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Datasheet for the decision of 21 March 2023

Case Number: T 0704/21 - 3.3.05

Application Number: 14870921.5

Publication Number: 3038773

IPC: C22C1/04, C22C32/00

Language of the proceedings: EN

Title of invention:
WELLBORE ISOLATION DEVICE MADE FROM A POWDERED FUSIBLE ALLOY MATRIX

Applicant:
Halliburton Energy Services, Inc.

Headword:
Wellbore isolation device/Halliburton

Relevant legal provisions:
EPC Art. 56
RPBA 2020 Art. 13(2)

Keyword:
Inventive step - main and auxiliary requests 1 and 2 (no)
Amendment after summons - taken into account (no)

Decisions cited:
T 0939/92

Catchword:

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Case Number: T 0704/21 - 3.3.05

D E C I S I O N
of Technical Board of Appeal 3.3.05
of 21 March 2023

Appellant: (Applicant)	Halliburton Energy Services, Inc. 10200 Bellaire Boulevard Houston, TX 77072 (US)
Representative:	Hoffmann Eitle Patent- und Rechtsanwälte PartmbB Arabellastraße 30 81925 München (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 21 December 2020 refusing European patent application No. 14870921.5 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chair	R. Winkelhofer
Members:	G. Glod
	J. Roider

Summary of Facts and Submissions

I. The appellant's (applicant's) appeal lies from the examining division's decision refusing European patent application EP 14 870 921.5, concerning a wellbore isolation device, for lack of inventive step.

II. The following documents are relevant here.

D1: US 2009/0226340 A1
D2: US 2013/0333890 A1

III. The requests underlying the impugned decision were re-submitted with the grounds of appeal.

Claim 1 of the main request is as follows.

"*1. A method of producing and introducing a wellbore isolation*
device, the method comprising:
providing a fusible alloy matrix in a powdered form;
placing at least the particles of the fusible alloy matrix powder into a mold;
compacting the particles located inside the mold via an application of pressure;
fusing the particles together to form a solid material, wherein the solid material forms at least a portion of the wellbore isolation device (30); and
introducing the wellbore isolation device into a wellbore, wherein the fusible alloy matrix undergoes a solid to liquid phase transformation at the bottomhole temperature of the wellbore after a desired amount of time, and
wherein at least one phase of the fusible alloy matrix has a melting point below 250°C."

In claim 1 of auxiliary request 1 the expression "*after a desired amount of time*" was deleted.

Claim 1 of auxiliary request 2 includes the following amendment at the end (underlined) compared with claim 1 of the main request.

"*1. [...] amount of time, ~~and~~*
wherein at least one phase of the fusible alloy matrix has
a melting point below 250°C, and
wherein the step of placing further comprises placing other particles into the mold along with the particles of the fusible alloy matrix powder, wherein the other particles have a phase transformation temperature that is greater than the phase transformation temperature of the fusible alloy matrix."

IV. In reply to the communication under Article 15(1) RPBA 2020, the appellant submitted auxiliary request 3 on 14 March 2023.

Claim 1 includes the following amendments (underlined) compared with claim 1 of the main request.

"*1. [...] introducing the wellbore isolation device into a wellbore;*
wherein the metal of the fusible alloy is selected from lead, tin, bismuth, indium, cadmium, silver, gallium, zinc, antimony,
copper, and combinations thereof;
~~wherein~~ the fusible alloy matrix undergoes a solid to liquid phase transformation at the bottomhole temperature of the wellbore after a desired amount of time;

at least one phase of the fusible alloy matrix has a melting point below 250°C;
the fusing step is performed after the compacting step and the compacting step is performed by cold isostatic pressing at a temperature below the sintering temperature of the fusible alloy matrix powder, or the fusing step is performed simultaneously with the compacting step by hot isostatic pressing; and the fusing step comprises heating the particles such that the fusible alloy is at its sintering temperature or melting temperature, wherein when the fusible alloy is heated to its melting temperature, the compacted particles remain in the mold and the mold does not deform at this temperature."

V. The relevant arguments made by the appellant can be summarised as follows.

The use of a fusible alloy matrix in powdered form avoided the problem of stratification during the production of a wellbore isolation device. The composition of the fusible alloy matrix was not decisive, provided that it melted at the bottomhole temperature of the wellbore.

