United States District Court,
E.D. Texas, Marshall Division.

POSITIVE TECHNOLOGIES INC,
Plaintiff.
v.
TOSHIBA AMERICA CONSUMER PRODUCTS, L.L.C., et al,
Defendants.

Civil Action No. 2:07-CV-67

July 1, 2008.

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MEMORANDUM OPINION AND ORDER

T. JOHN WARD**, District Judge.**

After considering the submissions and the arguments of counsel, the court enters the following order concerning the claim construction issues:

I. Introduction and Background

Plaintiff Positive Technologies Inc. ("Positive") accuses Defendants Toshiba America Consumer Products, L.L.C. and LG Display Co., Ltd. (collectively, "Defendants") of infringing claims 1, 56 and 61 of United States Patent No. 5,280,280 ("the '280 patent"); claims 7, 17, 19, 22 and 32 of United States Patent No. 5,444,457 ("the '457 patent"); and claims 1, 10 and 20 of United Stated Patent No. 5,627,558 ("the '588 patent"). The '558 patent is a continuation of the '457 patent, which is a continuation of the '280 patent. All three patents-in-suit (collectively, "the Hotto patents") claim an effective filing date of May 24, 1991 and list Robert Hotto as the sole inventor. The '280 patent issued on January 18, 1994; the '457 patent issued on August 22, 1995; and the '558 patent issued on May 6, 1997. The patents-in-suit, therefore, share a materially identical specification.

The '280 patent is directed to the control and driving of matrix addressable electro-optic displays, such as LCDs. The abstract of the patents states:

This invention relates to an improved drive and control means for matrix addressable electro-optic displays, such as passive matrix LCDs and active matrix LCDs. The present invention achieves improved drive and control of displays through the use of real time computation and memory circuits to simulate the electro-optic condition and the accumulated DC bias of individual display elements. This eliminates the burden of frequent and symmetrical reversals of the drive polarity, and allows the implementation of flexible DC drive methodologies.

'280 Patent at Abstract.

In general, the claims are directed to a driving and control technique for use in driving electro-optic displays. Asserted claim 1 of the '280 patent provides:

Claim 1

1. A system for displaying a demanded image in an array of pixels, wherein said array of pixels is driven to produce said demanded image, wherein said pixels operate within a range of controllable driven gray levels, the gray level displayed by each of said pixels responsive to electric fields applied to each of said pixels; said system comprising:

memory means for storing electro-optic conditions of pixels in said array;

driver means for applying drive signals to selective pixels; and

means for controlling the level of said drive signals applied to a pixel responsive to the demanded image and to the stored electro-optic condition existing on said pixel.

'280 Patent at 23:33-47.

II. General Principles Governing Claim Construction

"A claim in a patent provides the metes and bounds of the right which the patent confers on the patentee to exclude others from making, using or selling the protected invention." Burke, Inc. v. Bruno Indep. Living Aids, Inc., 183 F.3d 1334, 1340 (Fed.Cir.1999). Claim construction is an issue of law for the court to decide. Markman v. Westview Instruments, Inc., 52 F.3d 967, 970-71 (Fed.Cir.1995) (en banc), *aff'd,* 517 U.S. 370, 116 S.Ct. 1384, 134 L.Ed.2d 577 (1996).

To ascertain the meaning of claims, the court looks to three primary sources: the claims, the specification, and the prosecution history. Markman, 52 F.3d at 979. Under the patent law, the specification must contain a written description of the invention that enables one of ordinary skill in the art to make and use the invention. A patent's claims must be read in view of the specification, of which they are a part. *Id*. For claim construction purposes, the description may act as a sort of dictionary, which explains the invention and may define terms used in the claims. *Id*. "One purpose for examining the specification is to determine if the patentee has limited the scope of the claims." Watts v. XL Sys., Inc., 232 F.3d 877, 882 (Fed.Cir.2000).

