

UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

GODBERSEN-SMITH CONSTRUCTION	)	
COMPANY d/b/a GOMACO CORPORATION,	)	Case
	)	PGR2024-00026
Petitioner,	)	
	)	U.S. Patent No.
v.	)	11,772,723
	)	
GUNTERT & ZIMMERMAN CONST. DIV.,	)	
INC.,	)	
	)	
Patent Owner.	)	
	)	

ZOOM VIDEOCONFERENCE DEPOSITION OF
WILLIAM SINGHOSE, Ph.D.

February 13, 2025
10:03 a.m. (EST)
Meeting ID: 898 3748 1792

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1 ZOOM VIDEOCONFERENCE DEPOSITION OF
2 WILLIAM SINGHOSE, Ph.D., commenced at 10:03 a.m. (EST)
3 on February 13, 2025, with all participants appearing
4 remotely via Zoom, Meeting ID: 898 3748 1792, before
5 Kim Rupiper, a Certified Reporter, CR No. 50456, in and
6 for the County of Maricopa, State of Arizona, appearing
7 remotely via Zoom.

8

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1 WILLIAM SINGHOSE, Ph.D., 2 a witness herein, having been first duly sworn to speak 3 the truth and nothing but the truth, was examined and 4 testified as follows: 5 6 EXAMINATION 7 BY MR. PRICE: 8 Q. Good morning, Dr. Singhose. How are you 9 today? 10 A. Good morning. I'm doing pretty well. How 11 about you? 12 Q. I'm good. Thank you. 13 A. Are you out in California? 14 Q. I am in New York. 15 A. Oh, okay. So it's not so early for you. 16 Q. No. My poor colleague yesterday was dragged 17 out of bed early, but... 18 A. Yeah, I bet. 19 Q. This is a good time for me. 20 All right. So, Dr. Singhose, approximately 21 how many times have you been deposed before? 22 A. I'm going to guess 35 to 40. 23 Q. And how many of those times were in IPR 24 proceedings? 25 A. Maybe 10 to 15.	Page 4 Page 6 1 Q. BY MR. PRICE: You can download them all. One 2 is the Rio reference, one is the '723 patent, and one 3 is your declaration. You can download them now, or you 4 can wait. Right now I'm specifically asking a question 5 about your declaration. 6 A. Okay. I think I have them, and you're asking 7 me to open up Exhibit 1002? 8 Q. That's it. 9 A. Yeah, that's it. Okay. I just want to make 10 sure it's not like from yesterday, because the 11 computer's still cluttered up. 12 Okay. Yeah. So this is -- the one I just 13 opened is the declaration for the '723 patent. I've 14 got it. 15 Q. Okay. You recognize this document? 16 A. Yes, I do. 17 Q. And that's your signature there at the end on 18 Page 152? 19 A. Yes, it is. And I also have a hard copy next 20 to me. 21 Q. You can feel free to use the hard copy -- 22 A. Okay. 23 Q. -- so long as there aren't any markings on it, 24 there aren't any notes. There aren't any extraneous... 25 A. Yeah, they just gave it to me a few minutes
Page 5 1 Q. Okay. I'll just give you, you know, a quick 2 reminder that I'll be asking questions of you this 3 morning. I need your full and truthful answers to 4 those questions. Especially because this is a remote 5 interview, it's especially important that we just not 6 talk over each other for the sake of the record. So 7 can you just agree that you'll let me finish my 8 questions before you start answering, and I'll extend 9 you the same courtesy to let you finish your answer 10 before I jump into the next question? 11 A. Okay. 12 Q. Okay. Great. 13 Dr. Singhose, can you turn to Paragraph 113 of 14 your declaration which I have uploaded into the chat. 15 MR. HIGH: Counsel, I think you might need to 16 re-upload it. We're not seeing anything in our chat. 17 MR. PRICE: Meeting group chat. Should be 18 everyone. I just put it in. Can anyone see it? 19 THE WITNESS: I don't see it. 20 MR. HIGH: We only see exhibits that uploaded 21 after we joined. 22 MR. PRICE: Okay. I think that should work 23 now. 24 THE WITNESS: Okay. Now I have three things. 25 Do you want me to download them all?	Page 7 1 ago. I just got a hard copy of it. 2 Q. Just, generally speaking, I'm okay with you 3 using any hard copies of documents that are in the 4 record so long as you tell me that there are no notes 5 or markings. 6 A. Yeah. So if I'm leafing through something, 7 it's right here. It's a stack right next to me. I'll 8 show you. They just gave me this, as you know, like a 9 binder of stuff. 10 Q. If you make that representation to me, I'll 11 believe you. 12 A. Okay. 13 Q. All right. 14 Okay. So my question is going to be about 15 Paragraphs 112 and 113 of your declaration. So if you 16 want to get there and just review those two paragraphs. 17 You can let me know when you're finished. 18 A. Okay. Just to verify, you said 112 and 113 -- 19 Q. Correct. 20 A. -- paragraphs? Okay. 21 Q. Yep. So Pages 86 to 87 of the document; 22 native is 91 and 92. 23 A. Okay. (Reviewing document.) 24 Okay. I reviewed those. 25 Q. Okay. What is the relevance of Rio's rotary