The problem to be solved was to provide a method for producing and using a wellbore isolation device having improved removal properties by way of a solid-to-liquid phase transformation.

The advantages of the invention over D2 arose from the defined production method steps, not from the location or size of the solid material produced by the method.

D1 was not relevant since it did not relate to stratification. It concerned products formed at least

partially of an aluminium alloy which was degraded chemically. This was contrary to the teaching of D2.

The technical effect of reduced stratification was even more pronounced for the subject-matter of claim 1 of auxiliary request 2.

Auxiliary request 3 was to be taken into consideration. In its communication, the board deviated from the impugned decision in that the problem was redefined. The amendments made to auxiliary request 3 directly addressed the board's objections and did not lead to new problems.

VI. The appellant requests that the decision be set aside and amended such that a patent be granted on the basis of the main request, or alternatively on the basis of one of auxiliary requests 1 to 3.

Reasons for the Decision

Main request

1. Article 56 EPC

1.1 The invention relates to a method for producing and introducing a wellbore isolation device.

1.2 D2 is the closest prior art. It is undisputed that it also relates to a wellbore isolation device comprising an alloy that undergoes a solid-to-liquid phase transformation.

1.3 The alleged problem to be solved is to provide a process for producing an isolation device having little to no stratification or other inhomogeneities, thereby

providing a wellbore isolation device having improved removal properties (paragraph [0021] of the application as filed).

1.4 It is proposed that the problem be solved by a method according to claim 1, characterised in that a fusible alloy matrix is provided in a powdered form; at least the particles of the fusible alloy matrix powder are placed into a mold; the particles located inside the mold are compacted via an application of pressure and the particles are fused together to form a solid material which forms at least a portion of the wellbore isolation device.

1.5 It has not been demonstrated and it is not credible that this problem exists across the entire scope claimed, and that it is consequently solved across the entire scope claimed.

The problem of inhomogeneity may possibly arise for isolation devices comprising a significant proportion of solid material produced from alloys made from metals that have significant density differences, relatively similar melting points and are all present at significant amounts in the alloy. Such a composition is set out in paragraph [0019] of the application; however, it is not credible that all the isolation devices that are to be produced using the process in claim 1 would have such problems of stratification that would mean that they could not be properly removed at the bottomhole temperature of the wellbore after a desired amount of time. In fact, D2 clearly discloses that at least a portion of a first composition which can be made up of a metal, a metal alloy including fusible alloys, and a plastic (see paragraph [0032]) melts in a desired amount of time (paragraph [0043]).

The fusible alloy includes mixtures of metals which do not exhibit stratification. In addition, D2 already points out that the first and second substances are intermixed in the sense that all of the substances are relatively uniformly distributed throughout the composition to form the first composition (paragraph [0033]). Although this paragraph does not explicitly refer to a fusible alloy matrix, such a matrix is covered by D2, as is evident from the preceding paragraph [0032] and from the table in paragraph [0023].

The fact that the subject-matter of claim 1 includes embodiments in which the fused solid material is only a very minor part of the wellbore isolation device in view of the wording **"at least a portion"** confirms that the problem of stratification can only exist in the shell of undefined size. It is not apparent that, in such a case, the absence of stratification would actually be relevant for the melting of the shell at the undefined bottomhole temperature.

The board agrees with the examining division that stratification depends on the specific components and process conditions (point 20.3, second paragraph of the decision), but the assumption that powder metallurgy always results in less stratification than casting, independently of the components and their concentration, is considered speculative in the absence of any evidence to the contrary.

Therefore, the problem needs to be defined in less ambitious terms and can be considered that of providing a method for producing the isolation device.

1.6 The solution to this problem is obvious for the following reasons:

The skilled person seeking to solve the stated problem would turn to D1, since it generally relates to alloys, in particular of aluminium, which are useful in oilfield exploration (paragraph [0003]). The oilfield elements are designed to serve temporary functions (paragraph [0037]), such as plugs (paragraph [0032]). This is completely in line with D2, which discloses that the isolation device should be capable of being flowed from the wellbore via melting, without the use of a milling apparatus, retrieval apparatus, or other such apparatuses commonly used to remove isolation devices (paragraph [0046]).