Nonetheless, it is the function of the claims, not the specification, to set forth the limits of the patentee's claims. Otherwise, there would be no need for claims. SRI Int'l v. Matsushita Elec. Corp., 775 F.2d 1107, 1121 (Fed.Cir.1985) (en banc). The patentee is free to be his own lexicographer, but any special definition given to a word must be clearly set forth in the specification. Intellicall, Inc. v. Phonometrics, 952 F.2d 1384, 1388 (Fed.Cir.1992). And, although the specification may indicate that certain embodiments are preferred, particular embodiments appearing in the specification will not be read into the claims when the claim language is broader than the embodiments. Electro Med. Sys., S.A. v. Cooper Life Sciences, Inc., 34 F.3d 1048, 1054 (Fed.Cir.1994).

This court's claim construction decision must be informed by the Federal Circuit's decision in Phillips v. A WH Corporation, 415 F.3d 1303 (Fed.Cir.2005) (en banc). In *Phillips,* the court set forth several guideposts that courts should follow when construing claims. In particular, the court reiterated that "the *claims* of a patent define the invention to which the patentee is entitled the right to exclude." 415 F.3d at 1312 (emphasis added) (*quoting* Innova/Pure Water, Inc. v. Safari Water Filtration Systems, Inc., 381 F.3d 1111, 1115 (Fed.Cir.2004)). To that end, the words used in a claim are generally given their ordinary and customary meaning. *Id*. The ordinary and customary meaning of a claim term "is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention, i.e., as of the effective filing date of the patent application." Id. at 1313. This principle of patent law flows naturally from the recognition that inventors are usually persons who are skilled in the field of the invention. The patent is addressed to and intended to be read by others skilled in the particular art. *Id*.

The primacy of claim terms notwithstanding, *Phillips* made clear that "the person of ordinary skill in the art is deemed to read the claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification." *Id*. Although the claims themselves may provide guidance as to the meaning of particular terms, those terms are part of "a fully integrated written instrument." *Id*. at 1315 (*quoting* Markman, 52 F.3d at 978). Thus, the *Phillips* court emphasized the specification as being the primary basis for construing the claims. *Id*. at 1314-17. As the Supreme Court stated long ago, "in case of doubt or ambiguity it is proper in all cases to refer back to the descriptive portions of the specification to aid in solving the doubt or in ascertaining the true intent and meaning of the language employed in the claims." Bates v. Coe, 98 U.S. 31, 38, 25 L.Ed. 68 (1878). In addressing the role of the specification, the *Phillips* court quoted with approval its earlier observations from Renishaw PLC v. Marposs Societa' per Azioni, 158 F.3d 1243, 1250 (Fed.Cir.1998):

Ultimately, the interpretation to be given a term can only be determined and confirmed with a full understanding of what the inventors actually invented and intended to envelop with the claim. The construction that stays true to the claim language and most naturally aligns with the patent's description of the invention will be, in the end, the correct construction.

Consequently, *Phillips* emphasized the important role the specification plays in the claim construction process.

The prosecution history also continues to play an important role in claim interpretation. The prosecution history helps to demonstrate how the inventor and the PTO understood the patent. Phillips, 415 F.3d at 1317. Because the file history, however, "represents an ongoing negotiation between the PTO and the applicant," it may lack the clarity of the specification and thus be less useful in claim construction proceedings. *Id*. Nevertheless, the prosecution history is intrinsic evidence. That evidence is relevant to the

determination of how the inventor understood the invention and whether the inventor limited the invention during prosecution by narrowing the scope of the claims.

Phillips rejected any claim construction approach that sacrificed the intrinsic record in favor of extrinsic evidence, such as dictionary definitions or expert testimony. The *en banc* court condemned the suggestion made by Texas Digital Systems, Inc. v. Telegenix, Inc., 308 F.3d 1193 (Fed.Cir.2002), that a court should discern the ordinary meaning of the claim terms (through dictionaries or otherwise) before resorting to the specification for certain limited purposes. *Id*. at 1319-24. The approach suggested by *Texas Digital*-the assignment of a limited role to the specification-was rejected as inconsistent with decisions holding the specification to be the best guide to the meaning of a disputed term. *Id*. at 1320-21. According to *Phillips,* reliance on dictionary definitions at the expense of the specification had the effect of "focus[ing] the inquiry on the abstract meaning of words rather than on the meaning of the claim terms within the context of the patent." *Id*. at 1321. *Phillips* emphasized that the patent system is based on the proposition that the claims cover only the invented subject matter. *Id*. What is described in the claims flows from the statutory requirement imposed on the patentee to describe and particularly claim what he or she has invented. *Id*. The definitions found in dictionaries, however, often flow from the editors' objective of assembling all of the possible definitions for a word. *Id*. at 1321-22.

