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BEFORE THE PATENT TRIAL AND APPEAL BOARD
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CMS CEPCOR LTD., and CMS CEPCOR AMERICAS LLC,
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Petitioner,
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SANDVIK INTELLECTUAL PROPERTY AB,
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Patent Owner.
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REPORTED BY: SHOSHANA KRAMER, RPR, CRR
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S T I P U L A T I O N S

It is hereby stipulated and agreed by and between the counsel for the respective parties and the deponent that the reading and signing of the deposition transcript be reserved.

P R O C E E D I N G S

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THE COURT REPORTER: Would you please raise your right hand?

Do you swear or affirm that the testimony you're about to give in this case is the truth, the whole truth and nothing but the truth?

THE WITNESS: Yes, I do.

THEREUPON

Harri Kytomaa, PHD

was called as a witness and, having first been duly sworn, testified as follows:

DIRECT EXAMINATION

BY MR. SANKS:

Q. Good afternoon, Doctor Kamato; is that correct, am I pronouncing it correctly?

A. You're not.

Q. Can you say it again?

A. Kyotmaa.

Q. Hold on. My apologies there. To start with, I just wanted to say I viewed your CV and I thought it was very impressive. So congratulations on all that you have achieved so far in your career. With that said, I wanted to find out, have you had any direct experience working with crushers prior to being an expert in these

two P tab matters?

A. Yes, some experience with crushers, yes.

Q. Can you explain what the experiences were?

A. Yes, so generally, commonly used equipment, so specifically I've worked on coal pulverizers and bore mills, as well as a crusher. These were in the context of two or three projects that I worked that were associated with coal mines and coal fired power plants.

Q. And how long ago was that?

A. Oh, ranging from, geeze, I mean my first experience at a coal fire powered plant was decades ago all the way to fairly recently, you know, a year or two ago.

Q. Okay. Would you agree that sleeve bearings are commonly used in mechanical engineering?

MR. ARJOMAND: Objection, form.

A. No, that's not, I mean, that's, in fact even just saying sleeve bearing is not clear, what that would be outside of the context of this matter. And I, I've never really thought about that and it's not something that is like, for example, if you were to do a degree in mechanical engineering, you probably would never hear about a sleeve bearing.

Q. As it relates to crushers, what would be your understanding of a sleeve bearing?

MR. ARJOMAND: Objection, form.

A. So, what I've -- I mean there are two concepts here that you're asking me about. One is a sleeve, and the other is the bearing. So what I've learned from the patents that I've reviewed in the context of this case, is that the sleeve is a -- that is used at the top end of the shaft in the context of for example, the 090 patent is a wear item.

Q. Okay. And what about the bearings?

MR. ARJOMAND: Objection, form.

A. I mean, bearings. There are all sorts of different kinds of bearings out there things like journal bearings, universal bearings, ball bearings.

I mean just a very large range of types of bearings and as a mechanical engineer, one would understand what a type of bearing is. But just saying a bearing doesn't really inform you as to what kind of bearing.

Q. How about with respect to crushers and with respect to a sleeve that's used in a crusher?

MR. ARJOMAND: Objection, form.

A. Even crushers have many bearings and just so you telling me, you know, what is a bearing and a crusher, I would have to ask for clarifying questions.

Q. Understood. How about with respect to a flange

on a crusher?

MR. ARJOMAND: Objection form.

A. What about a flange, I don't understand the question.

Q. Let's scratch that one.

I'm going to direct you to patent number 2840399, I should be able to share on here, correct.

Are you familiar with this patent?

A. I am, I've reviewed it.

Q. I'm going to direct your attention to Figure 5. So adjacent to number 33 there is this mechanism here which appears to be a bolt. Would you agree with my, my assessment of what that element is?

MR. ARJOMAND: Objection, form.

A. Yes, I mean I think, I mean I don't think the bolt, I mean it's adjacent to the number 33 and based on this drawing alone it looks like a bolt. I mean there may be more than one bolt but that drawing is not clear on that.

Q. And turning to Figure 7 looking at the left end here, does that also appear to be a bolt or at least a head of a bolt?

MR. ARJOMAND: Objection, form.

A. Yeah, Figure 7, all we see on the far left of Figure 7 is the, hexagonal head. It may be more than

one head but that's, all we see is more than one head.

Q. Okay.

THE COURT REPORTER: Did you want to mark this document?

MR. SANKS: Yes, and we can actually mark it just so we're consistent with this Exhibit 1031 so it's consistent across all our other documents and pleadings.

