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Transcript of Regan Zane, Ph.D.

Date: October 7, 2024

Case: Vizio, Inc. -v- Polaris PowerLED Technologies, LLC (PTAB)

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WORLDWIDE COURT REPORTING & LITIGATION TECHNOLOGY

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

3
4 VIZIO, INC.,
5 Petitioner,

6
7 v.

8
9 POLARIS POWERLED TECHNOLOGIES, LLC
10 Patent Owner.

11
12 Case IPR2024-00073
13 U.S. Patent No. 7,843,148

14
15
16 REMOTE DEPOSITION of REGAN ANDREW ZANE, Ph.D.
17 Monday, October 7, 2024
18 11:01 a.m. CST

19
20 Job No.: 554108

21 Pages: 1 - 58

22 Reported By: Michelle M. Yohler, CSR, RMR, CRR

1 The deposition of REGAN ANDREW ZANE, Ph.D.,
2 held remotely pursuant to notice before
3 Michelle M. Yohler, CSR, RMR, CRR, a certified
4 shorthand reporter, CSR No. 84-4531.

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1 A P P E A R A N C E S

2 ON BEHALF OF THE PETITIONER:

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20 ALSO PRESENT:

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1 P R O C E E D I N G S

2 (Technician read-on.)

3 MS. REPORTER: Before I swear the witness
4 in, can I please have all attorneys identify
5 themselves and who they represent for the record.

6 MR. BEMBEN: I'll go first.

7 My name is Richard Bemben. I'm here on
8 behalf of the patent owner today, and I'm with the
9 law firm of Sterne Kessler.

10 MS. SWAROOP: Sheila Swaroop, Knobbe,
11 Martens, Olson & Bear for petitioner and for the
12 witness, Dr. Zane. Also attending with me from
13 Knobbe Martens is my partner, Daniel Kiang.

14 (WHEREUPON, the witness was duly sworn.)

15 REGAN ANDREW ZANE, Ph.D.,
16 called as a witness herein, having been first duly
17 sworn, was examined and testified as follows:

18 EXAMINATION

19 BY MR. BEMBEN:

20 Q Please state your full name for the
21 record.

22 A My full name for the record is Regan

1 Andrew Zane.

2 Q And, Dr. Zane, you understand you're under
3 oath today; is that correct?

4 A That is correct.

5 Q Are you on any medication that would
6 impair your ability to give truthful testimony
7 today?

8 A No, not that I'm aware of.

9 Q Is there any reason that you cannot give
10 truthful testimony today?

11 A No, not that I'm aware of.

12 Q Okay. So I know we've done this before,
13 but let's just go over the ground rules again.

14 I ask that you please provide verbal
15 answers so that the reporter can transcribe our
16 conversation. Is that --

17 A Yes.

18 Q -- okay?

19 Let's try not to speak over each other.
20 I'll let you answer your question if you let me
21 ask my question, please.

22 And I'm here today to ask the questions,

1 and you're here to answer them, of course. You
2 understand that, correct?

3 A That is correct.

4 Q If you don't understand a question that
5 I've asked, please let me know, and I'll try to
6 clarify the question. Okay?

7 A Yes.

8 Q But if you answer a question I have asked,
9 I'll assume that you understood the question; is
10 that fair?

11 A Yes.

12 Q Okay. And you understand that you're here
13 today to testify in IPR2024-00073, which involves
14 U.S. Patent Number 7,843,148? Do you understand
15 that?

16 A Yes.

17 Q Okay. And I'll sometimes, perhaps, refer
18 to that as "the IPR," when I'm referring to the
19 proceeding; is that okay?

20 A Yes.

21 Q And I may refer to the patent as the '148
22 patent. Is that okay?

1 A Yes.

2 Q Okay. And this is your second deposition
3 in this IPR, correct?

4 A That is correct.

5 Q And you provided two declarations in this
6 IPR, which have been previously marked as
7 Exhibit 1003 and Exhibit 1031; is that right?

8 A Yes, I believe that is correct.

9 Q And I understand from Counsel that you
10 have hard copies of those exhibits with you today;
11 is that correct?

12 A Yes.

13 Q And your declarations, Exhibit 1003 and
14 1031, that you have with you here today are
15 unmarked clean copies; is that correct?

16 A Yes.

17 Q Okay. And I understand from Counsel that
18 you have some other documents, exhibits that are
19 in the record today as well; is that correct?

20 A Yes.

21 Q Can you just tell me what those papers or
22 exhibits are.

1 A In addition to the two declarations of
2 mine that you have just mentioned, I also have a
3 copy of the videotaped deposition, the transcript
4 of my previous deposition.

5 And then I also have paper and electronic
6 copies of the '148 patent itself, the Thomas
7 reference that is referred to in this case, and
8 the Zane reference that is referred to in this
9 case.

10 Q Thank you.

11 And, just for the record, the '148 patent
12 is Exhibit 1001, correct?

13 A That is correct.

14 Q The Thomas reference was previously marked
15 as Exhibit 1005, correct?

16 A Yes.

17 Q And I believe the Zane reference is
18 Exhibit 1006; is that correct?

19 A Yes.

20 Q Okay. And, you know, so I'll ask you
21 questions. I'm primarily going to be focusing on
22 your reply declaration, which is Exhibit 1031, but

1 if you need to reference those other documents or
2 another document that hasn't been introduced today
3 but is in the record, you feel you need to
4 reference that for some reason, let me know, and
5 we can introduce that document. Okay?

6 A Yes.

7 Q So can you grab your reply declaration,
8 Exhibit 1031.

9 A Yes, I have it.

10 Q Okay. And can you turn to Page 24.

11 A Yes.

12 Q And that is your signature on Page 24,
13 correct?

14 A Yes.

15 Q And I may refer to this document,
16 Exhibit 1031, as your reply declaration. Do you
17 know what I'm referring to if I say that?

18 A Yes.

19 Q Okay. You can set that aside for a
20 second.

21 I'd like to take a look at Thomas, which
22 is Exhibit 1005.

1 A I have that.

2 Q Okay. And you have read Thomas, correct?

3 A That is correct.

4 Q You understand the Thomas reference,
5 correct?

6 A I believe that is correct.

7 Q Is there anything in the Thomas reference
8 that you don't understand?

9 A Not that I'm aware of at this time, no.

10 Q Okay. Can you take a look at Figure 2 of
11 Thomas.

12 A Yes, I see it.

13 Q Figure 2 shows the modulator 17; is that
14 right?

15 A That is correct.

16 Q Figure 2 shows the shift register 31,
17 correct?

18 A That is correct.

19 Q Figure 2 shows that the shift register 31
20 receives as input the signal E that is the output
21 of the modulator 17; is that correct?