Phillips does not preclude all uses of dictionaries in claim construction proceedings. Instead, the court assigned dictionaries a role subordinate to the intrinsic record. In doing so, the court emphasized that claim construction issues are not resolved by any magic formula. The court did not impose any particular sequence of steps for a court to follow when it considers disputed claim language. *Id*. at 1323-25. Rather, *Phillips* held that a court must attach the appropriate weight to the intrinsic sources offered in support of a proposed claim construction, bearing in mind the general rule that the claims measure the scope of the patent grant.

The Hotto patents include claim limitations that fall within the scope of 35 U.S.C. s. 112 para. 6. Section 112 para. 6 states "[a]n element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure ... in support thereof, and such claim shall be construed to cover the corresponding structure ... described in the specification and equivalents thereof." 35 U.S.C. s. 112 para. 6 (2007). The first step in construing a means-plus-function limitation is to identify the recited function. *See* Micro Chem., Inc. v. Great Plains Chem. Co., 194 F.3d 1250 1258 (Fed.Cir.1999). Then, the court must identify in the specification the structure corresponding to the recited function. *Id*. The "structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim." Medical Instrumentation and Diagnostics, Corp. v. Elekta AB, 344 F.3d 1205, 1210 (Fed.Cir.2003) (*citing* B. Braun v. Abbott Labs., 124 F.3d 1419, 1424 (Fed.Cir.1997)).

The patentee must clearly link or associate structure with the claimed function as part of the quid pro quo for allowing the patentee to express the claim in terms of function pursuant to s. 112 para. 6. *See* id. at 1211; *see also,* Budde v. Harley-Davidson, Inc., 250 F.3d 1369, 1377 (Fed.Cir.2001). The "price that must be paid" for use of means-plus-function claim language is the limitation of the claim to the means specified in the written description and equivalents thereof. *See* O.I. Corp. v. Tekmar Co., 115 F.3d 1576, 1583 (Fed.Cir.1997).

If a patent purports to use software as the structure to perform the claimed function, a failure to associate that software with the recited function constitutes a failure to particularly point out and claim that particular

structure as a means of performing the function. *See* Medical Instrumentation and Diagnostics Corp., 344 F.3d at 1211. Further, it is "important to determine whether one of skill in the art would understand the specification itself to disclose the structure, not simply whether that person would be capable of implementing the structure. *See* Atmel Corp. v. Info. Storage Devices, Inc., 198 F.3d 1374, 1382 (Fed.Cir.1999). Fundamentally, it is improper to look to the knowledge of one skilled in the art separate and apart from the disclosure of the patent. *See* Medical Instrumentation and Diagnostics Corp., 344 F.3d at 1211. The court now turns to a discussion of the disputed claim terms.

III. Disputed Constructions

1. electro-optic conditions of pixels in said array

Positive proposes "electro-optic conditions, such as gray scale levels, of pixels in a display." The defendants propose "both electrical and optical conditions existing on a pixel."

Positive argues that this term "is neatly described in the specification [ ]" to refer to the gray scale levels of pixels in a display. Opening Brief at 6 (citing the '280 Patent at 4:8-20 (describing the "electro-optic turn on curve" which "shows the relationship between applied voltage and gray level"); 6:58-65 (The summary of the invention describes memory means for storing representations of the current electro-optical conditions of the pixels); and 15:1-16 (the specification describes the "simulated image array," which stores values representing the gray levels of the pixels of a display)).