MR. ARJOMAND: Just for the record, I think it's marked as Exhibit 1033 in the 01381 proceeding but it's fine to marked it as Exhibit 1031 in this proceeding or in this deposition.

(Exhibit No. 1031 was marked for identification.)

Q. So looking at figures 7 and 5, would a person of ordinary skill in the art, I understand that both these figures have a bolt passing through it and end cap with the shoulder?

MR. ARJOMAND: Objection, form.

A. If you could show me seven again.

Q. Sir, excuse me, I meant to. There?

A. Yeah, no problem. Well, Figure 7 doesn't really show you the bolt, right, you just see a head, person skilled in the art would see the head, would have to guess, as to whether there is indeed a bolt. And

what were the other two elements that you asked me about in your question?

Q. I asked you about the passing through an end cap with a shoulder, where the end cap has a shoulder?

MR. ARJOMAND: Objection form.

A. Yeah, I mean I think the exactly what different components are called, is unclear, one, to a person ordinary skilled in the art that person would have to review the patent specifically to see how different components are called so I, you know, I won't guess but I think with some effort, reviewing the patent, one would be able to make that determination.

Q. Okay. So just for clarification, I want to go back to Figure 4. I'll direct you to column three, starting at line 16. And I would ask if you could read that paragraph?

A. Sure, should I read it into the record.

Q. Yes, please.

A. The arrangement of the invention is also highly advantageous in facilitating removal and replacement of a gear. To remove a gear, it is only necessary to back off the bolts nine slightly and introduce oil under pressure through the bore 16 so as to expand the gear hub. Where upon the gear will slide back against the washer eight with no difficulty and may then be removed.

Q. And then now going back to Figure 4, do you see element nine in Figure 4?

A. I do.

Q. And we agree that that's the bolt?

MR. ARJOMAND: Objection form.

A. No, we actually don't, the, we, I just read the paragraph that you asked me to read talks about multiple bolts. Or a plurality of bolts.

Q. So Figure 9, I mean element nine, could that be one of the plurality of bolts?

A. From that figure it's unclear, right and so element nine in Figure 4 only shows one bolt.

Q. And how about element eight?

MR. ARJOMAND: Objection, form.

A. What about it?

Q. Does that show the washer?

MR. ARJOMAND: Objection form, sorry.

A. I believe -- I apologize, yes, I believe to the extent that what I read identified element eight as the washer, then it would be the washer. But I don't have the text in front of me.

Q. Column four, starting at line 16, can you read that paragraph into the record, please?

A. Sure. The invention may also be applied to double webbed gears where both webs extend regularly and

such an application is shown in Figure 7. This case, the hub 40 has a pair of radio webs 41, and the hub is relieved by grooves 43 at each side of these webs. The oil bore 44 has branches for supplying oil to both of the grooves 42 as indicated. The construction and operation is otherwise the same, as in the embodiments previously described.

Q. The referring back to Figure 7.

So does Figure 7 show only a single groove on the outside surface of the main shaft?

MR. ARJOMAND: Objection, form.

A. I don't know whether this, I mean it only shows one shaft so I don't know whether it's the main shaft. So I'll just speak to the shaft, the only shaft that I see.

Q. Thank you.

A. And the Figure 7 only shows one groove on the shaft.

Q. And what number are you identifying as the one groove?

A. It is actually not numbered.

Q. Okay. I'd like to mark this exhibit as Exhibit 1040, it was originally in the 01381 proceeding under that exhibit number. So are you familiar with this reference?

(Exhibit No. 1040 was marked for identification.)

A. Yes, this is the Yagi reference, I am.

Q. On column six, starting at line 40. Yup, starting at line 40, that paragraph, you mind reading that into the record?

A. Would it be possible for to you scroll let's see, actually, hang on. Line 40, no. Okay, I see the whole thick thing.

Q. Let me make it larger. When I'm on the other hand of a share, it always looks so small to me, so?

A. Yeah, yeah, yeah. This is a little too big, I'm quite close to the monitor.

Q. Oh, I'm sorry I will shrink it.

A. Thank you though for accommodating. And so you said line 40, right?

Q. Yes, sir.

A. Okay, good. And starting the tapered shaft, right, that's the right paragraph.

Q. That's correct.

A. I can't see the column number. Okay the tapered shaft 60 comprises a taper part, 61, and an axial oil passage 62 is formed along the axial direction along the tapered shaft 60 from the front end surface of the taper part 61. Also in the regular direction of the

taper part 61 a radial oil passage 63 is formed. The radial oil passage 63 communicates with the terminal end of the axial oil passage 62. And both ends thereof are open to the outer peripheral surface of the taper part 61.

