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| 2 | UNITED STATES PATENT AND TRADEMARK OFFICE | |
| 3 | BEFORE THE PATENT TRIAL AND APPEAL BOARD | |
| 4 | | |
| 5 | HTC Corporation, | |
| 6 | HTC America, Inc., | |
| 7 | LG Electronics, Inc., | |
| 8 | Samsung Electronics Co., Ltd., and | |
| 9 | Samsung Electronics America, Inc., | |
| 10 | Petitioners | |
| 11 | V. | |
| 12 | Parthenon Unified Memory Architecture LLC, | |
| 13 | Patent Owner | |
| 14 | | |
| 15 | Case No. IPR2015-01500 (Patent 7,321,368 B2) | |
| 16 | Case No. IPR2015-01501 (Patent 7,777,753 B2) | |
| 17 | Case No. IPR2015-01502 (Patent 7,542,045 B2) | |
| 18 | | |
| 19 | | |
| 20 | DEPOSITION OF HAROLD S. STONE, Ph.D. | |
| 21 | Washington, D.C. | |
| 22 | March 17, 2016 | |
| 23 | | |
| 24 | Reported by: Mary Ann Payonk | |
| 25 | Job No. 105102 | |
| 1 | | |

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| | Page 2 | | Page 3 |
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| 1 | | 1 | APPEARANCES: |
| 2 | | 2 | |
| 3 | | 3 | ON BEHALF OF PETITIONER and THE WITNESS: |
| 4 | | 4 | ALLAN SOOBERT, ESQUIRE |
| 5 | March 17, 2016 | 5 | PAUL HASTINGS |
| 6 | 9:00 a.m. | 6 | 875 15th Street, NW |
| 7 | | 7 | Washington, DC 20005 |
| 8 | Deposition of HAROLD S. STONE, Ph.D., | 8 | - and - |
| 9 | held at the law offices of Paul Hastings LLP, | 9 | JOSEPH RUMPLER, ESQUIRE |
| 10 | 875 15th Street, N.W., Washington, D.C., | 10 | 1117 South California Avenue |
| 11 | pursuant to Notice before Mary Ann Payonk, | | Palo Alto, California 94304 |
| 12 | Nationally Certified Realtime Reporter and | 12 | |
| 14 | Notary Public of the District of Columbia, | 14 | ON BEHALF OF PATENT OWNER: |
| 15 | commonwealth of virginia, States of Maryland | 15 | MICHAEL MCBRIDE, ESQUIRE |
| 16 | and New TOIK. | 16 | AHMAD, ZAVII SANOS, ANAIPAKOS, $ALANLE MENSINC$ |
| 17 | | 17 | 1221 McKinney Street |
| 18 | | 18 | Houston Texas 77010 |
| 19 | | 19 | Houston, Texas 77010 |
| 20 | | 20 | ON BEHALF OF HTC: |
| 21 | | 21 | JOSEPH MICALLEF, ESOUIRE |
| 22 | | 22 | SIDLEY AUSTIN |
| 23 | | 23 | 1501 K Street, NW |
| 24 | | 24 | Washington, DC 20005 |
| 25 | | 25 | |
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| | Page 4 | | Page 5 |
| 1 | Page 4 Appearances (Cont'd): | 1 | Page 5 H. Stone |
| 1 2 | Page 4 Appearances (Cont'd): | 1 2 | Page 5 H. Stone THE REPORTER: Appearances for the |
| 1 2 3 | Page 4 Appearances (Cont'd): ON BEHALF OF LG: | 1 2 3 | Page 5 H. Stone THE REPORTER: Appearances for the record? |
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| 1 | H. Stone | 1 | H. Stone |
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| 2 | MR. SOOBERT: I just want to note | 2 | sanctioning to your counsel to enforce during |
| 3 | an objection for the record. We weren't | 3 | the next break. That's all right. I'm not |
| 4 | served petitioner was not served with | 4 | either, so |
| 5 | a deposition notice pursuant to the | 5 | So I'd like to to begin just sort |
| 6 | Patent Office rules. We object to that | 6 | of talking about a little bit about your |
| 7 | and reserve any relief as appropriate | 7 | background. Do you mind sort of telling me |
| 8 | under the rules. | 8 | let's start with your education, where you went |
| 9 | MR. McBRIDE: Okay, I'll follow up | 9 | to school. |
| 10 | with my office. I'm not sure what | 10 | A. Sure. I was an undergraduate at |
| 11 | happened. Are we able to proceed, | 11 | Princeton University with a degree in |
| 12 | though? | 12 | electrical engineering in 1960. I graduated |
| 13 | MR. SOOBERT: Sure. | 13 | summa cum laude. |
| 14 | BY MR. McBRIDE: | 14 | I received a master's and Ph.D. from |
| 15 | Q. So I guess I'll dive into the most | 15 | the University of California at Berkeley, both |
| 16 | important issue. Are you aware of today's | 16 | in electrical engineering, the master's in 1961 |
| 17 | date? | 17 | and the doctorate in 1963. |
| 18 | A. Yes, I am. | 18 | Q. Any postdoctorate education, any |
| 19 | Q. And you're aware it's St. Patrick's | 19 | other degrees? |
| 20 | Day? | 20 | A. No no degrees after that. |
| 21 | A. Yes, I am. | 21 | Q. Let's move on to your sort of work |
| 22 | Q. Are you wearing green, sir? | 22 | history. Following your Ph.D. in 1963, what |
| 23 | A. No, but my wife's maiden name is | 23 | did you do next? |
| 24 | Murphy. | 24 | A. Well, my first position was a brief |
| 25 | Q. Okay. Well, I'll leave the | 25 | one at Boeing. I decided not to stay in the |
| | | | |
| | Page 8 | | Page 9 |
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| 1 | H. Stone | 1 | H. Stone |
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| 2 | structure that we used and the means of | 2 | of, or does that pretty much sum up in your |