Page 8 1 encoders to your opinion that the claims of the '723 2 patent are unpatentable? 3 MR. HIGH: Objection. Form. 4 THE WITNESS: Well, Rio's rotary -- I think 5 you said rotary sensor? 6 Q. BY MR. PRICE: I said rotary encoder. I think 7 is -- 8 A. Yeah, okay. Yeah. So rotary encoder. 9 So the rotary encoder is a device that allows 10 the controller to know how much the actuator has turned 11 the crawler tracks. So you're going to need that 12 information to coordinate with the swing leg. So if 13 you know how much the swing leg has rotated in one 14 direction, that rotary encoder allows you to turn 15 the -- the actuator for the crawler track sort of the 16 opposite direction. That measures how far you're going 17 so that you know that you've gone far enough. 18 Q. Are you citing the rotary encoder to meet a 19 particular claim limitation of the '723 patent? 20 A. I mean, the rotary encoder would generally be, 21 I think, the claim limitation is the second sensor or a 22 sensor associated with the second actuator. 23 Q. Do you need a copy? Do you want to download 24 the '723 patent and just look at it -- 25 A. Sure.	Page 10 1 swing leg. 2 A. The swing leg. Okay. Well, that would be the 3 first one. 4 So that appears, I believe, in Limitation 1D. 5 Yeah. 1D says, "wherein a first angular position 6 transducer is disposed on the modular frame or the 7 swing leg to measure an angular position between the 8 swing leg and the modular frame..." 9 That would be one place that Rio's sensor is 10 being used, or could be used. 11 Q. Okay. So my question is, you're pointing to 12 Rio's rotary encoder as the first angular position 13 transducer; is that correct? 14 A. That is one -- yeah, that's one place that it 15 could be used in this combination. It's also being 16 used out of the crawler track to measure the crawler 17 track relative rotation. 18 Q. Okay. I understand. 19 Were rotary encoders like those used in Rio 20 known in the art before Rio? 21 A. Yes. 22 Q. Okay. And is it generally true, as you say in 23 Paragraph 112 that "Rotary encoders measure the amount 24 of rotation of one component relative to another by 25 converting angular motion about the pivot signal" --
Page 9 1 Q. -- and point me to the actual language? 2 A. It's probably in the binder here, but if you 3 want to... 4 Q. It's uploaded to the chat, too, so if you want 5 to -- 6 A. Oh, it is? Oh, yeah. 7 Q. -- download it, that's fine. If you want to 8 find it in your binder, that's... 9 A. Here, let me just open it up here. 10 I believe you're asking about the one 11 that's -- there's basically two sensors or two 12 transducers in the claims. You want to talk about the 13 second one? The one that's -- 14 Q. So I'm asking specifically about the one that 15 you are -- I assume you're citing Rio's rotary encoder 16 for one of them. So whichever one you're citing it 17 for. 18 A. Well, yeah, just to clarify. The question is 19 a little confusing to me because Rio discloses two 20 rotary encoders. So it discloses a rotary encoder 21 that's out measuring the crawler track, and it also 22 discloses another one that measures the swing leg. 23 That's what I was trying to ask you, which one you 24 wanted to talk about. 25 Q. I'm asking about the one that measures the	Page 11 1 "about the pivot point into a signal"? 2 A. Yes. 3 Q. Okay. So a POSITA would understand that when 4 they're reading about a rotary encoder? 5 A. Yes. 6 Q. And then turning to Paragraph 113, you also 7 say, "A POSITA would have been familiar with other ways 8 to associate a rotary encoder with a pivot point"; is 9 that right? 10 A. Yes. 11 Q. And what are those other ways to associate a 12 rotary encoder with a pivot point that a POSITA would 13 have been familiar with? 14 MR. HIGH: Objection. Form. 15 THE WITNESS: Well, there's a number of ways. 16 I can start explaining it, but I'm not sure I have all 17 day. 18 But a rotary encoder essentially has to be in 19 contact with two different things. One, we'll call it 20 the reference body, and the other one is the rotating 21 body. And if it's able to essentially be attached 22 or -- to those two bodies, then one of those bodies 23 rotates, it causes part of the sensor to turn inside, 24 and that turning inside of the sensor causes either 25 some light changes or some -- it could even be magnetic