Therefore, oil fed from a hydraulic pressure source not shown flows in the axial oil passage 62 and the radial oil passage 63 in the order and flows out to the outer peripheral surface of the taper part 61.

Q. Okay. And looking at the next paragraph, and I'm looking really at the second line, well, the second sentence, would you agree that, well, if you could read the line that starts with the oil flowing out of.

A. Yeah. The oil flowing out of the opening of the radial oil passage 63 flows in the second oil groove 65 by which the oil is permeated in the circumferential direction of the outer peripheral surface of the taper part 61.

Q. And going to the next paragraph starting at 58, could you just read that first sentence?

A. Sure. In the outer peripheral surface of the taper part 61, there is provided a connecting oil groove 66, one end of the which communicates with the second, second oil groove 65, and which extends in the axial

direction towards the front end of the tapered shaft 60.

Q. Okay. Could a person of ordinary skill in the art understand based on what you just read in Yagi, that Yagi can be configured such that fluid -- excuse me, the funnel passage, 62, could feed oil through the groove 64 which in turn feeds oil to groove 65?

MR. ARJOMAND: Objection form.

A. Could you show me the figure that shows groove 64 and 65, please.

Q. Yes.

A. So somebody, a mechanical engineer of ordinary skill in the art in machine components like these, would understand that, that oil would flow from groove 64-4 to groove -- sorry, groove 65 to groove 64.

Q. And are they connected through groove 66?

A. Yes.

Q. Looking at these drawings does Yagi teach a plurality of groups?

MR. ARJOMAND: Objection, form.

A. The shaft of Yagi has more than one groove, yes.

Q. This next exhibit that was, I'd like to mark it as Exhibit 1017 which is the same number as used in the 01381 proceeding, are you familiar with this part reference?

A. I am.

(Exhibit No. 1017 was marked for identification.)

Q. Would you agree that Polinski teaches a prior art arrangement with where a head nut is threaded on to a main shaft and presses a mantle against the shaft?

MR. ARJOMAND: Objection, form.

A. I'm not sure I completely followed your question but to the extent that you know there's specific language that says what you just stated in the patent, I'd be happy to take a look at it.

Q. You could read line 15 starting, that sentence starts there and that last sentence that ends line 20?

A. Sure, thank you. To secure, so this is a description of the prior art.

Q. Yes.

A. To secure the mantle, to the shaft, a threaded section has generally been provided on the shaft, immediately above the tapered portion supporting the mantle for receiving a head nut which forces the mantle against the tapered portion of the shaft.

Q. And would you agree that that's prior art in the industry, or, I would say prior art?

MR. ARJOMAND: Objection, form.

A. Well, so, yes, yes, I mean I think that that's

the representation in this Polinski reference. It does refer to that as prior art, yes.

Q. And this is referring to, and is this referring to prior art with respects to crushers?

MR. ARJOMAND: Objection form.

A. This patent relates to gyratory crushers, yes.

Q. You could read into the record where you ended on line 20 starting through the end of line 25 ending with shaft?

A. While this type of arrangement has proven to be satisfactory for most crusher installations, experience has indicated that the relatively abrupt changes in the cross sectional area of the shaft above and below the threaded section have resulted in high local stress concentrations in these regions of the shaft.

Q. So reading that, would a person of ordinary skill in the art understand that stress concentrations are acceptable in gyratory crushers?

MR. ARJOMAND: Objection form.

A. This paragraph about the description of the prior art makes the opposite point. It says that these high local stress concentrations in the shaft in the presence of substantial stressors generated by the cyclical bending loads applied to the shaft by the mantle during operation have caused the development of

fatigue racks or fractures in the shredded section of the shaft as well as immediately above and below it.

Q. So wouldn't a person of ordinary skill in the art understand as long as the stresses stay within acceptable limits it would be okay?

MR. ARJOMAND: Objection, form.

A. That's not what this says, it says that in the presence of these high local stressors and the elevated cyclic bending loads applied to the shaft that cracks have occurred and can occur.

Q. All right, but what would a person of ordinary skill in the art understand?

MR. ARJOMAND: Objection, form, asked and answered.

A. So a person of ordinary skill in the art would understand that, that areas of abrupt changes in the cross sectional area of the shaft would be susceptible, particularly in the presence of elevated cyclic bending loads that are typical in gyratory crushers. These would be susceptible to forming cracks and breaks, both above and below the threaded region as well as in the threaded region. That's what they would understand.

