therefore non-compliant with section 28.3 of the *Patent Act*.

Stephen MacNeil Member Leigh Matheson Member Kurtis Ulicny Member

DECISION OF THE COMMISSIONER

- [81] I concur with the conclusions and recommendation of the Board that the application be refused on the ground that claims 1-33 on file would have been obvious and are therefore non-compliant with section 28.3 of the *Patent Act*.
- [82] 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 17th day of July, 2023