Page 12 1 changes, but ultimately that causes an electrical 2 signal to come out of the sensor. And that signal is 3 going up and down and up and down, and the controller 4 is basically able to count that. And, basically, it 5 counts how many times the signal goes up and down and 6 up and down, and it converts that to, for example, a 7 number of degrees. 8 So that's ultimately how these work. They 9 have to be attached to sort of a -- two different 10 things, and it measures that relative rotation. 11 Q. BY MR. PRICE: And that was well known to a 12 person of ordinary skill in the art at the time? 13 A. Yes. Just so we're talking about it, you're 14 talking about the time of Rio, which I think is 2005 or 15 something. I'll have to look it up, but you're talking 16 about the time of Rio? 17 Q. That's correct. 18 A. Yes, it was definitely known at that time. 19 Q. Can we turn to Rio? 20 A. Sure. 21 Q. I uploaded it to the chat. It's Exhibit 1006. 22 A. Okay. I have it open. 23 Q. Do you recall talking to my colleague about 24 this reference yesterday? 25 A. Yes, I do.	Page 14 1 Q. Are you aware of any road milling machines 2 that were ever built that include legs that could be 3 retracted under the machine and that used rotary 4 actuators to turn a crawler track? 5 A. I'm certainly aware of milling machines that 6 have the legs that retract inside the frame. Sitting 7 here, without consulting any material, I'm not sure 8 that I know of one that uses a rotary actuator in the 9 way it's being used here. I mean, obviously, it's an 10 actuator that rotates it, but I can't remember the 11 exact mechanisms that were used. 12 Q. If the machine that's described here that has 13 those retractable legs and that are -- with crawler 14 tracks that are turned by rotary actuators didn't work, 15 would that alter your opinion on whether or not it 16 would have been obvious to implement the teachings of 17 Rio inside a larger machine like a slipform paver? 18 MR. HIGH: Objection. Form. 19 THE WITNESS: So it's hard for me to answer 20 that question, because I know they do work, but you're 21 saying I am supposed to assume they don't work? That 22 was your question? 23 Q. BY MR. PRICE: Yeah, if you were to find out 24 that what was described in Rio did not work for its 25 milling machine, would that affect your opinion about
Page 13 1 Q. And that was in relation to a related inter 2 partes review case? 3 A. Yes, it was. 4 Q. Are you aware of whether or not Rio, the 5 machine described in Rio was ever built? 6 MR. HIGH: Objection. Form. 7 THE WITNESS: I didn't do that investigation. 8 I just kind of looked through Rio to see if it's saying 9 this is corresponding to any particular model, you 10 know, the Caterpillar model or something. I don't see 11 it in there. So I didn't do an investigation, and I 12 don't think Rio is actually disclosing a specific 13 machine. I think it's disclosing some technology. 14 Q. BY MR. PRICE: Okay. But you're not aware of 15 any physical machines that have ever been implemented 16 that implement this -- the technology described and 17 claimed in Rio; correct? 18 MR. HIGH: Objection. Form. 19 THE WITNESS: Yeah. There's a lot of 20 technology disclosed in Rio. I don't know of a machine 21 that was built that practices all of it. How about 22 that? 23 Q. BY MR. PRICE: Are you aware of -- 24 A. Like, certainly, there's a lot of things in 25 there that are in machines.	Page 15 1 whether or not it would be obvious to implement the 2 teachings of Rio in a larger slipform paver? 3 MR. HIGH: Objection. Form. 4 THE WITNESS: Can you describe to me -- 5 explain to me in what way it wouldn't work? Do you 6 have a specific way of not working in mind? Like 7 you're just thinking it doesn't work. I don't know 8 what it's not doing; right? 9 Q. BY MR. PRICE: Sure. If it wasn't, for 10 example, able to steer crawler tracks with one of the 11 legs in the protracted position as it claims. 12 MR. HIGH: Same objection. 13 THE WITNESS: I just -- I can't fathom that, 14 because I know it works -- I know it does work. So I'm 15 trying to understand how I can go along with that. If 16 I can't make sense of the hypothetical, it's hard for 17 me then to follow on from the hypothetical. 18 So I guess I just disagree with the 19 hypothetical so much I can't go to step 2. Sorry. 20 Q. BY MR. PRICE: Well, I mean, you told me 21 you've never actually seen one of these machines with a 22 rotary actuator in real life; isn't that correct? 23 A. Well, I've seen these machines with the swing 24 leg swung out, and I -- in that configuration I've seen 25 them steering.

Page 16 1 What I've testified to is I wasn't sure 2 exactly what mechanism was on that machine that was 3 doing that. Like it could have been a piston with a 4 linkage rather than a rotary actuator like a worm gear. 5 But combined with that is my knowledge that worm gears 6 can create incredibly high amounts of torque, so it 7 just doesn't make any sense that a worm gear would not 8 be able to rotate the crawler track. 9 Q. Okay. And if it wasn't, you would have been 10 surprised? 11 MR. HIGH: Objection. Form. 12 THE WITNESS: I wouldn't be surprised if there 13 was one particular prototype or one particular model 14 where the engineers selected a rotary drive that was 15 underpowered. Like that could happen. But because 16 rotary slew drives, worm gears can have a very high, 17 what we call gear ratios, I would have known just to 18 swap out that one with one that provides you higher 19 torque. 20 Q. BY MR. PRICE: And can you always just put in 21 a worm gear that gives you higher torque given the 22 design constraints of machines? 23 A. Not -- 24 THE COURT REPORTER: (Requests clarification.) 25 Q. BY MR. PRICE: I said, and can you always just	Page 18 1 Rio describes the second actuator to 44? 2 A. Yes, I do. 3 Q. Does Rio disclose any embodiments where the 4 second actuator is not adapted to cause at least a 5 portion of the lifting column 46 to rotate about a 6 lifting column axis 48? 7 A. Well, the particular sentence that you've 8 pointed me to says, "The second actuator 44 is 9 connected to the lifting column 46 and is adapted to 10 cause at least a portion of the lifting column 46 to 11 rotate about a lifting column axis 48..." 12 So that particular sentence doesn't, but the 13 disclosure on its own -- the whole of the disclosure 14 does because it indicates that I could put that second 15 actuator at the bottom of the lifting column. And for 16 it to work down there, you would have to lock all of 17 the portions of the lifting column above it so that it 18 could push against that to rotate the crawler track. 19 Q. You would have to; is that correct? Is that 20 your testimony, that there's no other way to put a 21 rotary actuator on a lifting -- at the bottom of a 22 lifting column that would not cause a portion of the 23 lifting column to rotate? That's impossible? 24 MR. HIGH: Objection. Form. 25 THE WITNESS: Well, in truth, anytime that you
Page 17 1 swap in a worm gear with higher torque given the design 2 constraints in any given machine? 3 MR. HIGH: Objection. Form. 4 THE WITNESS: Well, any realistic design 5 constraints, yes, because the way it increased the 6 torque -- there's many ways to increase the torque of a 7 worm gear. We covered some of those yesterday. 8 But one simple way is you simply change the 9 number of teeth that's on the gear, and you increase 10 the number of gear teeth, so the actuator turns slower 11 because it has to go through more teeth, say to rotate 12 once, but the amount of torque goes up. 13 So given the same size and configuration and 14 really even cost, you could just swap out those gears 15 to a higher gear ratio, and you could always do it. 16 The price you would be paying is that you would be 17 rotating a little bit slower. 18 Q. BY MR. PRICE: Go to Column 4 of Rio. 19 A. Okay. 20 Q. Can you turn to Lines 51 through 60 or so. 21 A. Okay. Basically, all of Column 4? 22 Q. No, no, no. Lines 51 through 60. 23 A. Oh, Line 51. I thought you said Line 1. 24 Okay. I'm at 51. 25 Q. All right. Do you see in this paragraph where	Page 19 1 rotate two objects relative to each other, they're both 2 going to move. There's no way to have perfect 3 stiffness. And given these lifting columns are many 4 feet tall, when I twist the crawler track at the 5 bottom, the bottom portion of the lifting column is 6 going to be pushed backwards a little bit. 7 So to that extent, just the physics of the 8 real world, a portion of the lifting column is always 9 going to be rotating backwards compared to the crawler 10 track. That's just the physics of materials and 11 Newton's method. 12 But I think you're asking me, would there be 13 large amounts of rotation in the lifting column and 14 also large amounts of rotation in the crawler track? 15 And it strikes me that you'd have to come up with some 16 kind of weird non-useful mechanism to do that. 17 The standard implementation of putting a 18 rotary actuator at the bottom would tell a person of 19 ordinary skill in the art to lock the parts of the 20 lifting column rotationally together. They still have 21 to slide up and down, so there's always that relative 22 rotation, but as far as the torsional motion, that 23 needs to be all locked together for this to work well. 24 Q. BY MR. PRICE: It needs to be? That's your 25 testimony? That it's impossible for it to work any