Q. If you could read the sentence that's about midway in line 55? Excuse me.

A. Certainly, certainly. Sorry.

Q. Through line 67 ending at fill field, which is the subsequent paragraph.

A. Yeah. I think you're asking me to read a sentence, I think that's more than a sentence.

Q. Oh, my apologies.

A. No worries, I'll read the whole thing.

Q. All right.

A. So starting at line 66 there, the sleeve arrangement which is releasably, so this is actually, just for the record to be clear this is the summary of the invention so we've switched away from now, prior to art, to now summary of the invention, and I'm on line 56, middle of the line.

The sleeve arrangement which is releasably secured to the bearing journal, at the low stressed outermost end of the shaft includes a head nut which abuts the mantle to secure it to the tapered portion of the shaft.

From the foregoing it can be seen that the invention contemplates an arrangement wherein abrupt structural discontinuities in the normally high stress regions of the main shaft have been essentially eliminated to minimize the development of the fatigue fractures in the shaft while at the same time providing an arrangement which can be

easily maintained and repaired in the field.

Q. Would a person of ordinary skill in the art be aware that material and rock crusher main shaft generally needs to remain below the allowable stress?

MR. ARJOMAND: Objection form.

A. I don't actually understand your question. I'm sorry.

Q. Let's scratch that question.

Can you explain to me your understanding of the term threading corrosion?

A. Yes, yes. So threading corrosion occurs really in association with two mechanisms, threading and corrosion and threading is a failure mechanism associated with typically metal components rubbing against one another and this is exacerbated by corrosive environments. And so corrosive environments that have materials that can chemically attack the metal material and thereby cause the threading to accelerate.

Q. Is this an issue that can occur with crushers?

MR. ARJOMAND: Objection, form.

Q. So threading corrosion from a design perspective, if you were to design a crusher, would that be a factor that you take into consideration in your design?

MR. ARJOMAND: Objection form.

A. It would be. It wouldn't be the only consideration and what would be important in light of the great variability associated with threading corrosion is to understand the, you know, the specific application and understand the experience that there has been associated with threading corrosion in that application.

Q. Looking at figure one, what would you recognize as being the main shaft?

MR. ARJOMAND: Objection, form.

A. I'm not sure that it is called the main shaft but the shaft that, you know, I have been focusing on in this matter is item is, let's see numbered I think maybe eight, but of the shaft, other parts of the shaft, like the number 11 for example, yeah, so it's the vertical structure that starts from where you see the number 18 to where you see the numbers 34 and 35.

Q. Okay.

A. I'm sorry for interrupting. I mean, there's another shaft for example, that's labeled or at least in association with the label 27 but I'm not sure that that's the one you are asking me about.

Q. No it's not. Let's keep that part clear.

Okay, and looking at what you've identified as the main shaft. Let's scratch that, hold on.

1 Considering potential -- well, considering
2 trying to abate threading corrosion, would one of
3 the components you be focused on doing that with
4 would be the main shaft?
5 MR. ARJOMAND: Objection, form.
6 A. Yes, as we discussed already in association
7 with the prior, one of the challenges has been the
8 development of the fractures on the shaft. Now, on the,
9 just you know, I apologize if I'm just repeating myself
10 here, but I don't know that the shaft is called the main
11 shaft, so I.
12 Q. I understand.
13 A. I just call it the shaft, I think you call it
14 the main shaft and you, your question represented it
15 that I called the main shaft, but I didn't and I just
16 wanted to clarify that.
17 Q. Thank you. Referring now to Figure 2, I'm
18 going to point you to 36 and I'm going to ask you some
19 questions about that but I first want to go to the spec
20 so we have a reference on what 36 is pointing towards.
21 So if you're looking in column three, I believe
22 starting here at roughly line 27 or 28, it discusses
23 the projecting -- well, let me see, an inwardly
24 projecting annular lip 36 on the upper end of the
25 sleeve. I'm not going to tell to you read it but my

question is, what is the purpose of element 36.

A. All right, it is to be secured against the upper manager national edge surface of the shaft by the sleeve nut 35. It is in fact to hold the sleeve in a certain position, the principle, let's say securing of the sleeve is done by the heat rink connection between the sleeve and the cylindrical end of the shaft but this is a design feature that positions the sleeve against the end of the shaft.

Q. So would a person of the ordinary skill in the art understand that element six would be used during installation?

MR. ARJOMAND: Objection, form.

A. You have to remind me what element six is.

Q. 36, excuse me. The lip we just spoke of?

MR. ARJOMAND: I see, okay, objection, form.