The defendants argue that this term is a truncation of "electrical" and "optical" and their proposed construction reflects this fact. The specification does not support the defendants' argument. The patent makes a distinction between certain electrical conditions, e.g. DC bias, and electo-optical condition. *See* '280 Patent at 1:66-2:3 ("Aspects of the display which are simulated in the present invention include the existing electro-optical condition of the pixels, the accumulated DC bias on the pixels, and the difference between the existing condition of the display and the most recent demanded image").

The intrinsic record supports the concept that electro-optics refers to display opacity at a given voltage. The y-axis of the graph in Figure 6 is label "opacity (gray level) of pixel," and the specification describes the "[a]pplication of an electrical pulse to a pixel causes the energy level of the pixel to rise, thereby increasing the opacity of the pixel (see FIG. 6)." *See* ' 280 Patent at 22:5-7. Moreover, the patent teaches that the electro-optic condition is where the pixel currently resides on one of the turn-on or turn-off curves shown in Figure 4. *Id*. at 13:19-22. ("FIG. 4 illustrates the relationship between the voltage applied to a liquid crystal pixel and the opacity of the pixel, and how that relationship changes with changing ambient temperature"). FN1 For these reasons, the court construes "electro-optic conditions of pixels in said array" to mean "the grey scale level of pixels in said array resulting from the application of a voltage to the pixels."

FN1. The court notes that multiple curves are shown in Figure 4 to illustrate the role temperature plays in the electro-optic condition of a pixel. This figure, however, also illustrates that, at a given temperature (e.g.$(tau)_1$), the opacity is a function of the applied voltage.

2. memory means for storing electro-optic conditions of pixels in said array FN2

FN2. For each means-plus-function limitation, Positive's proposed constructions include a section entitled "The claim element covers." The court explicitly rejects these proposed summary of the scope of these

limitations.

The parties agree that this limitation should be construed as a means-plus-function limitation. The parties disagree as to the claimed function. Positive proposes that the recited function "storing electro-optic conditions of pixels in said array" requires no further construction. The defendants propose construing the recited function as "storing both the electrical and optical conditions existing on pixels" by incorporating their proposed construction of "electro-optic condition."

The defendants' proposed construction of the recited function is unnecessary. The recited function is "storing electro-optic conditions of pixels in said array." The term "electro-optic conditions of pixels in said array" means "the grey scale level of pixels in said array resulting from the application of a voltage to the pixels," as discussed above. The addition of the term "storing" recites a well-understood function to one of skill in the art. No additional construction of this recited function is required.

With respect to the corresponding structure, Positive proposes that the RAM memory 16 is the corresponding structure for this limitation. Defendants propose that the corresponding structure should include a RAM memory "partitioned into a first part for storing computed current gray levels displayed at the pixels and a second part for storing the computed current bias accumulated at the pixels, which correspond to the format of the pixels of the display." Response Brief at 15-16, citing '280 Patent at 14:64-68.

The specification clearly links the storage of the electro-optic conditions of the display to the RAM memory 16. *See, e.g.,* '280 Patent Fig. 1; 14:10-13; and 15:1-16. "While corresponding structure need not include all things necessary to enable the claimed invention to work, it must include all structure that actually performs the recited function." *See* Default Proof Credit Card System, Inc. v. Home Depot U.S.A., Inc., 412 F.3d 1291, 1298 (Fed.Cir.2005). Defendants attempt to include unnecessary limitations on the way in which the memory is to be partitioned or organized. They also incorrectly attempt to read in an algorithm for "storing." FN3 The court concludes that it is the RAM memory 16 is the corresponding structure for the function "storing electro-optic conditions of pixels in said array." FN4

FN3. The defendants make a *WMS Gaming* argument that the corresponding structure should include: "a microcontroller programmed to execute Block 68 (Update Simulated Image Array) and Block 69 (Update Bias Violation Array) in FIG. 7, because the specification identifies 'the simulated gray levels and bias violation levels of the pixels are updated (block 68 and 69) and stored in the corresponding locations in RAM memory 16.' " The court rejects this argument, as the specification clearly links RAM memory 16 to the recited function of storing.