Page 20 1 other way? 2 A. No, that's what I'm saying. I don't like the 3 idea of impossibility because I can come up with some 4 kind of weird mechanism where as I'm rotating the 5 crawler track, I have some linkage that's forcing some 6 small part of the lifting column to go backwards. It 7 just wouldn't be particularly useful, and it would not 8 be like the standard understood way of building a 9 machine in this configuration. 10 Q. Do you have evidence that there was a standard 11 way of connecting a rotary actuator to the bottom of a 12 jacking column? 13 MR. HIGH: Objection. Form. 14 THE WITNESS: Well, there's lots of prior art 15 in this case that shows that, and when you're at the 16 bottom, you -- these actuators have -- they're kind of 17 like the sensors. They have two parts. You've got to 18 connect one to one object and then the other to 19 another. 20 So if you're going to put the actuator at the 21 bottom lifting column, you're going to have to bolt it 22 or attach it or weld it or rigidly connect it to the 23 lifting column so it stays there. 24 And the other side of the actuator that turns 25 has to be rigidly attached to the crawler track, such	Page 22 1 tracks. 2 Q. Is Miller's rotary actuator bolted on to some 3 part of the jacking column, or is it connected to the 4 walking beam? 5 A. So in Figure 20 you see how it's deployed in 6 the full machine, and the jacking column is -- there's 7 a couple of them there, but they're 60 and 62. And 8 those jacking columns come down and attach to sort of 9 this yoke structure that's over the top of that 10 actuator. So it's securely connected to the actuator 11 through that -- and I'll call that yoke. So, yeah, 12 it's securely coupled to the bottom of the lifting 13 column. 14 Q. That's through another element; is that 15 correct? 16 A. Yeah, I think that -- again, I'm calling it 17 kind of a yoke. There's actually two yokes there. 18 There's a yoke that secures the crawler track, and then 19 there's a yoke that secures the lifting column to the 20 rotary actuator. So that's the -- and it's not bolted 21 or welded. It's secured to that yoke. That's the way 22 that it's being attached to the bottom of the lifting 23 column in that case. 24 Q. Well, and that yoke is also just completely 25 tying that jacking column to the frame; correct?
Page 21 1 as a yoke. That would be, yeah, the standard way of 2 putting a rotary actuator between two objects. 3 Q. BY MR. PRICE: Can you show me any evidence 4 that you're citing of this prior art that shows that 5 arrangement? 6 A. I think we have to go to the, like, exhibits 7 probably if you want to -- you're saying you want to 8 see the exhibits to this case? 9 Q. I have the exhibits. I mean, you can tell 10 me -- I have -- I can put any exhibit in the chat, 11 so... 12 A. Okay. I mean, they're all in my report, if 13 you want to start walking through them. 14 But Miller, for example, has one like that. 15 Q. Let's start with Miller, then. 16 A. Okay. 17 Q. It should be there. Do you have -- 18 A. Yeah. I've got -- I've that now. But I think 19 I pointed to -- I'm trying to find it in my report as 20 well, but I think it's Figure 7, if I recall. 21 Yeah, so Figure 7 -- actually, in my report I 22 talk about this in Paragraph 70, Page 53. So Figure 3 23 of -- Figure 7 of Miller shows kind of a close-up view 24 of the rotary actuator, and then Figure 20 shows it 25 being deployed in sort of the full frame with four	Page 23 1 A. Yes. I think it's doing both of those things. 2 That yoke is holding the machine together on the frame, 3 that walking beam that you're talking about, but it's 4 also holding it to the bottom of the jacking column. 5 Q. Okay. So this standard way of connecting a 6 rotary actuator to a jacking column in Miller is not 7 where you are actually connecting one side of the 8 rotary actuator bolting it on to another side of -- to 9 the bottom of the jacking column? Is that -- 10 MR. HIGH: Objection. Form. 11 THE WITNESS: That's exactly what I'm talking 12 about, is that this rotary actuator has its top side 13 rigidly connected to the jacking column, the bottom of 14 it. The other side of the actuator is rotationally 15 attached to the crawler track. This is, again, a 16 standard implementation. 17 One side is rigidly attached to the bottom 18 lifting column. The other side is rotationally 19 attached to the crawler track. And then when you power 20 the actuator, that rotational motion comes into play, 21 and it turns the crawler track relative to the lifting 22 columns. 23 Q. BY MR. PRICE: There are no bolts connecting 24 the actuator itself to the jacking column, are there? 25 There's a physical separation between those two