Although D1 possibly focuses on the chemical degradation, for example by water (paragraph [0026], sentence linking the left-hand and right-hand columns, and paragraph [0037]), the appellant's narrow interpretation of D1 does not represent the entire teaching of D1.

D1 generally discloses, for example in the table in paragraph [0040], different methods including casting and powder metallurgy that are suitable for manufacturing downhole oilfield products (see also paragraph [0027]). These methods are then described in more detail in paragraphs [0043] to [0056] and [0057] to [0062], respectively. Paragraph [0054] explains how to obtain the desired properties and homogeneity in the event that casting is used. It does not teach that only casting should be used for obtaining a specific homogeneity. The skilled person understands from these passages that both methods are suitable for producing an alloy. In particular, paragraph [0059] also mentions

mixing low melting-temperature additives with other materials as identified in D2 (paragraph [0032]) to produce powders with a desired melting temperature for use in powder-metallurgy methods.

Therefore, D1 clearly teaches that casting and powder metallurgy are suitable methods for producing the alloy. The skilled person seeking to solve the problem of providing a method for producing the isolation device from D2 learns from D1 that casting and powder metallurgy are suitable solutions to the problem. Such a mere arbitrary choice from the possible solutions cannot involve an inventive step (T 939/92, point 2.5.3 of the Reasons).

1.7 Therefore, the board concurs with the examining division that claim 1 of the main request lacks an inventive step in view of D2 in combination with D1.

Auxiliary request 1

2. Article 56 EPC

Notwithstanding the question of whether the omission of the feature "after a desired amount of time" is acceptable under Article 123(2) EPC, this amendment does not alter the reasoning under Article 56 EPC given for the main request. As indicated above (point 1.2), D2 already discloses that the isolation device undergoes a solid-to-liquid phase transformation at the bottomhole temperature of the wellbore.

Therefore, this request is not allowable either for lack of inventive step.

Auxiliary request 2

3. Article 56

Claim 1 of this request includes the features of claims 5 and 8 of the application as filed. This amendment does not affect the reasoning given for the main request, since these features are already disclosed in D2 (see paragraph [0035] of D2). It does not add any new differentiating features with respect to D2. It does not restrict the claim with respect to the composition of the alloys, meaning that it is still not credible that the alleged problem is solved across the entire scope. In addition, the amendment is not incompatible with the general teaching of D1 (see paragraph [0062] of D1).

Therefore, this request is not allowable either for lack of inventive step.

Auxiliary request 3

4. Article 13(2) RPBA 2020

This request was submitted one week before the oral proceedings in response to the communication under Article 15(1) RPBA 2020.

Notwithstanding the question of what role reformulating the problem could play in giving rise to exceptional circumstances within the meaning of Article 13(2) RPBA 2020, the criteria of Article 13(1) RPBA 2020 can also be taken into consideration when deciding on Article 13(2) RPBA 2020 (Case Law of the Boards of Appeal of the EPO, 10th edition, 2022, V.A.4.5.1, last two paragraphs).

These criteria concern the state of the proceedings, the suitability of the amendment for resolving the issues raised by the board, whether the amendment is detrimental to procedural economy, and, in the case of an amendment to a patent application, whether any such amendment *prima facie* overcomes the issues raised by the board and does not give rise to new objections.

In this case, the amended claim 1 cannot be considered to overcome the issue of inventive step. Claim 1 is still very broad and allows a small amount of alloys to be present that could still be made up by elements in undefined amounts having big differences in melting points. In addition, the added process steps are rather generic to powder metallurgy and do not help to resolve the key issue of the alleged problem across the entire scope of the claim.

Furthermore, the omitted feature "such that the liquefied matrix and other particles remain enclosed within the mold until cooled to a solid" appears to be linked to the previous feature "the compacted particles remain in the mold and the mold does not deform at this temperature", thereby implying a certain process step. It is not immediately evident that the requirements of Article 123(2) EPC are thus fulfilled.

Since the request does not clearly resolve the issue of inventive step and likely leads to a new problem under Article 123(2) EPC, and dealing with it would also go against procedural economy, it is not taken into consideration.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chair:

C. Vodz R. Winkelhofer

Decision electronically authenticated