FN4. For each means-plus-function limitation, pursuant to 112 para. 6, the claim covers the identified corresponding structure and its equivalents.

3. selective pixels

Positive proposes this term be construed as "selected pixels." The defendants propose "selected picture elements from the image being displayed."

The defendants argue that this term relates to the patents' teaching of driving only the pixels which have reached a DC bias threshold or have met a particular decay condition. While the patent teaches the ability to not drive all of the pixels during each frame cycle, it discloses an embodiment that uses this addressing technique. *See* '280 Patent at 10:23-10:35. Moreover, the term "selective pixel" does not provide textual reference to import the defendants' proposed limitations into the claim. *See* MBO Laboratories, Inc. v. Becton, Dickinson & Co., 474 F.3d 1323, 1330-31 (Fed.Cir.2007) ("[n]one of the disputed terms ... can reasonably be construed to impose the simultaneously-safety requirement" even though the court recognized that the "patentee has clearly indicated via the specification and the prosecution history that the invention provides, as an essential feature, immediate needle safety upon removal from the patient").

The court, therefore, construes the term "selective pixels" means "selected pixels."

4. drive signals

Positive proposes that this term does not need to be construed. The defendants propose that this term be construed to mean "non-alternating voltages, selectively changing polarity based on an exceptional condition of a pixel."

The defendants' proposed construction could be taken as ambiguous, specifically, a "non-alternating voltage" that "chang[es] polarity." At the claim construction hearing, the defendants clarified that their use of the term "non-alternating" means that the polarity does not change on every cycle, i.e. from frame to frame. *See* Claim Constr. Hr'g Tr. at p. 109. With this understanding, the court views the defendants as advancing two distinct position: (1) that the patentee disclaimed "drive signals" that changes polarity on every cycle, and (2) the term "drive signals" encapsulates the concept of "maximum bias violation tolerance" (or "MBVT"), i.e. the polarity is changed based on an exceptional condition of the DC bias level of the pixel. The court rejects both arguments.FN5

FN5. The court also rejects the broader argument made by the defendants that the specification supports limiting all of the claims to require the described concepts of MBVT and DC bias monitoring.

The defendants, however, are correct that the patentee has made a clear disclaimer in light of the prior art. The specification is replete with support that the drive signals of this invention do not include predetermined periodic changes in the polarity of the voltages applied to the pixels. The patent clearly and unequivocally disclaims drive signals that reverse polarity for every frame or every fixed number of frames in a predetermined manner. *See e.g.,* '280 Patent at 1:39-49, 2:12-15, 6:52-53, 7:39-41 and 8:45-51. A disclaimer of subject matter arises when a patentee characterizes his invention in the patent specification as having a feature that is distinct from the prior art. *See* SafeTCare Manufacturing Inc. v. Tele-Made Inc., 497 F.3d 1262, 1270 (Fed.Cir.2007). For example, a system that generates a drive signal that changes polarity at a set number of frames, or with any predetermined period, would fall outside the scope of this invention's "drive signals."

The term "drive signals" means "voltages that do not change polarity in a predetermined and periodic fashion."

5. driver means for applying drive signals to selective pixels

Positive proposes that this phrase should not be construed as a means-plus-function limitation. The defendants propose that this limitation should be construed as a means-plus-function limitation.

As an initial matter, this limitation is in means-plus-function format. The language of the limitation does not recite sufficient structure to rebut the presumption that the term "means" invokes 35 U.S.C. 112 para. 6. The function of this limitation is "applying drive signals to selective pixels."

The parties agree that column driver 26 and row driver 24 are corresponding structure. *See* Joint Claim Construction Chart at 4-5. The defendants argue that based on the arrow drawn between the column and row drivers in Figure 1 that these elements must be connected in series. Nothing in the text of the patent supports this conclusion. Rather, the column and row drivers must be "connected together" and both are "connected to microcontroller 12" '280 Patent 14:41-46.