22 A Yes.

1 Q Figure 2 does not show that the shift
2 register 31 receives as input a clock signal,
3 correct?

4 A A clock signal is not drawn on Figure 2.
5 There are many signals and/or inputs that would be
6 inherent or known as part of the shift register
7 that are not shown on this figure, such as a power
8 supply or a clock signal; it is not shown in
9 Figure 2.

10 Q Okay. Let's turn to your declaration, the
11 reply declaration, Exhibit 1031, please.

12 And if you could go to Paragraph 23 and go
13 ahead and review that for me.

14 A I read it.

15 Q In the last two sentences, which are on
16 Page 15 of your declaration, you state, "Because
17 the shift register is shifting the bits
18 concurrently with each new pulse or lack of pulse
19 from E fed into it, the shift register is
20 necessarily receiving a shift signal synchronous
21 with each new clock pulse or lack of pulse from E.
22 That synchronous shift signal is a clock signal."

1 Did I read that correctly?

2 MS. SWAROOP: Counsel, I'm just going to
3 object. I think you misread the sentences so...

4 BY MR. BEMBEN:

5 Q Okay. Let me try that again.

6 A If you could just repeat. Thank you.

7 Q Sure.

8 Okay. You see the last two sentences --
9 let me try it this way: The last two sentences,
10 you're familiar with those sentences?

11 A Yes, I am.

12 Q Okay. So, in your opinion, why does the
13 shift register need to receive a shift signal with
14 each new pulse or lack of pulse from E?

15 A As I have stated in these two sentences,
16 and as we can see in Figure 3 of Thomas, as well
17 as the description of Figure 3 which explains the
18 purpose of using the shift register and the
19 shifting of the signal, in order to generate three
20 additional signals from the modulator output E,
21 the shift register generates the signals F, G, and
22 H by shifting the signal E through the shift

1 register, as I've described in these two
2 sentences.

3 It is clear to me -- I believe it would be
4 clear to any person of ordinary skill in the art
5 at the time -- that in order to shift these
6 signals, a shift signal would be necessary to
7 shift at the time intervals indicated specifically
8 in Figure 3 and as described in the description of
9 Figure 3 in Thomas.

10 You can also recognize -- as I believe
11 your question is why is a shift signal needed --
12 for example, that the signal output E that is
13 indicated from the modulator has no information
14 contained in it.

15 For example, as we see in Figure 3, on the
16 X axis, which is the time axis, at the points B1,
17 C1, D1, there is no information contained in the
18 signal E itself that would indicate the shift time
19 points -- B1, C1, D1, for example -- where the
20 shift register is able to, within these time
21 intervals, based on the shifting which occurs,
22 generate signals F, G, and H.

1 That is why it is my understanding that a
2 shift signal, which would be a clock signal, would
3 be inherent and necessary as part of this shift
4 register to achieve the signals shown in Figure 3.

5 Q Excuse me for paraphrasing, but just to
6 try to, I guess, maybe summarize, is it your
7 opinion that that shift signal is necessary in
8 order to inform the shift register when data is
9 available and when to shift the signals?

10 MS. SWAROOP: Objection to form.

11 BY THE WITNESS:

12 A Well, we may be saying the same thing.
13 But not just that information is ready, but to
14 achieve what Thomas describes -- for example,
15 looking at the description of Figure 3 in
16 column 4, describing the generation looking at
17 column 4, around 33 [as read]: "In determining
18 the time delay between a predetermined number of
19 modulating signals (E, F, G, H) the predetermined
20 time is chosen with respect to the duration of the
21 positive pulses in the first signal (E) so that
22 the input of each modulating signal to its

1 respective set of switches goes high during each
2 period 40."

3 And then later in that same paragraph,
4 it's stated this is accomplished by equally
5 dividing the period 40 by these predetermined
6 number of modulating signals as described here in
7 column 4.

8 So it's more than just when data is
9 available, but it is a requirement that there are
10 predetermined intervals that are used by the shift
11 register to generate, for example, equally
12 dividing the period 40 by the number of signals
13 being generated -- in this case, three additional
14 signals -- which requires a shift signal or a
15 clock that is synchronous to the operation of the
16 modulator, which, in Thomas, means an operation
17 with the modulator such as the pulse with
18 modulator generating signal E.

19 BY MR. BEMBEN:

20 Q And in your answer there, you mention a
21 shift signal or a clock. Are you using those
22 terms synonymously?

1 A The clock signal that I have referred to
2 as being inherent in the shift register as
3 disclosed in Thomas is the signal that is used to
4 shift the bits down the shift register. In that
5 regard, I'm using those terms synonymously.

6 Similarly, this is how the term is used in
7 the '148 patent -- for example, in claim 7, that a
8 clock connected to a shift register for shifting
9 the bits along the shift register -- I'm using the
10 term "clock" in the same way for the behavior that
11 is in Thomas as well as the requirement listed in
12 claim '148 -- of the '148 patent, claim 7.

13 Q Are all shift signals clock signals?

14 A It's a broad question, and I wouldn't know
15 how to answer the question in general.

16 In the context of the shift register of
17 Thomas, the signal that indicates shifting through
18 the shift register would clearly be understood as
19 a clock signal.

20 BY MR. BEMBEN:

21 Q Just in general, though, outside the
22 context of Thomas, are all shift signals clock

1 signals?

2 MS. SWAROOP: Objection to form.

3 BY THE WITNESS:

4 A Again, that's a very broad question. I
5 would have to have context and any detail how it's
6 being used.

7 Generally speaking, in a shift register, a
8 signal that would be considered, for example, a
9 digital signal that would shift bits down the
10 register, that would, generally speaking, meet the
11 description of a clock signal, particularly in the
12 context of the '148 patent in claim 7.

13 BY MR. BEMBEN:

14 Q So you said that a digital signal that
15 would shift bits down the register, that would,
16 generally speaking, meet the description of a
17 clock signal, particularly in the context of the
18 '148 patent in claim 7.

19 But that doesn't mean that all shift
20 signals are clock signals, correct?

21 MS. SWAROOP: Objection to form.

22

1 BY THE WITNESS:

2 A Without context, I really couldn't answer
3 the question other than to say that may be correct
4 because I just don't have the context of what the
5 context of a shift signal is out of context or how
6 it may be used or even what wave shape it may take
7 and in what context we're defining the term
8 "clock" or even "clock signal."