A. No, I think 36 has this paragraph starting from line 15 also explains is there two alignment against the top of the marginal edge surface the of the shaft seven, and it's always there during normal operations. So it's not like it serves a function during installation and then doesn't anymore. It always does, but the primary manner in which the sleeve is secured is by a heat rink type connection between the sleeve and the shaft.

Q. Hypo-patent -- I'd like to have this exhibit

marked as Exhibit 1018 as its marked in proceeding 01381.

(Exhibit No. 1018 was marked for identification.)

Are you familiar with this prior art reference?

A. I am.

Q. What would you -- so looking at Figure 2 what would you identify as the as the shaft or main shaft in this image?

MR. ARJOMAND: Objection, form.

A. I think the entire structure in this image Figure 2 is a shaft.

Q. From what you understand of these crushers, would the shaft be subject to cyclic loading conditions in operation?

MR. ARJOMAND: Objection, form.

A. Yes, these gyratory crushers which is the subject of the of this dispute as I understand it, are subject to cyclic bending loads on the shaft, yes.

Q. Are they subject to eccentric loads?

MR. ARJOMAND: Objection, form.

A. Yes, gyratory crushers are subject to bending loads and eccentric bending loads that where essentially the eccentric loads are the loads that then create bending loads in the shaft.

Q. Can we go ahead and take a break right now.
(Discussion held off the record.)
Q. Can you explain from a mechanical design perspective what is a stress concentration?
A. Sure, a stress concentration, so I'll give you first a very simple example. But think of a straight bar, imagine just the bar that's let's say half inch in diameter, circular, so just a bar. If you were to fall on that bar, the stress as defined by engineers is simply the force that you pull on it, divided by the area. That's the stress. That's how it's defined.
Q. Divided by what area?
A. Area of the bar.
Q. Okay.
A. So it would be, you know, pie, pie R squared, area of the bar where R is the radius. The stress concentrator, would be, for example, if you had a knot in the bar or a scratch in the bar, anything that actually locally reduces the cross-sectional, right, the effective cross sectional area slightly decreases now and the stress, because of that, is increased because the bar is still carrying the same load, right, we're dividing the load by the area, the area is smaller, the stress goes up. And the material characteristics are typically described by the stresses that a material can

withstand. Not the load, but the stresses. Just as I have defined them. And so, so a stress concentrator is for example, the knots that I described, but it could be a variety of other things. For example, a stress concentrator could be a design feature that is inadvertently designed into a component that causes the effective cross sectional area to decrease. But the -- another way to think about stress concentrators is also for components that experience loads and stresses, if you now have an imperfection. Imperfections again can be -- can be scratches that it could be sort of accidental or it could be design features or it could be a consequence of operation, of a machine. Like, for example, you can get corrosion pitting, if you have corrosive materials in the vicinity of a certain metal that can eat at the metal and create local pits and those pits also can be stress concentrators. They're well known to be stress concentrators that as a result of cyclic loading now on such a component that has experienced such a pit, you can begin to develop a crack, a fatigue crack for example that ultimately results in the failure of the component.

Q. And for crushers they're typically -- they're mechanical design in how they're, I'll use the word mechanized, they experience loads and stresses, correct?

MR. ARJOMAND: Objection, form.

A. Yeah, by design, the shaft of a gyratory crusher will experience cyclic forces on the mantle that is transmitted then in the form of cyclic loads on the shaft.

Q. But if designed correctly is it possible that the stress concentrations do not lead to failure?

MR. ARJOMAND: Objection, form.

A. The, as I mentioned in my prior answer it's not just the design that's important. So obviously there will be design characteristics, specifically the geometry as designed, but then you also have issues related to weather, imperfections arise during manufacturing. Those arise. And also whether a imperfection constitute stress concentrators in the operation itself as a result of for example, corrosion. And so there are many, even though you might design a machine well, it might be manufactured in such a way that it is a little bit different from how it was designed and it might be operated in a manner that is different from what is designed. And as a result in each of those stages you can have situations that bring forth or develop stress concentration situations.

Q. If a shaft had, say, multiple stress concentrations, would the shaft fail simultaneously at

all stress concentrations?

MR. ARJOMAND: Objection, form.

A. That's actually, that's a question that I think engineers struggle with to this day. The answer is complicated, I'll try to keep it brief but ultimately the manifestation of a failure, for example the kinds of failures that the patents in suit and as well as prior art talk about is really failure of a shaft and your question really is also about the shafts, so I'll focus on that, even if you had, let's say, two parts, or two stress concentrations that nominally appear to be similar where exactly the failure will happen is very statistical in nature and oftentimes difficult to predict and part of the reason for that is the sort of last stage of failure tends to be a fatigue failure phenomenon that is initiated at stress, the locations of stress concentrations and the fatigue failure mechanism is very difficult to predict and it's very poorly understood. Generally not repeatable. And so you're asking me would they fail at you know the same place or the same time and the answer is no. These failures are very unpredictable.