| 3 | programming is is different from what | 3 | mind the the research projects, or at least |
| 4 | evolved. We had to visualize what the future | 4 | the main research projects at Stanford Research |
| 5 | technology was like. And I don't know that we | 5 | Institute? |
| 6 | got it right or wrong; we just had something | 6 | A. Those those are the ones that come |
| 7 | that's different from what evolved. | 7 | to mind now. There may be others. I don't |
| 8 | O. Okay. So I have parallel computing, | 8 | don't mean to leave anything out, but those are |
| 9 | intelligent memory, cellular logic. Anything | 9 | the ones that I can recall right now. |
| 10 | else? I guess we can keep this while you were | 10 | O. Okay. And just just to fill in a |
| 11 | at Stanford Research Institute. | 11 | gap, at least in my notes, what years were you |
| 12 | A. That's right, right. I did work in | 12 | at Stanford Research Institute? |
| 13 | design automation. | 13 | A. 1963 to 1968. |
| 14 | O. And what is design automation? | 14 | O. You mentioned that you published |
| 15 | A. Software for the development of | 15 | papers Do you recall first off how many |
| 16 | computers. My design automation software did | 16 | papers? |
| 17 | layouts for automatic wiring machines. Of | 17 | A It would be in my vitae I I |
| 18 | course that's that's now obsolete but it's | 18 | helieve I can't count right now I et's say |
| 19 | not not terribly different from the layout | 19 | on the order of half a dozen. But don't hold |
| 20 | that goes on at at some level of integrated | 20 | me to that number please |
| 21 | circuit manufacture today when you when you | 21 | O $I_{}$ I won't |
| 22 | lay out the wiring between transistors on a | 22 | Generally speaking do you recall the |
| 23 | on a mask. So I was doing work that's related | 23 | subject matter of those papers? |
| 24 | to things that that happen today | 24 | A I do. One was on callular logic |
| 25 | O Okay Anything else you can think | 25 | A. 1 do. One was on central togic. |
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| 1 | H. Stone | 1 | H. Stone |
|---|---|---|--|
| 2 | A. Indirectly, it did. | 2 | example, and you see a region. Think of that |
| 3 | O. How did it involve it indirectly? | 3 | as your 8 by 8 region with 64 numbers |
| 4 | A. I was working on something called the | 4 | representing those. Now erase that and look |
| 5 | fast Fourier transform. | 5 | again and look at the edges in this room. You |
| 6 | O. Would you mind taking a couple | 6 | see there are edges along the walls, there are |
| 7 | minutes to describe fast Fourier transform? | 7 | edges along shadows and things like that. If |
| 8 | A. Well, surely. Let's consider a | 8 | instead of looking at the pixels, the numbers |
| 9 | picture, an image, and when you represent that | 9 | of the colors. I told you where the edges were |
| 10 | image, you represent it as a set of numbers, as | 10 | and told you where they were spaced. I could |
| 11 | an array of numbers. Each number represents a | 11 | reconstruct that whole picture |
| 12 | color value. And for sake of argument, let's | 12 | O. Okav. |
| 13 | suppose our image is 8 by 8, so there are 64 | 13 | A just by the edges. By knowing |
| 14 | numbers. | 14 | where the edges are and the relative spacing. |
| 15 | It's well known in mathematics that | 15 | I'm telling you the frequencies that are |
| 16 | you don't need to use numbers for pixels to | 16 | involved in that representation. So that's |
| 17 | represent that image. You can use frequencies. | 17 | what the Fourier fast Fourier transform |
| 18 | So I'll explain it briefly, but if I can | 18 | is a way of representing data, and I'm going to |
| 19 | transform those those numbers, those | 19 | use this term "edges" loosely. That's just at |
| 20 | integers of pixels into frequencies, I will get | 20 | a high level for you and me. It's more |
| 21 | exactly the same number of numbers. I will | 21 | accurate to say frequencies. But instead of |
| 22 | have an array of 8 by 8, 64 numbers, each | 22 | looking at the pixels themselves, I'm going to |
| 23 | representing a frequency. | 23 | tell you where the edges are and then you'll be |
| 24 | Now let me explain what's happening. | 24 | able to reconstruct the image. Okay? |
| 25 | Focus on someplace on the wall behind me, for | 25 | So that's I was working on the |
| | | | |
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| | Page 16 | | Page 17 |
| 1 | Page 16 | 1 | Page 17 |
| 1 | Page 16 H. Stone | 1 | Page 17 H. Stone |
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