Page 24 1 components? 2 MR. HIGH: Objection. Form. 3 THE WITNESS: The top -- from this picture it 4 shows that there is a small gap, apparently, between 5 the top of the actuator to the bottom of the lifting 6 column if you go straight up. But this yoke comes 7 around the side, and that yoke has some bolts or some 8 pins. You can actually see them in there. 9 So, essentially, the design is that you 10 rigidly, firmly attach the rotary actuator to the 11 bottom of the lifting column. 12 Q. BY MR. PRICE: To the yoke which is connected 13 to the lifting column; correct? 14 A. That's right. The yoke is sort of the 15 attachment mechanism, the bolt, if you want. You know, 16 it's the thing that's rigidly connecting them together. 17 Q. Okay. 18 A. But your question was, do I have evidence? 19 And if we proceed on through my report, then there's 20 additional evidence. 21 For example, Whitaker is the next one I talk 22 about, and then I can talk about Johns as well. So 23 this is where I laid out that evidence for you. 24 Q. In Whitaker, is that inner shaft circular or 25 square?	Page 26 1 MR. HIGH: Objection. Form. 2 THE WITNESS: Sure. I mean, it doesn't use 3 those exact words. It says that you can put the rotary 4 actuator anywhere along the lifting column axis which 5 includes from the top, in the middle, and at the 6 bottom. 7 Q. BY MR. PRICE: Can you show me where the word 8 "anywhere" is in Rio? Because I was looking in your 9 report and I saw the word "anywhere," but then I looked 10 at Rio, and I didn't see it in there, so... 11 A. Yeah. I may not use that word. I'll look it 12 up. If I can search. I had trouble searching 13 yesterday. 14 I think it says it in a couple places, but, 15 for example, one is in Column 5, starting on Line 8. 16 I'll let you get there, if you want to get there and 17 read along with me. 18 Q. I'm there. 19 A. Okay. It says, "In another of the preferred 20 embodiments, the second actuator 44" -- and that's the 21 actuator you're asking me about -- "is positioned on 22 the lifting column 46 at a location spaced apart from 23 the first actuator 42 along the lifting column axis 48. 24 So it doesn't say "anywhere" along. It just 25 says "along the lifting column axis 48." That's the
Page 25 1 A. Well, there's actually multiple inner shafts, 2 if I understand your question. It's a telescoping 3 device, and it can have sort of any number, but those 4 are rectangles. 5 Q. Is the bottom one that connects to the crawler 6 track, is that circular or square? 7 A. Well, down at the part where the gear is, the 8 highlighted gear part, that portion is circular. The 9 part that -- it's the inner race of the gear, that 10 portion of it's circular, but the telescoping parts 11 above that are rectangles. 12 Q. Okay. Now, you also say Johns. Does Johns 13 have a jacking column? 14 A. I don't think that Johns has a jacking column. 15 It's just another kind of construction machine which 16 has a rotary actuator that turns its grounding gauging 17 members relative to the structure above it. 18 Q. Okay. And it has wheels, right, not crawler 19 tracks? 20 A. Yeah, the picture that Johns shows, it does 21 have wheels. 22 Q. You told me earlier -- and correct me if I'm 23 wrong -- that Rio actually discloses putting a rotary 24 actuator on the bottom of the jacking column. Can you 25 point me to where it says that?	Page 27 1 exact words. 2 Q. Okay. So the word "anywhere" that's used in 3 the report is not in Rio? 4 A. Yeah, I don't think it uses that word, but it 5 teaches a person of ordinary skill in the art it could 6 be anywhere. It's just suggesting that you don't put 7 it right where the other -- where another piece of -- 8 where another mechanism is coming in. It just wants 9 you to space it apart from other things that may be 10 attaching to lifting column. 11 So that teaches a person of ordinary skill in 12 the art essentially anywhere, except don't put it where 13 there's another mechanism. 14 Q. Now, this paragraph starts off with the 15 phrase, "In another of the preferred embodiments..." 16 Do you see that? 17 A. Yes. 18 Q. What do you think that means? What 19 embodiment? Do you see this paragraph as being somehow 20 different from some other embodiment that was disclosed 21 already in the Rio patent? 22 MR. HIGH: Objection. Form. 23 THE WITNESS: Yeah, I mean, I'm taking it on 24 its face value. It's telling me that it's -- in this 25 paragraph it's providing something different than