Q. With respects to fatigue, are you familiar with the term endurance limit?

A. Yes.

Q. Can you explain what that is?

A. Yes, so in, you know, in a simple typical fatigue test. So for example, a three point bending configuration, if you expose the sample to a cyclic stress of a certain magnitude, most metals although they're not all the same, have a limit that is such that below a certain stress the component will be able to with stand in essence and infinity of cycles. So that's true for example the three point bending situation where you are imposing a midspan horizontal load on sort of a beam, small beam component, but you could do that in a similar kind of test that would bear out similar results with metal samples that are load in sort of a cantilevered beam configuration or simply in a pure tensile stress. For example, you just sort of pull on a sample in a cyclic manner, generally you would see these similar phenomenon.

Q. So at a stress concentration, if the cyclic stress is below the endurance level, will fatigue occur?

MR. ARJOMAND: Objection, form.

A. So yes, if the -- let me give you sort of a full answer. So if you have a stress concentration which I think that you have in your question, that you just asked me, then the stresses will be higher than the stresses as calculating a very simple manner with, you

1 know, load divided by the area as I've described before.
2 Because locally, the imperfection, the stress
3 concentrator will amplify the stress load. Right. And
4 so in that particular local region where there is a
5 stress concentrator, your stress might be higher. And
6 so the question really is whether now that stress that
7 the stress concentration location is higher than the
8 endurance limit, and so, you know, depends. You could
9 be doing a fatigue test, very low stressors, that in the
10 presence of a stress concentrator that still may not be
11 problematic and ultimately result in failure or the
12 stress concentrator could be such that it elevates the
13 stresses sufficiently so that ultimately with enough
14 cycles you do have a failure.
15 Q. Does either the patent that's at issue here the
16 090 or the 568 patent, does it teach that the shaft is
17 freely rotating?
18 A. Yes, it does.
19 Q. What does freely rotating mean to you?
20 MR. ARJOMAND: Objection, form.
21 Q. Scratch that. What does one person of ordinary
22 skill in the art understand freely rotating to mean?
23 MR. ARJOMAND: Objection, form.
24 A. I have to answer that question in the context
25 of the patents specifically the gyratory crushers where,

you know, that has a very specific meaning and I would say that outside of that context, you know, it would be difficult to answer the question, so the --

Q. Let's just focus on --

A. Yeah, so the gyratory crushers in question operate by creating an eccentric motion of the lower end of the shaft, and what that does is it brings the mantle in closer proximity with its opposing crushing surface to then effect the act of crushing by simply, you know, squeezing whatever is in between those two things and if you look at the design, a person of ordinary skill understanding that the design of these types of gyratory crushers would see that, the only thing that is driving or let's say the constraining, the shaft, from the perspective of its rotating motion, are the eccentric drive at the bottom of the crusher. The bearings at the bottom and the top of the shaft is such that they just sit in a configuration that's typically known in mechanical engineering in a journal bearing configuration and a journal bearing simply is a shaft in a circular aperture with no restraint on the rotation of the shaft. And so as a result of that configuration as well as some text in the specifics, a person of ordinary skill in the art would understand the shaft is freely rotating.

Q. Would one understand as it relates to these patents that freely rotating is the shaft is uncontained?

MR. ARJOMAND: Objection, form.

A. The person of ordinary skill in the art would understand that the shaft is unconstrained from the perspective of rotating about its own axis. Now, it's not entirely unconstrained, right, because it has a very described motion that is constrained by the location of the journal bearings that I just described as well as the eccentric motion that is imposed to the lower end of the shaft, right. So those are constraints on the shaft but the shaft is unconstrained from the perspective of rotating about its own access.

Q. Just from a mechanical design perspective what would be the opposite, what would be the technical term for the opposite of freely rotating?

MR. ARJOMAND: Objection, form.

A. Well, as I explained, freely rotating means it is allowed to turn freely about its own axis. So, for example, as the shaft undertakes this eccentric motion and narrower parts of the crushing regents engage with material, those will impose certainly a crushing force on the material, but the material also as it engages with the a mantle and the mantle is moving in eccentric

fashion will actually cause the mantle to rotate about the shaft's axis, right. The end opposite of this, and I think the -- there would be many examples so I cannot give you a comprehensive answer, but a situation that is somewhat, you know, opposed to a freely rotating situation is a situation where the shaft is not allowed to rotate about its own axis. So, for example, if you were to look at the shaft from above, it would stay in the same clock position, if you will, even while its executing an eccentric motion, right. In that situation, it would not be freely rotating, it would be angularly constrained, prevent it from rotating about its own axis, and that would now create a very different, let's say, functionality for the crusher, probably not a beneficial one.