9 We really have to have context to see how
10 these terms are being applied. I believe the term
11 is clear in the context of the '148 patent
12 claim 7. I believe the concept of a clock to
13 shift bits down a shift register as applied to the
14 shift register described in Thomas is also very
15 clear. It would be well-known.

16 BY MR. BEMBEN:

17 Q Is it possible to shift bits along a shift
18 register without using a clock signal?

19 MS. SWAROOP: Objection to form.

20 BY THE WITNESS:

21 A It really depends on what the term "clock
22 signal" is being defined as, what the context is

1 of each of these terms. I would have to have
2 context to review a particular shift register and
3 the signal and how it operates.

4 However --

5 BY MR. BEMBEN:

6 Q By the -- sorry.

7 A However, it would generally be my opinion
8 that a signal that would be, for example, a square
9 wave signal that is input to a shift register or
10 even generated within a shift register that is
11 used to shift the bits along the shift register
12 would be reasonably considered a clock signal.

13 Q So you asked me for context with respect
14 to the use of clock signal. The context that I'd
15 like you to analyze that answer in is the same
16 context that you use "clock signal" in
17 Paragraph 23 of your reply declaration.

18 A And then can you repeat a question then?

19 Q Sure. So using the context "clock signal"
20 as you've stated it in your Paragraph 23 of your
21 reply declaration, is it possible to shift bits
22 along a shift register without using a clock

1 signal?

2 MS. SWAROOP: And, Dr. Zane, if you need
3 to refer to Paragraph 23 of your reply declaration
4 to answer the question, please take the time to do
5 so.

6 MR. BEMBEN: Counsel, please no speaking
7 objections. Thank you.

8 BY THE WITNESS:

9 A My answer to the question is really the
10 same as my previous answers. In Paragraph 23 I am
11 speaking of a clock signal with reference to the
12 shift register of Thomas, in which case it is my
13 opinion that the signal used to shift the bits
14 down the shift register, as described and depicted
15 in Figure 3 of Thomas, is a clock signal, at least
16 in the context of how a clock signal is used in
17 claim 7 of the '148 patent.

18 BY MR. BEMBEN:

19 Q That didn't answer my question.

20 Okay. So in Paragraph 23 when you say
21 "clock signal," what do you mean?

22 A I believe I just stated that. What I'm

1 using a "clock signal" for in Paragraph 23 is a
2 clock signal in the context of Thomas with respect
3 to the signal that is used in Thomas for shifting
4 the data down the shift register 31 in Thomas.

5 Q But I think we agreed earlier that Thomas
6 doesn't disclose a clock signal, correct?

7 MS. SWAROOP: Objection to form.
8 Mischaracterizes his testimony.

9 BY THE WITNESS:

10 A I believe what I stated is that Figure 2
11 in Thomas does not explicitly show a clock signal,
12 but that a clock signal, in my opinion, is
13 inherent in the shift register described in Thomas
14 according to the discussion we just had.

15 BY MR. BEMBEN:

16 Q So I'm trying to understand -- go ahead.
17 Sorry.

18 A Just to complete.

19 That is the context of the clock signal
20 that I'm describing in Paragraph 23.

21 Q Does Thomas show the clock signal in
22 Figure 3 in your opinion?

1 A No. Figure 3, in my opinion, describes
2 the signal E, which is the output of the
3 modulator, and then the signals F, G, and H, which
4 are generated by the shift register using a signal
5 to shift the data through the clocks -- through
6 the shift register of Thomas, which, in my
7 opinion, inherently would require a clock signal.

8 Q Okay. So you just used the term "clock
9 signal" again, and that's what I'm trying to
10 understand, how you're understanding that term in
11 the context of Thomas. So let me ask you this
12 way: In Thomas -- strike that.

13 So you're saying that Thomas inherently
14 discloses a clock signal, correct?

15 A That is correct, as I've described here in
16 Paragraph 23.

17 Q And are you using that term in a way that
18 is different than how a person of ordinary skill
19 in the art would have understood the term "clock
20 signal"?

21 A Not in the context of Thomas. A person of
22 ordinary skill would understand a clock signal in

1 the same way that I've described it in
2 Paragraph 23 with respect to the register -- the
3 shift register described in Thomas.

4 As I've shown here in Paragraph 23, a
5 skilled person would understand that there would
6 be a clock signal as part of that shift register
7 that, as I've stated here, is a shift signal that
8 is synchronous with each new pulse or lack of
9 pulses from E.

10 Q So the clock signal that you're describing
11 in Paragraph 23, is it periodic?

12 A The clock signal as I'm describing it here
13 in Paragraph 23 would be synchronous to the
14 operation of the modulator.

15 Meaning, to the extent that the modulator
16 is operating in a periodic way, which would
17 generally be the case as indicated in Figure 3,
18 the clock signal would follow that same behavior.

19 Q Is it your opinion that the modulator 17
20 in Thomas is receiving a clock signal in order to
21 output signal E?

22 A The modulator 17 may or may not be

1 directly receiving a clock signal, but certainly
2 the waveform that it generates, E, is generated in
3 a fashion that is synchronous to the behavior of
4 the shift register.

5 So either the modulator is receiving also
6 a clock signal or the modulator receives other
7 signals that would be derived and related to the
8 timing of the clock signal that the shift register
9 operates on.

10 Q In your opinion, where does the clock
11 signal that you say is inherent in Thomas, where
12 does that originate?

13 A Within the driver circuit of Thomas.

14 Q And what circuit would create the clock
15 signal?

16 A Any type of common circuit known to a
17 person of ordinary skill in the art for generating
18 a clock signal, as would be known and implemented,
19 associated with the modulator and the shift
20 register.

21 As described in Thomas, quite likely this
22 would be implemented as part of the modulator, but

1 depending on how the box is drawn, it could be
2 considered as a clock or a timing circuit that
3 feeds the modulator and the shift register.

4 Q Can you give me an example of the type of
5 common circuit known to a person of skill in the
6 art for generating the clock signal?

7 A A circuit that has timing and delays can
8 be used for generating a clock signal.

9 Again, a skilled person would be familiar
10 with many options; for example, a circuit that's
11 often known as a 555 timer is a circuit that's
12 commonly used, has been for decades, to generate
13 different forms and types of clock signals or
14 timing signals could be included as part of this
15 modulator.

16 A microcontroller with a -- its own timing
17 circuit can also generate a clock signal as
18 necessary for a volts with modulator and the shift
19 register.

20 Q So is it your opinion that Thomas' shift
21 register has to directly receive a clock signal in
22 order to shift bits?