Page 28 1 perhaps previous paragraphs. 2 Q. BY MR. PRICE: And what do you think is 3 different in this paragraph? What do you think that 4 the author was actually trying to get to when using 5 this phrase "In another of the preferred embodiments"? 6 MR. HIGH: Dr. Singhose, I just wanted to make 7 sure you finished your answer to the last question. 8 Counsel, like, I know it's hard; we're on 9 Zoom, but please don't interrupt the witness. 10 MR. PRICE: Note my apologies if I did. 11 THE WITNESS: It's okay. 12 Well, before we get to this paragraph, Rio is 13 talking -- Rio is teaching to Figures 2 through 4. And 14 so Figures 2 through 4 are one embodiment, and these 15 pictorially or they pictorially represented this 16 particular embodiment in Figures 2 through 4. 17 And particularly in Figure 2 they've shown us 18 that in this embodiment the actuator is at the top of 19 the lifting column. That's pretty clearly shown in 20 Figure 2. 21 And so they're explaining their invention to a 22 person of ordinary skill in the art with Figures 2 and 23 3 and 4 in this text, but they don't want to limit it 24 to just that. 25 So here they're actually pointing out we have	Page 30 1 A. Anywhere. That's what I'm saying. It's -- it 2 does not say -- 3 Q. Where does it say "anywhere," Doctor? 4 A. No, I already told you, it doesn't use those 5 words. This is a teaching to like an engineer. And if 6 you're telling an engineer along an axis, the engineer 7 is not going to say, I have to put it here. They're 8 going to look at the whole axis and they're going to 9 say, well, for my particular use of this technology 10 where would I put it along the axis? And it would be 11 obvious to put it at the bottom. 12 Q. It would be obvious to put it at the bottom. 13 Does Rio actually disclose putting it at the bottom, or 14 are you saying it would be obvious to put it at the 15 bottom? 16 A. Well, Rio does not have any words that say 17 place it at the bottom. It has these words that we're 18 looking at that says place it -- I know you don't like 19 "anywhere," so I won't use that -- place it along the 20 axis. And one way -- one place along the axis is at 21 the bottom. And as a person of ordinary skill in the 22 art, we would know that the easiest places would be at 23 the top and the bottom. Those would be the two easiest 24 places, but then we could also put it somewhere in the 25 middle.
Page 29 1 other embodiments, and another embodiment is you don't 2 have to put that actuator at the top. You can put it 3 along the lifting column axis. 4 Q. BY MR. PRICE: I mean, but doesn't the next 5 line say that preferably you're putting it at the top? 6 A. Yeah. That's -- it's saying that we prefer 7 this at the top, but you could put it anywhere. 8 Q. But -- 9 A. Understanding that depending on how you want 10 to use their invention, you may not want to put it at 11 the top, which is where they're preferring to do it, 12 but you could have a reason to put it somewhere else, 13 and so put it somewhere else. 14 Q. Okay. But isn't this somewhere else that 15 they're referring to in this paragraph somewhere that's 16 just different from where the first actuator is? Isn't 17 that what the first sentence of this paragraph is 18 saying? 19 A. Yes. Different and spaced apart from the 20 first actuator. 21 Q. And where does Rio talk -- suggest spacing 22 this second actuator in this particular embodiment? 23 A. Along the lifting column axis spaced apart 24 from the first actuator. 25 Q. Where?	Page 31 1 Q. Okay. And if you are putting it at the top or 2 somewhere in the middle, it would continue to work as 3 described in Column 4, Lines 51 through 60, right, 4 where it is adapted to cause at least a portion of the 5 lifting column to rotate about the lifting column axis? 6 A. That's right. That part that we talked about 7 before where part of the lifting column is rotated, 8 that's associated with that previous embodiment. 9 Q. Okay. 10 A. That's sort of one version of this. And so 11 when you get to this and they say this is a different 12 embodiment, you can place it along the lifting column 13 axis, a person of ordinary skill in the art would then 14 reflect back and say, yeah, all those details that were 15 above don't have to be in this new embodiment. Those 16 details were associated with the first preferred 17 embodiment. 18 Q. Where does it say in this second preferred 19 embodiment that you can do away with how the actuator 20 is actually described to work by turning the portion of 21 the lifting column axis, or is that just something else 22 an engineer is supposed to understand from reading Rio? 23 A. Well, when you put it at the bottom, you can't 24 attach it to two parts of the lifting column. The 25 reason why in the previous embodiment you could attach