Q. Okay, I am going to share.

So what I am sharing is the 090 patent marked as Exhibit 1001 in the 01381 proceeding.

(Exhibit No. 1001 was marked for identification.)

And I'd like this to be marked as Exhibit 1001. If you could read starting at column four, line 52, to the sentence that ends at line 63 into the record, please.

A. Column four, is column four the left or the

1 right.
2 Q. The right?
3 A. And say the numbers again. 53 to.
4 Q. 52, the second paragraph there under detailed
5 description and down to line 63?
6 A. Okay, starting at a drive?
7 Q. Yes.
8 A. A drive not shown is coupled to make shaft 107
9 via a drive shaft 108, and suitable gathering 116, so as
10 to rotate shaft 107 eccentrically about a longitudinal
11 axis 126 of the crusher and to cause head 103 to perform
12 a gyratory pendulum movement and crush material
13 introduced into crushing chamber 104. A first axial
14 upper end region 113 of shaft 107 is maintained in a
15 rotatable position by a top end bearing assembly 112
16 positioned intermediate between main shaft 107 and a
17 central boss 117. Similarly, a second axial bottom end
18 118 of shaft 107 is supported by a bottom end bearing
19 assembly 119. Upper frame 101 is divided into an upper
20 frame part commonly termed a top shell 111, mounted upon
21 lower frame part 102 commonly termed a bottom shell and
22 a spider assembly 114 having arms 110 that extend from
23 top shell 111 and represents an upper portion of the
24 crusher.
25 Q. Based on this disclosure, doesn't this suggest

that the shaft is not freely rotatable?

MR. ARJOMAND: Objection, form.

A. It doesn't.

Q. Okay. So looking at 108 here, at the far left end what would you describe that as?

A. So 108 is a shaft and then you have a gear, a conical gear at the left end of the shaft.

Q. And what do you understand the purpose of that gear to be?

MR. ARJOMAND: Objection, form.

A. So the teeth of the gear attached to shaft 108 engages with teeth on the structure labeled 160, and 116 is essentially a turntable that imposes a gyratory motion to the bottom of the shaft, so essentially what it does is that it, it guides the bottom of the shaft, in a circular motion, but the shaft itself is free to rotate about its own center and so the structure 116 imposes a circular, say trajectory of the center of the shaft at the bottom but the shaft itself is free to rotate about its own center.

Q. Okay. Let's go ahead and take a 15-minute break and I should only be having a few questions after that.

A. Okay.

(Discussion held off the record.)

MR. SANKS: Just have a few more questions.

Q. Are you familiar with any other gyratory crushers where the shafts are freely rotating?

MR. ARJOMAND: Objection, form.

A. I would expect this to be a design feature that exists in other gyratory crushers but I have not, let's say undertaken the exercise of studying, let's say gyratory crushers manufactured by other entities other than the parties in this matter.

Q. Based on your experience with gyratory crushers, typically if the shaft is not freely rotating, what movements do they have?

MR. ARJOMAND: Objection, form.

A. I mean crushing can be affected by motions other than sort of a gyratory motion. The gyratory motion we've talked about here in some details, so if your question is about specific gyratory crushers where the shaft is constrained and prevented from freely rotating, first of all I'm not aware that such gyratory crushers exactly exist. There is a benefit to the free rotation of the shaft but if it is constrained the what will happen is the in the crushing action, the material that is being crushed in the narrow gap of the gyratory crusher will experience not only the compressive squeezing forces if you will, but also a sheer force

that doesn't, that is -- let's say the that constitutes potentially energy that is wasted in that it doesn't affect crushing but requires expenditure of energy. That in part is why gyratory crushers have freely rotating shafts.

MR. SANKS: It was my last question. Mehran, do you have any redirect?

MR. ARJOMAND: Why don't we take a two minute break, let me just look at my notes and I'll get right back to you, Terry.

MR. SANKS: All right, thank you.

MR. ARJOMAND: I'm going to say we don't have any questions.

MR. SANKS: All right.

MR. ARJOMAND: I don't think you need the camera for that.

MR. SANKS: All right.

THE COURT REPORTER: Would the witness like to read or waive?

THE WITNESS: I'd like to read.