1 A I don't know what you may be reading into
2 the term "directly receive," but the modulator and
3 the -- its operation to generate the signal E,
4 then the shift register in its operation to shift
5 the bits and generate signals F, G, and H, at
6 least, for example, as shown in Figure 3, it is my
7 opinion that it would require a signal to shift
8 the bits through the register in such a way as to
9 generate the outputs shown in Figure 3.

10 And that signal, which would shift the
11 bits in the shift register, would certainly meet
12 the limitation of claim 7 and the '148 patent of a
13 clock connected to the shift register.

14 Q Are you familiar with the term "strobe
15 signal"?

16 A I would need context to be sure I
17 understand the term.

18 Q Have you ever heard in the context of
19 digital circuit design of a strobe signal?

20 MS. SWAROOP: Objection to form. Object
21 as outside the scope.

22

1 BY THE WITNESS:

2 A Possibly, but I would still need context
3 to know what a strobe signal would be used for or
4 is intending.

5 BY MR. BEMBEN:

6 Q Well, how have you heard the term "strobe
7 signal" used?

8 MS. SWAROOP: Same objections. Outside
9 the scope.

10 BY THE WITNESS:

11 A I don't recall how I've heard or used the
12 term "strobe signal."

13 BY MR. BEMBEN:

14 Q Okay. I'm going to introduce -- bear with
15 me for one second.

16 MR. BEMBEN: There is a document titled
17 "Newton Strobe"; can you please introduce that
18 into the chat.

19 THE TECHNICIAN: Yes. One moment, please.

20 MS. SWAROOP: Do we click on the link then
21 to access it? Or how does that work?

22 THE TECHNICIAN: Counsel, would you like

1 me to present it --

2 MR. BEMBEN: No.

3 THE TECHNICIAN: -- in the chat?

4 MR. BEMBEN: You can just give them a copy
5 of it or give them access to a copy through the
6 chat.

7 THE TECHNICIAN: Copy. One second,
8 please.

9 BY MR. BEMBEN:

10 Q Okay. While he does that, what I'm
11 presenting is Newton's Telecom Dictionary. It's
12 the Fifth Edition, copyright 1999. It's an
13 excerpt from that document.

14 Please let me know when you have access to
15 the copy, Dr. Zane.

16 THE TECHNICIAN: The exhibit has been
17 uploaded.

18 MS. SWAROOP: Let me make my record of
19 objections to this exhibit in terms of
20 authentication, hearsay, incomplete, not an
21 exhibit of record. I'll object on that basis as
22 well. And relevance.

1 BY THE WITNESS:

2 A I have access to the document.

3 THE TECHNICIAN: Counsel, would you like
4 this exhibit marked?

5 MR. BEMBEN: I would. Please mark it as
6 Deposition Exhibit 1.

7 THE TECHNICIAN: Thank you.

8 (WHEREUPON, Zane Exhibit No. 1 was
9 presented to the witness.)

10 BY MR. BEMBEN:

11 Q And it's only four pages, Dr. Zane. You
12 can look through it. It is the cover page, the
13 copyright page, another page at the beginning of
14 the edition, and then Page 749, which includes the
15 definition of "strobe."

16 Go ahead and take a look at Page 749, and
17 let me know when you're ready.

18 MS. SWAROOP: And, Counsel, to be clear as
19 well, to the extent you're intending on using this
20 in surreply, we object to the introduction of any
21 new evidence on surreply and to the use of this
22 exhibit on that basis.

1 MR. BEMBEN: What is the basis of your
2 objection?

3 MS. SWAROOP: The rule against the
4 introduction of new evidence on surreply.

5 MR. BEMBEN: What rule is that?

6 MS. SWAROOP: I don't have the rule
7 number, but I'm happy to look at that on a break,
8 but I just want to make clear our objections to
9 the use of new evidence on surreply.

10 BY THE WITNESS:

11 A I am ready.

12 BY MR. BEMBEN:

13 Q Okay. So do you see the definition of
14 strobe? It says [as read], "A signal that
15 triggers a data reading, transfer, or information
16 or sampling. Such a sampling might be to figure
17 if a circuit is active and, if so, what level of
18 activity is taking place. The sampling process
19 might allow a carrier to bill the user correctly
20 for circuit usage."

21 Do you see that?

22 A I see that.

1 Q So I'll ask you again, have you ever heard
2 of the term "strobe"?

3 A I see it here.

4 MS. SWAROOP: I'm going to, again, object
5 to this line of questioning as outside the scope.
6 BY MR. BEMBEN:

7 Q Do you disagree with this definition of
8 strobe?

9 MS. SWAROOP: Objection to form.
10 BY THE WITNESS:

11 A I don't have any specific disagreement
12 with the definition listed here. Again, I have no
13 context for how this might be used or what it's
14 being used for, but I see what is defined as a
15 signal as a strobe.

16 BY MR. BEMBEN:

17 Q And have you ever heard of the term
18 "strobe" being used in the context that's
19 described in this dictionary?

20 A Not that I recall.

21 MS. SWAROOP: Objection to form. Outside
22 the scope.

1 Go ahead, Dr. Zane.

2 BY THE WITNESS:

3 A Not that I recall. I mean, I may have or
4 may not. I really don't recall.

5 But the concept of what is being described
6 here, an ability, for example, to pole a user --
7 or in this case they're giving an example of an
8 ability to detect if a circuit is active -- I
9 understand what's being listed here.

10 BY MR. BEMBEN:

11 Q Okay. I'd like to go to Paragraph 30 of
12 your declaration, your reply declaration.

13 A Okay.

14 Q In Paragraph 30 you refer to an SPDT
15 switch.

16 Do you see that?

17 A Yes.

18 Q Does SPDT stand for single pole double
19 throw switch?

20 A Yes.

21 Q And would a person of skill in the art
22 have been familiar with SPDT switches?

1 A Yes.

2 Q Can you explain to me what an SPDT switch
3 is?

4 A An SPDT switch -- as shown, for example,
5 in the diagram below Paragraph 30 -- is simply a
6 switch that performs the function that's
7 described.

8 The terminology dates back to any
9 mechanical switch, such as a light socket switch,
10 and has been carried forward and used for many
11 years for electronic circuits implementing that
12 switch in different ways.

13 The single pole double throw switch simply
14 is a switch that makes a connection between one
15 point and, for example, two other points in a
16 circuit.

17 Q So in the circuit shown on Page 19 of your
18 declaration, the two points that the connections
19 are made to are ground and to the programmable
20 voltage reference; is that correct?