Page 32 1 it to two parts of the lifting column is because it was 2 at the top or somewhere in the middle, and those 3 configurations, one part of the actuator has to attach 4 to the portion of lifting column that's kind of above 5 it and one below it. 6 When you get to the bottom, the only thing 7 that's below it is the crawler track or the yoke of the 8 crawler track. So when you get to that configuration, 9 you know that the flexibility, the rotating part is 10 below you and the fixed part is above you. 11 So that concept of having the fixed part above 12 and the rotating part below, that's the part that 13 doesn't change. But when you get down there, you're at 14 the end of the lifting column and there's nothing left 15 for you to grab on and twist except the crawler track. 16 Q. Okay. And Rio doesn't actually tell you how 17 its machine would have to be modified in order to put 18 it down at the bottom, right, in the way that you're 19 suggesting? 20 A. I kind of don't understand the setup of that 21 question, because it's -- it's not -- you know, Rio is 22 not disclosing just a machine; right? We've talked 23 about various embodiments of this technology. That's 24 the way I view patents; right? It's not a specific 25 machine, but it's technology.	Page 34 1 rotary actuator and then the bottom of the rotary 2 actuator would connect to 54. 3 Q. Okay. And is that something Rio discloses or 4 something an engineer is supposed to take from, you 5 know, reading Rio in the way that you suggest? 6 A. Yeah, a person of ordinary skill in the art 7 would know that. This would be adjusted just by 8 sliding the actuator in between the end of the lifting 9 column and the top of the crawler track. Here I'm 10 speaking as sort of the bracket being part of the 11 crawler track, the yoke of the crawler track. 12 Q. And that's -- that's not what's disclosed in 13 Miller, correct, for example? 14 MR. HIGH: Objection. Form. 15 THE WITNESS: Well, Miller has, you know, some 16 slightly different parts, so it's not exactly what's 17 disclosed in Miller, but Miller is disclosing something 18 very similar in it's disclosing a way of connecting the 19 bottom of a lifting column to a rotary actuator which 20 then connects to the top of the crawler track. 21 Q. BY MR. PRICE: Are you sitting on a chair 22 today? 23 A. Yes. 24 Q. Are you sitting on a chair even though you're 25 wearing pants? I assume you're wearing pants?
Page 33 1 And so this is just saying this is a different 2 flavor of our technology. And so when it introduces a 3 new flavor of a technology, it doesn't have to go 4 through every specific implementation detail because 5 they're speaking to a person of ordinary skill in the 6 art, and a POSITA just knows how to attach rotary 7 actuators to two objects. 8 Q. So if we turn to Column 5, Lines 39 through 9 43, and can you tell me when you're there. 10 A. Okay. 11 Q. So this aspect of the machine as disclosed in 12 Rio would have to be modified, right, in order to 13 implement the actuator in the manner that you're 14 suggesting? 15 MR. HIGH: Objection. Form. 16 THE WITNESS: No, this part would work the 17 same. 18 Q. BY MR. PRICE: You wouldn't have to change 19 what is connected to that bracket in order to implement 20 this in a way that satisfies the claims? 21 A. Oh, I see what you're saying. It says that 22 the bottom part is connected to bracket 54, which is 23 the yoke that goes around the crawler track. 24 Yeah, you wouldn't -- you wouldn't connect it 25 to 54 directly. You would connect it to the top of the	Page 35 1 A. How do you know I'm wearing pants? I am. 2 Yes. 3 MR. PRICE: All right. I think it's a good 4 time for a break. 5 THE WITNESS: Okay. Any -- 6 MR. PRICE: Maybe 10 minutes? 7 THE WITNESS: -- particular time? Okay. 8 MR. PRICE: 10 minutes or so. 9 (A recess was taken from 10:52 a.m. to 10 11:03 a.m.) 11 Q. BY MR. PRICE: Dr. Singhose, can you turn to 12 Column 6 of Rio. 13 A. Okay. 14 Q. Around Line 27 begins a paragraph talking 15 about an anti-swing device. Do you see that? 16 A. Yes, I do. 17 Q. What does Rio's anti-swing device do? 18 A. The anti-swing device helps to keep the swing 19 arm in a desired position. 20 Q. Any desired position or particular desired 21 positions? 22 A. Well, it's any desired position that the 23 operator wants to put it in. I'm not sure that the 24 operator can put it in every .1 degree, if that's the 25 question you're asking.

Page 36 1 Like, there may be sort of specific positions 2 that they can put it in, and if the operator desires it 3 to be in one of those, then it locks into that 4 position. 5 Q. And what are those two positions? 6 A. Well, I'm not sure there's just two. You can 7 move the arm to various places. 8 Q. But what does Rio actually say? What two 9 positions? 10 A. Well, it generally talks about a retracted 11 position and a projecting position. So certainly in 12 those two places you could engage it, but I don't see 13 any reason why you couldn't engage it in other places 14 as well. 15 Q. But Rio doesn't disclose engaging it in any 16 other places; right? 17 A. You know, I'm not exactly sure what you mean 18 by discloses. I think that's kind of a legal term. If 19 you're looking for like it exactly expressly says 20 different positions, I don't think it says different 21 positions. 22 But the way it works is that it projects 23 out -- the pin ejects out into a hole or some recess. 24 And so you could put those holes or recesses wherever 25 you want, but it does specifically show them	Page 38 1 transducer to any particular location at the pivot 2 connection for the swing leg and the frame? 3 A. Well, it says it provides an angular position 4 transducer at the pivot connection for the swing leg at 5 the hinge bracket. So it's placing it at the hinge 6 bracket. 7 Q. Is it your position that if it's connected at 8 all to a hinge bracket that it cannot be disposed on 9 the things that the hinge bracket is connected to? 10 MR. HIGH: Objection. Form. 11 THE WITNESS: Can you repeat that question? 12 Q. BY MR. PRICE: Are you construing the term 13 "disposed on" to mean disposed directly on? 14 MR. HIGH: Objection. Form. 15 THE WITNESS: Yeah, I don't think I'm doing 16 any construing here. I'm just using the plain ordinary 17 meaning. I don't really know what directly disposed 18 on. I didn't find that in the specification. Is it in 19 there somewhere? Is that a term that's used in the 20 specification? 21 Q. BY MR. PRICE: No, I'm trying to understand 22 why you think that the hinge plate that's connected to 23 the jack -- to the swing leg and the frame means that 24 something that's on that hinge bracket cannot also be 25 on the hinge bracket -- on the swing leg or the frame.
Page 37 1 corresponding to two positions: the retracted position 2 and the projecting position. 3 Q. Can you open up the '723 patent, please, 4 Exhibit 1001. 5 A. Okay. I have it open. 6 Q. Just give me a moment. 7 Turn to Column 6, Lines 19 through 25. Let me 8 know when you're there. 9 A. Okay. I'm there. 10 Q. Okay. Have you read that paragraph? 11 A. Oh, let me read it. Just a second. 12 Okay. I've read that. 13 Q. Okay. I understand that you take the position 14 that Claims 1 through 7 lack written-description 15 support for a first angular position transducer 16 disposed on the modular frame or the swing leg; is that 17 correct? 18 A. Yes. 19 Q. I don't see this aspect of the disclosure 20 cited in this section. Did you miss it? 21 MR. HIGH: Objection. Form. 22 THE WITNESS: No, I didn't miss it. This 23 seems to sort of reinforce my position. 24 Q. BY MR. PRICE: Does this disclosure limit the 25 positioning of the first -- of the angular position	Page 39 1 MR. HIGH: Objection. Form. 2 Q. BY MR. PRICE: Right? I mean, I -- 3 A. I think I'm just using the plain, ordinary 4 meaning of 'disposed on.' 5 As you hinted before, I'm disposed on this 6 chair, I suppose, but the chair is sitting on the floor 7 and I'm not sitting on the floor; right? I'm -- I'm 8 disposed on the chair. 9 Q. Are your pants part of you? Are your pants 10 part of you? 11 A. Hopefully they stay on me. 12 Q. Are they part of you? 13 A. They're certainly part of my housing that I 14 walk around in -- 15 Q. But they're not part of you. 16 A. -- so when I'm sitting on the chair, you know, 17 obviously I know there's a layer of material between me 18 and the chair, but obviously I'm sitting on the chair. 19 Q. Okay. And so if something is disposed on 20 something else, even though there's an intervening 21 part, are you saying that "disposed on" means something 22 different in the context of the '723 patent? And if 23 so, I'm wondering why that's the case. 24 MR. HIGH: Objection. Form. 25 THE WITNESS: No, I think I'm using the plain