THE COURT REPORTER: And you would like the same, Mr. Arjomand?

MR. ARJOMAND: I think we would just like the rough today and then you can send us the final version when its ready, when do you think you'll

have done.

(TIME NOTED: 2:00 P.M.)

CERTIFICATE OF OATH

STATE OF FLORIDA:
COUNTY OF ORANGE:

I, SHOSHANA KRAMER, Notary Public, State of Florida, do hereby certify that Harri Kytomaa, PHD personally appeared before me on November 19, 2025 and was duly sworn and produced a driver's license as identification.

Signed this 20th day of November, 2025.

SHOSHANA KRAMER, RPR, CRR

Notary Public, State of Florida
My Commission No.: HH 321921
Expires: 11/13/2026

CERTIFICATE OF REPORTER

STATE OF FLORIDA:

COUNTY OF ORANGE:

I, SHOSHANA KRAMER, Notary Public, State of Florida, certify that I was authorized to and did stenographically report the deposition of Harri Kytomaa, PHD; that a review of the transcript was requested; and that the foregoing transcript, pages 4 through 37, is a true and accurate record of my stenographic notes.

I further certify that I am not a relative, employee, or attorney, or counsel of any of the parties, nor am I a relative or employee of any of the parties' attorneys or counsel connected with the action, nor am I financially interested in the action.

DATED this 20th day of November, 2025.

SHOSHANA KRAMER, RPR, CRR

ERRATA SHEET

DO NOT WRITE ON TRANSCRIPT-ENTER CHANGES HERE

IN RE: CMS CEPKOR V SANDVIK
DATE: NOVEMBER 19, 2025
DEPONENT: HARRI KYTOMAA, PHD
Job No. FLA7755208

PAGE NO.	LINE NO.	CORRECTION & REASON
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Under penalties of perjury, I declare that I have read the foregoing document and that the facts stated in it are true."

_____

DATE Harri Kytomaa, PHD

Job No. FLA7755208
NOVEMBER 20, 2025

Harri Kytomaa, PHD
C/O Morrison & Foerster, LLP
MArjomand@mofo.com

In Re: November 19, 2025, Deposition of Harri Kytomaa, PHD

Dear Harri Kytomaa, PHD:

This letter is to advise that the transcript for the above-referenced deposition has been completed and is available for review. Please email signed errata sheet to transcripts-fl@veritext.com or sign below to waive review of this transcript.

It is suggested that the review of this transcript be completed within 30 days of your receipt of this letter, as considered reasonable under Federal Rules*; however, there is no Florida Statute to this regard.

The original of this transcript has been forwarded to the ordering party and your errata, once received, will be forwarded to all ordering parties for inclusion in the transcript.

Sincerely,

Shoshana Kramer, RPR, CRR

cc: TERRY SANKS, Esquire
Mehran Arjomand, Esquire

Waiver:

I,_____, hereby waive the reading and signing of my deposition transcript.

_____ _____
Deponent Signature Date

*Federal Civil Procedure Rule 30(e)/Florida Civil Procedure Rule 1.310(e

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Federal Rules of Civil Procedure

Rule 30

(e) Review By the Witness; Changes.

(1) Review; Statement of Changes. On request by the deponent or a party before the deposition is completed, the deponent must be allowed 30 days after being notified by the officer that the transcript or recording is available in which:

(A) to review the transcript or recording; and

(B) if there are changes in form or substance, to sign a statement listing the changes and the reasons for making them.

(2) Changes Indicated in the Officer's Certificate. The officer must note in the certificate prescribed by Rule 30(f)(1) whether a review was requested and, if so, must attach any changes the deponent makes during the 30-day period.

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Veritext Legal Solutions represents that the foregoing transcript is a true, correct and complete transcript of the colloquies, questions and answers as submitted by the court reporter. Veritext Legal Solutions further represents that the attached exhibits, if any, are true, correct and complete documents as submitted by the court reporter and/or attorneys in relation to this deposition and that the documents were processed in accordance with our litigation support and production standards.

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fashion to authenticated parties who are permitted to access the material. Our data is hosted in a Tier 4 SSAE 16 certified facility.

Veritext Legal Solutions complies with all federal and State regulations with respect to the provision of court reporting services, and maintains its neutrality and independence regardless of relationship or the financial outcome of any litigation. Veritext requires adherence to the foregoing professional and ethical standards from all of its subcontractors in their independent contractor agreements.

Inquiries about Veritext Legal Solutions' confidentiality and security policies and practices should be directed to Veritext's Client Services Associates indicated on the cover of this document or at www.veritext.com.