21 A That is correct.

22 Q In Paragraph 30 you mention that an SPDT

1 switch contains a transistor; do you see that?

2 A I do.

3 Q Do all SPDT switches contain at least one
4 transistor?

5 A Again, that's a very broad question. I
6 just stated that the terminology dates back to a
7 wide range of solutions.

8 In context, a person of ordinary skill in
9 the art would understand how a single pole double
10 throw switch is being used and implemented. In
11 the context of the Zane reference, I don't think
12 there's any question that a person of ordinary
13 skill would recognize that the single pole double
14 throw switch being indicated would include a
15 transistor.

16 Q In the context of the Zane reference, is
17 it possible to design an SPDT switch that does not
18 include at least one transistor?

19 A I don't know. I'm not aware of one, but a
20 person of ordinary skill would have recognized as
21 a solution appropriate to the implementation shown
22 in the Zane reference; for example, specifically

1 with the waveforms shown as experimental results,
2 which is the context of the implementation shown
3 in Zane.

4 These results show timing waveforms. For
5 example, if we look at the Zane reference,
6 Exhibit 1006 at Figure 6, showing, for example, a
7 set of string current outputs and showing these
8 outputs are being turned on and off according to
9 the operation of the Zane circuit.

10 It also shows the time scale of the
11 waveforms. And also shows the operation of the --
12 of the modulation of those waveforms relative to
13 each other.

14 Additional examples are given in Figure 5,
15 and, in fact, all the figures beyond that point
16 except for Figure 9.

17 In that context, knowing the timing and
18 the description given in Zane for the use of the
19 single pole double throw switch to realize the
20 control of the LED current -- for example, as
21 shown in the paragraph on Page 290 of the
22 reference at experimental setup -- describing that

1 same figure that is under Paragraph 30 of my reply
2 declaration, which is Figure 4 of the Zane
3 reference, clearly indicating how the single pole
4 double throw switch is controlled by the PS-PWM,
5 which is defined as the phase shift pulse with
6 modulation -- module in its operation.

7 So, yes, based on my opinion, a skilled
8 person reading Zane understanding and seeing the
9 results with the timing of the results would
10 recognize it would be implemented using a
11 transistor to achieve those types of results.

12 MS. SWAROOP: And, Counsel, before you go
13 on to the next question, the rule you asked me
14 about is 37 CFR 42.23 Subsection B, which is the
15 rule preventing use of new evidence on surreply.

16 BY MR. BEMBEN:

17 Q So in addition to the at least one
18 transistor, are there other components that the
19 SPDT switch would contain?

20 MS. SWAROOP: Objection to form.

21 BY THE WITNESS:

22 A A skilled person would recognize that

1 there were options for realizing a single pole
2 double throw switch. They may contain a variety
3 of other components. Could be a single integrated
4 circuit. Could simply be one or more transistors.
5 Could also include additional circuitry.

6 But any of these could implement the
7 single pole double throw switch indicated
8 including using only transistors.

9 BY MR. BEMBEN:

10 Q Is it your opinion that the SPDT switch in
11 the Zane reference can include only a single
12 transistor?

13 MS. SWAROOP: Objection to form.

14 BY THE WITNESS:

15 A No, I don't believe I've stated that. And
16 I believe I've just stated the opposite. Any
17 number of components could be included in an
18 implementation of a single pole double throw
19 switch, but a skilled person reading Zane would
20 certainly recognize an implementation to achieve
21 the results of Zane would include at least a
22 transistor.

1 BY MR. BEMBEN:

2 Q My apologies. I misunderstood your
3 answer.

4 So you're saying that it would have at
5 least one transistor, but it could be more than
6 one transistor; is that correct?

7 A That is correct.

8 Q What is the simplest implementation of an
9 SPDT switch that you are aware of?

10 MS. SWAROOP: Objection to form.

11 BY THE WITNESS:

12 A Well, the term "simple" is subjective.
13 Any, you know, variety of circuits could implement
14 a single pole double throw switch.

15 As I've mentioned, one or more
16 transistors; a transistor with a resistor; a
17 single integrated circuit all available at the
18 time of the Zane reference, all commonly known by
19 a person of ordinary skill in the art could be
20 used to realize the single pole double throw
21 switch.

22

1 BY MR. BEMBEN:

2 Q Sitting here today, can you describe to me
3 how a single -- or what the circuit diagram of
4 what single throw -- I'm sorry. Strike that.

5 Sitting here today, can you describe to me
6 how an SPDT switch circuit would look?

7 A Well, yes, I believe I just did. It could
8 look a variety of -- it can look as a variety of
9 solutions, including each of the circuit scenarios
10 and/or a simple single integrated circuit that I
11 just described.

12 Q Fair. Could you draw a SPDT circuit
13 diagram sitting here today?

14 MS. SWAROOP: Objection to form.

15 BY THE WITNESS:

16 A Yes, I could. It's not something I've
17 been asked to consider or analyze or anything that
18 I've shown here for this system, but there are
19 plenty of circuits that could be used for a single
20 pole double throw switch. I could draw any number
21 of them.

22

1 BY MR. BEMBEN:

2 Q Can you pull out a piece of paper and draw
3 one SPDT circuit for me?

4 A Yes, I believe -- although, I only have a
5 mouse with me, but I could probably sketch one
6 using the mouse if there were a sketch option in
7 the white board. Is that what you would like me
8 to do?

9 MR. BEMBEN: Can we do that, Gary?

10 THE WITNESS: It looks like it.

11 THE TECHNICIAN: Yes. One moment, please.

12 BY THE WITNESS:

13 A I have a white board open. Are you able
14 to see it?

15 BY MR. BEMBEN:

16 Q I think so. Are you drawing right now?

17 A I am.

18 Q Yes.

19 You just drew a transistor?

20 A Yes. That is correct.

21 Q Okay.

22 A I apologize for the quality of the figure

1 using a mouse, but here's an example of a single
2 pole double throw switch drawn in the same general
3 diagram as shown in Figure 4 of the Zane
4 reference.

5 Indicating one example of how a skilled
6 person may understand to implement a single pole
7 double throw switch. There are others, of course,
8 that could be implemented. I mentioned this could
9 be implemented using two transistors; so this
10 resistor that I've shown could be replaced by
11 another transistor. It could also be simply a
12 single integrated circuit. One integrated circuit
13 could replace this entire block.

14 There were many integrated circuits
15 available at the time of the Zane reference a
16 skilled person would know that implements similar
17 circuitry inside of them.