Page 40 1 and ordinary meaning of a phrase "disposed on," as a 2 person of ordinary skill in the art would understand 3 it, and they would understand it to include layers of 4 material, or in the case of a sensor, they would know 5 that would include the housing of the sensor. 6 But they're certainly not going to think that 7 my butt is disposed on the floor. They are going to 8 think it's disposed on the chair. 9 Q. BY MR. PRICE: But you agree that the plain 10 and ordinary meaning of "disposed on" means that you 11 can have intervening material between the thing that is 12 being disposed on and the thing that it is disposed on; 13 correct? 14 MR. HIGH: Objection. Form. 15 THE WITNESS: Yeah. I mean, it depends on the 16 kind of material; right? Like in the case of my pants, 17 obviously that's just a thin material; that's 18 considered part of me as I'm walking around the world. 19 In the case of a sensor, the sensor is 20 normally going to be in a housing, and so a person of 21 ordinary skill in the art would think that if the 22 sensor housing was on something, the sensor would be 23 disposed on that something. 24 Q. BY MR. PRICE: Are there different ways that a 25 pivot connection can be implemented between a swing leg	Page 42 1 "multitude." I would say it's a small number of ways 2 to do it in this application. You have to have a 3 really strong connection, a really reliable connection. 4 So you can't get too esoteric or crazy with that. It's 5 got to be a connection that can support a lot of loads. 6 Q. Is there anything limiting the fixed pivot 7 connection being part of the frame? 8 MR. HIGH: Objection. Form. 9 THE WITNESS: Can you repeat the question? I 10 didn't quite understand it. 11 Q. BY MR. PRICE: Is there anything that limits 12 the disclosure of the '723 patent from having a pivot 13 connection that's integrally part of the frame? 14 MR. HIGH: Same objection. 15 THE WITNESS: I didn't do an analysis for that 16 particular point, to be honest. I was doing my 17 analysis mostly to go along with the claim language 18 that's in there, which requires a hinge bracket. And 19 so the bracket would be the thing that's attaching to 20 the swing leg, and the bracket -- the other side of the 21 bracket is attaching to the frame. 22 MR. PRICE: I don't have any other further 23 questions this morning. 24 Thank you, Dr. Singhose. 25 THE WITNESS: Thank you.
Page 41 1 and a frame? 2 A. Yes. 3 Q. Okay. So do you see that, you know, any part 4 of the '723 patent limiting the way that the pivot 5 connection between the frame and the swing leg is 6 implemented? 7 MR. HIGH: Objection. Form. 8 THE WITNESS: I don't recall there being a 9 specific limitation of these are the only ways that you 10 can do it. There would only be a finite number of ways 11 to do it realistically. And then as we, you know, look 12 at the written description, there's kind of only two 13 ways that it would do it. 14 One is if that pivot pin that the swing leg is 15 pivoting around is either fixed to the bracket and 16 sticks with the bracket or is kind of bolted onto the 17 swing leg and rotates onto the swing leg. 18 So there's only those kind of two variations 19 that fits the written description. One is the fixed 20 rotational pin, and one is a moving rotational pin. 21 Q. BY MR. PRICE: But a person of ordinary skill 22 in the art is aware of a multitude of ways to implement 23 a pivot connection between a frame and a swing leg; 24 correct? 25 A. I don't know exactly what you mean by	Page 43 1 MR. HIGH: Can you give me two minutes? 2 MR. PRICE: Sure. 3 (A recess was taken from 11:17 a.m. to 4 11:19 a.m.) 5 MR. HIGH: No questions here. So I think that 6 concludes the deposition. 7 MR. PRICE: Thank you, Dr. Singhose. 8 Appreciate it. 9 (11:19 a.m.) 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 WILLIAM SINGHOSE, Ph.D.

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