18 MR. BEMBEN: Gary, can you mark this as
19 Deposition Exhibit 2, please?

20 THE TECHNICIAN: Yes, one moment.

21 (WHEREUPON, Zane Exhibit No. 2 was
22 presented to the witness.)

1 BY MR. BEMBEN:

2 Q And so, Dr. Zane, you drew a, it looks to
3 be, a MOSFET and a resistor. Those are the
4 components of the SPDT switch that you drew; is
5 that correct?

6 A That is correct.

7 Q Okay. And, just so I'm clear, the node on
8 the left which is connected to the transistor in
9 Figure 4 of the Zane reference, that would be
10 connected to the programmable voltage reference;
11 is that right?

12 A That is correct.

13 Q And the node on the right, that would be
14 connected to RA -- the resistor RA; is that
15 correct?

16 A That is correct.

17 Q And then the node below the resistor, that
18 would be connected to ground; is that correct?

19 A That is correct.

20 Q And I see you are -- are you continuing to
21 draw?

22 A I'm just showing the second example that I

1 had indicated that the resistor as I had drawn
2 could also be replaced by a transistor, as an
3 additional example that I described previously.

4 Q I see. Okay.

5 So in that second example you just drew,
6 you have two MOSFETs of different polarity; is
7 that correct?

8 A That is correct.

9 MR. BEMBEN: So, Gary, can you mark
10 this -- the whole thing as Exhibit 2, please?

11 THE TECHNICIAN: Yes, Counsel.

12 MR. BEMBEN: Thank you.

13 BY MR. BEMBEN:

14 Q So, thank you, Dr. Zane. We can remove
15 the white board as long as we capture that
16 drawing.

17 Going back to Paragraph 30 of your
18 declaration.

19 A I am there.

20 Q So in Paragraph 30, you're proposing to
21 relocate the SPDT switch from the noninverting
22 input of the op amp to a location that's between

1 the op amp's output and the control terminal or
2 base of the transistor Q; is that correct?

3 A That is correct. I've stated that this
4 would be an obvious variation of the circuit
5 disclosed in the Zane reference.

6 Q In your proposed modification, once you've
7 relocated the SPDT switch to the output of the
8 op amp, would you hardwire the programmable
9 voltage reference V program to the resistor RA?

10 MS. SWAROOP: Objection to form. Outside
11 the scope.

12 MR. BEMBEN: I guess let me rephrase that.

13 BY MR. BEMBEN:

14 Q So in your proposed modification, once
15 you've relocated the SPDT switch, what would you
16 replace it with?

17 MS. SWAROOP: Objection to form. Outside
18 the scope.

19 BY THE WITNESS:

20 A The connection would be that the supply or
21 the source Vprog, would be connected directly to
22 the resistor RA. And I believe I've described

1 that, for example, in Paragraph 34.

2 BY MR. BEMBEN:

3 Q Not considering your proposed
4 modification, but as originally designed, can you
5 explain to me how the circuit operates, the
6 circuit Figure 4 shown on Page 19 of the
7 declaration?

8 And you can start with the situation when
9 the reference voltage is connected to the resistor
10 RA.

11 MS. SWAROOP: Objection to form.

12 BY MR. BEMBEN:

13 Q Do you understand what I'm asking,
14 Dr. Zane?

15 A Yes, I believe I do.

16 Q Please continue.

17 A The way that the circuit operates, as I
18 understand a person of ordinary skill would
19 recognize looking at the Zane reference -- in this
20 case we're referring to Figure 4 of the Zane
21 reference as shown here on Page 19 of my reply
22 declaration -- starting in the position where the

1 single pole double throw switch has the supply
2 V_{prog} connected to the resistor R_A , this is at the
3 time when the base shift pulse with modulator is
4 indicating a signal to enable the current to flow
5 through the LED.

6 In that position, the voltage, which is
7 indicated as 1.24 volts, is applied through the
8 resistor R_A to the positive terminal of the
9 op amp, which results in a voltage of essentially
10 1.24 volts applied to the positive terminal of the
11 op amp.

12 The feedback circuit that is associated
13 with the op amp, the transistor Q , and the
14 resistor R_S -- which is our sense resistor -- and
15 the feedback connection through the resistor R_F to
16 the inverting input, the negative input of the
17 op amp, is inoperational.

18 The operation of that op amp circuit, as
19 any skilled person would know, is such that the
20 positive and negative terminals of the op amp are
21 approximately the same when that feedback circuit
22 is active and properly working, which is the

1 expectation here, in which case the negative
2 terminal of the op amp is also at 1.24 volts.
3 Which means that, as a skilled person would
4 understand, the voltage across the resistor R_S is
5 also at approximately 1.24 volts.

6 This means that the current through the
7 LED is -- according to the equation shown in that
8 figure, the LED current is the voltage V_{prog}
9 divided by that resistance, R_S .

10 Now, when the signal PS-PWM changes such
11 that the request is to turn off the current in the
12 LED, the single pole double throw switch changes
13 position. In this position, the circuit in the
14 op amp is essentially disabled such that the
15 voltage across resistor R_S is no longer 1.24 volts
16 but, instead, goes to zero volts.

17 In this case, the voltage across resistor
18 R_S is zero volts, and this means that there is
19 zero current flowing through it. In this case,
20 the LED current is zero.

21 That's the operation of the circuit.

22 Q You mentioned that when the SPDT switch is

1 connecting the programmable voltage reference to
2 the resistor RA, that the voltage at the input of
3 the inverting and noninverting inputs of the
4 op amp are both 1.24 volts; is that correct?

5 A That is correct.

6 Q What is the voltage at the output of the
7 op amp in that situation?

8 A The voltage at the output of the op amp
9 really isn't particularly relevant to the overall
10 operation of the circuit; it is whatever is
11 required. And that's what any skilled person
12 would understand.

13 The behavior here is simply that the
14 op amp is acting as part of a feedback loop. And
15 during this time that feedback loop is activated
16 and the op amp is able to regulate this circuit,
17 the voltage of the output of the op amp is
18 whatever is necessary.

19 Now, if that voltage exceeds the
20 limitations of the op amp, then the op amp would
21 be disabled essentially.

22 But in this case, the signal is clearly

1 understood to be in the range of the op amp, in
2 which case that voltage is whatever voltage is
3 necessary to control the current through the
4 transistor Q, such that it meets the equation that
5 I just described.

6 Q What is the function of the op amp in this
7 circuit?

8 A The op amp is part of a feedback circuit
9 with the op amp, the transistor Q, and the
10 resistor RS, such that when the PS-PWM signal is
11 active, the op amp feedback loop is active and it
12 is controlling the current to the peak value as
13 described by this equation.

14 Q Op amps consume power when they operate;
15 is that correct?

16 A That is correct. Any op amp would be
17 expected to have some current flowing through the
18 VDD pin, as indicated here in this figure, which
19 would typically mean that it has some power
20 consumption.

21 Q And what factors affect the power
22 consumption of an op amp?

1 MS. SWAROOP: Objection.

2 BY THE WITNESS:

3 A It depends entirely on the context, as
4 well as the implementation and operation of the
5 op amp.

6 BY MR. BEMBEN:

7 Q Does the input and output impedance of an
8 op amp affect its power consumption?

9 MS. SWAROOP: Objection to form.

10 BY THE WITNESS:

11 A The power consumption of an op amp is
12 predominantly determined by what is known as the
13 quiescent current in the op amp. This would be
14 listed in any data sheet for an op amp to show
15 what power it would consume just by powering the
16 op amp.

17 And then any additional power consumption
18 would typically depend on the load of the op amp
19 and the frequency that the op amp is operated at.

20 MS. SWAROOP: Counsel, we've been going
21 about an hour, so if there's a good stopping
22 point, maybe it would be a good time for a break.

1 MR. BEMBEN: I want to wrap up this series
2 of questions, please.

3 MS. SWAROOP: Dr. Zane, how are you doing?

4 THE WITNESS: I am okay.

5 MS. SWAROOP: Great.

6 MR. BEMBEN: We can take a break now.

7 That's fine.

8 MS. SWAROOP: How much do you want?

9 MR. BEMBEN: Why don't we go for about ten
10 minutes. Dr. Zane, does that work for you?

11 THE WITNESS: Yes.

12 MR. BEMBEN: Okay. About 1:15.

13 MS. REPORTER: Okay. Off the record.

14 (WHEREUPON, a recess was had.)

15 BY MR. BEMBEN:

16 Q Dr. Zane, does the SPDT switch in Figure 4
17 of the Zane reference have an inherent impedance?

18 MS. SWAROOP: Objection to form.

19 BY THE WITNESS:

20 A The SPDT switch, as shown in the
21 experimental section of the Zane reference, as a
22 skilled person would understand, has very little

1 impact on the operation of the circuit in terms of
2 its impedance. The circuit would behave nearly
3 ideally in most any reasonable implementation of
4 that single pole double throw switch.

5 The implementation of the switch itself --
6 and I described that a person of ordinary skill
7 would understand a wide range of solutions for
8 implementing it -- the implementation itself would
9 have a certain impedance in each of the positions
10 of the switch.

11 A skilled person would recognize that, you
12 know, a wide range of solutions would work just
13 fine in implementing the solution described in the
14 Zane reference from Figure 4.

15 MR. BEMBEN: Thank you, Dr. Zane. I have
16 no further questions.

17 MS. SWAROOP: Thanks. We can go off the
18 record. We'll take a break, and then we can come
19 back on, and I'll let you know if I have any
20 redirect.

21 So can we take maybe 20 minutes?

22 MR. BEMBEN: Okay.

1 MS. REPORTER: Off the record.

2 (WHEREUPON, a recess was had.)

3 EXAMINATION

4 BY MS. SWAROOP:

5 Q Dr. Zane, I just have a few brief
6 questions for you on redirect.

7 So just prior to the break, do you recall
8 being asked a line of questions about how an SPDT
9 switch can be implemented?

10 A Yes.

11 Q And do you recall identifying examples of
12 that implementation including an integrated
13 circuit as one such example?

14 A Yes.

15 Q And can you identify what components would
16 be included in such an integrated circuit?

17 A The components in an integrated circuit
18 solution for the SPDT switch would be similar to
19 my previous responses. They would be using the
20 same or similar components to those I described.

21 As I stated, it is my opinion that that
22 would include at least one transistor, and could,

1 for example, be very similar to the circuitry that
2 I drew but implemented on an integrated circuit.

3 MS. SWAROOP: Thank you. I have no
4 further questions.

5 MR. BEMBEN: Nothing for recross.

6 MS. SWAROOP: So we can go off the record?

7 MR. BEMBEN: Yes.

8 MS. REPORTER: Okay. Off the record.

9 (WHEREUPON, the deposition was concluded
10 at 12:34 p.m. CST)

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ACKNOWLEDGMENT OF DEPONENT

I, REGAN ANDREW ZANE, Ph.D., do hereby
acknowledge that I have read and examined the
foregoing testimony and the same is a true,
correct, and complete transcription of the
testimony given by me and any corrections appear
on the attached errata sheet signed by me.

(SIGNATURE)

(DATE)

1 C E R T I F I C A T E O F R E P O R T E R

2

3 I, MICHELLE M. YOHLER, a Certified
4 Shorthand Reporter within and for the County of
5 Will, State of Illinois, do hereby certify:

6 That previous to the commencement of the
7 examination of the witness, the witness was duly
8 sworn to testify the whole truth concerning the
9 matters herein;

10 That the foregoing deposition transcript
11 was reported stenographically by me, was
12 thereafter reduced to typewriting under my
13 personal direction and constitutes a true record
14 of the testimony given and the proceedings had;

15 That the said deposition was taken
16 remotely before me at the time and place
17 specified;

18 That I am not a relative or employee or
19 attorney or counsel, nor a relative or employee of
20 such attorney or counsel for any of the parties
21 hereto, nor interested directly or indirectly in
22 the outcome of this action.

1 IN WITNESS WHEREOF, I do hereunto set my
2 hand and affix my seal of office at Chicago,
3 Illinois, this 14th day of October, 2024.

4
5
6
7 *Michelle M. Yohler*
8 _____

9 Michelle M. Yohler, CSR, RMR, CRR
10 Certified Shorthand Reporter
11 CSR No.: 84-4531
12

A			
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NEWTON'S TELECOM DICTIONARY

**The Official Dictionary of
Telecommunications & the Internet**

- IP Telephony • LANs & Intranets • Call Centers & Computer Telephony
- Fiber Optics, SONET and DWDM • Satellites
- Voice, Data, Image & Video Networking • Wired and Wireless Telecom • VoIP • T-1, T-3, T-4, E-1, E-3 • ISDN & ADSL • Cable Modems • Cellular, PCS & GSM • Windows 95, 98, NT, NetWare, Apple, Sun & Unix Networking • Ecommerce

Updated
15th
Expanded
Edition

by Harry Newton

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**15th Updated, Expanded and Much
Improved Edition**

Streetsweeper A heavy duty shotgun with a revolving round magazine typically holding 18 12-gauge or 20-gauge shotgun shells. This word crept into a story the Wall Street Journal ran on cellular fraud. When the Feds rang a cellular phone store as a sting operation, one customer offered to trade his streetsweeper in on a phone. That's how dependent Detroit's drug-traffickers had become on cellular phones and beepers.

Stress Puppy A person who thrives on being stressed-out.

String A sequence of elements of the same type, such as characters, considered as a unit (a whole) by a computer. A data structure composed of a sequence of characters, usually in human-readable text.

Striping 1. A RAID (Redundant Array of Inexpensive Disks) term. The process of dividing a large logical block of data into multiple physical blocks of equal size for storage on multiple disk drives. See RAID and REDUNDANT ARRAY OF INEXPENSIVE DISKS.

2. A Fibre Channel definition. Striping is a way of achieving higher bandwidth using multiple N_ports in parallel to transmit a single information unit across multiple levels.

Stroke A signal that triggers a data reading, transfer of information or sampling. Such a sampling might be to figure if a circuit is active and, if so, what level of activity is taking place. The sampling process might allow a carrier to bill the user correctly for circuit usage.

Stroke A straight line or arc that is used as a segment of a graphic character.

Stroke Edge An imaging and OCR term. In character recognition, the line of discontinuity between a side of a stroke and the background, obtained by averaging, over the length of the stroke, the irregularities resulting from the printing and detecting processes.

Stroke Speed In facsimile systems, the number of times per minute that a fixed line perpendicular to the direction of scanning is crossed in one direction by a scanning or recording spot. In most conventional mechanical systems, this is equivalent to drum speed. In systems in which the picture signal is used while scanning in both directions, the stroke speed is twice the above figure.

Stroke Width In character recognition, the distance measured perpendicularly to the stroke centerline between the two stroke edges.

Strong text The HTML character style used for strong emphasis. Certain browsers display this style as bold.

Stronger, Armond The man who invented the telephone dial and the earliest automatic telephone switch as a method of allowing the user to complete calls without using the Operator. In Kansas City in the late 1800's, Ol' Armond was an undertaker who wasn't getting much business. That's because the girlfriend of a rival undertaker was a telephone operator, and when she got a call asking for the local undertaker, she forwarded the calls to her boyfriend. This story may or may not be apocryphal. But it's a great story.

Structured Query Language SQL. A relational database language (ANSI Standard) that consists of a set of facilities for defining, manipulating and controlling data.

Structured Programming A technique for organizing and coding (computer) programs in which a hierarchy of modules is used, each having a single entry and a single exit point, and in which control is passed downward through the structure without unconditional branches to higher levels of the structure. Three types of control flow are used: sequential, test, and iteration.

Structured Wiring As data flows have sped up in recent

years and as moves, adds and changes have proliferated, so the erstwhile idea of wiring up a building with plain old analog voice telephone wire has become no longer intelligent. The idea then came up of defining wiring standards and flexible schemes so that a user could feel comfortable about choosing a complete solution for wiring phones, workstations, PCs, LANS and other communicating devices throughout the building, the campus, the network, the company and throughout his life in the place. Consistency of design, flexible layout and logic are the keys to structured wiring systems. Typically a structured wiring system consists of two elements:

1. Manufacturer-originated standard components that link wires together in a systematic, intelligent way.
2. A set of rules for building smart wiring. The ANSI/TIA/EIA-568-A and ISO/IEC 11801 standards specify the minimum requirements for telecommunications cabling within a commercial building. The Commercial Building Telecommunications Wiring Standard is available from Global Engineering Documents, Englewood CO 314-726-0444 / 800-854-7179.

A structured cabling system will improve performance in five ways, according to Anixter, a leading supplier of structured wiring systems:

1. It eases network segmentation, the job of dividing the network into pieces to isolate and minimize traffic, and thus congestion.
2. It ensures that proper physical requirements, such as distance, capacitance, and attenuation are met.
3. It means adds, moves, and changes are easy to make without expensive and cumbersome rewiring.
4. It radically eases problem detection and isolation.
5. It allows for intelligent, easy and computerized tracking and documentation.

"Structure" brings order to what has often been an afterthought — wiring. The main pieces of a structured wiring system are:

1. Drop cable. The cable that runs from the computer to a network outlet.
2. Cable run. The cable that runs from the outlet to the wiring closet.
3. Patch panel. A board that collects all the cable runs in one place and "patches" them to different parts of the wiring concentrator. Network managers (users or their secretaries, it's that simple) change the LAN layout by plugging and unplugging "patch cables" between the patch panel and the wiring concentrators. No rewiring is necessary to move one user from one network segment to another.
4. Wiring concentrator. It makes the network connections. Some wiring concentrators are dumb, making only physical connections between network segments. Others are intelligent, making networking decisions and providing network diagnostics. A wiring concentrator can have bridges and routers that divide the network into segments. It can have the hardware necessary to change from one media, say twisted pair, to another, say fiber optic. And it can contain the hardware to change from one network type to another, say from Ethernet to Token Ring.

Here is a glossary of structured wiring words, with thanks to Anixter.

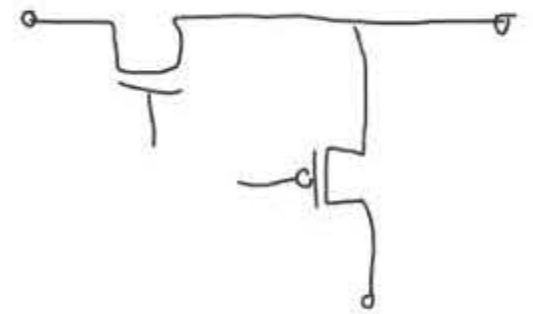
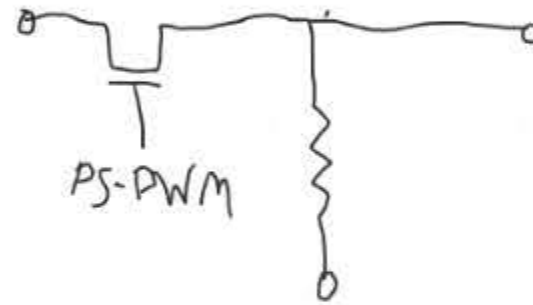
Access Method

The method of "communicating" on the wire. Examples include Ethernet, Token

Ring, AppleTalk, AS400 and 3270.

Cable Type (Media)

The type of cable used in the system. Examples are coaxial,



Regan Zane