In addition to the column and row drivers, the microcontroller 12 is necessary structure to perform the recited function. *See e.g.,* '280 Patent at 16:14-57 ("The MCU [microcontroller] 12 communicates the drive patterns and signals to the row and column drivers 24 and 26"); 18:36-39 ("[t]he MCU 12 then generates a drive pattern that will be applied to the row and column electrodes through the row and column drivers 24 and 26"); and 16:14-57 ("[T]he MCU 12 ... makes the corresponding drive signals available on the output drive lines which are connected to the row and column electrodes of the LCD 10.").

With respect to a disclosed algorithm, the flowchart in Figure 7 is sufficient disclosure to satisfy *WMS Gaming*. "In a means-plus-function claim in which the disclosed structure is a computer, or microprocessor, programmed to carry out an algorithm, the disclosed structure is not the general purpose computer, but rather the special purpose computer programmed to perform the disclosed algorithm." WMS Gaming, Inc. v. Int'l Game Tech., 184 F.3d 1339, 1349 (Fed.Cir.1999). Specifically, the "Generate Drive Pattern" block 66 is clearly linked to the recited function:

These intensity requirements for the individual pixels are necessary for the next operation, which is "generate drive pattern" (block 66). To generate the drive pattern, the MCU 12 must set up a sequence of drive voltages at the electrodes which produces the desired voltages at the individual pixels. The drive pattern is converted to a sequence of bit patterns which are stored in memory that, when loaded into the drive circuit (HV04), will synthesize the desired drive pattern.

'280 Patent at 19:18-26.

For these reasons, the corresponding structure is column driver 26, row driver 24, and microprocessor 12 programmed to execute the algorithm represented by block 66.

6. means for controlling the level of said drive signals applied to a pixel responsive to the demanded image and to the stored electro-optic condition existing on said pixelFN6

FN6. Though not separately briefed, Positive argues that the construction of this limitation should also be applied to the following limitations (as laid out in Appendix A to its Opening Claim Construction Brief):
(1) "means responsive to said simulation of the existing electro-optic condition of said pixels and to a demanded image for producing drive signals for said pixels to produce said demanded image" (claim 56 of the ' 280 patent);
(2) "real time control means for driving each of said pixels by a drive signal level related to the specific

simulated and demanded electro-optic conditions on said pixel" (claim 61 of the '280 patent);
(3) "second means responsive to the signals from the first means for the individual ones of the elements in the display means and to the images displayed in such individual ones of the elements in the display means for producing signals representing the changes to be provided in such images from such individual ones of the elements" (claim 32 of the '457 patent); and
(4) "driver means responsive to said signals from said first and second means for said individual ones of said pixels for driving said individual ones of said pixels in real time to produce said demanded display" (claim 20 of the '558 patent).

The parties address numerous limitations in their respective appendices to the motions. As with this limitaion, the parties appear to agree that these limitations are sufficiently similar in the issues presented to the court. The court views the briefed terms as representative of the identified limitations for purposes of claim construction.
The parties agree that this limitation should be construed as a means-plus-function limitation. Positive proposes that the recited function does not require construction. Defendants propose the function be construed to be "controlling the level of the non-alternating voltages, selectively changing polarity based on an exceptional condition of a pixel, applied to each pixel responsive to the input gray level for the pixel and both the stored electrical and optical conditions existing on the pixel." The defendants' proposal simply incorporates their proposed constructions for the terms "drive signals" and "electro-optic condition" into the recited function.

The court rejected defendants' proposed constructions for these two terms. By doing so, the court has resolved the parties' dispute as to the meaning of the recited function in this limitation. Absent a showing that a dispute remains, the court identified the recited function as "controlling the level of said drive signals applied to a pixel responsive to the demanded image and to the stored electro-optic condition existing on said pixel."

Positive argues that the corresponding structure to this limitation is microprocessor 12, ROM 14, RAM 16, and the process described in the '280 Patent at 15:58-17:25. Defendants argue that the structure "should include the disclosed microcontroller programmed to execute Block 65 (Generate Difference Array), Block 66 (Generate Drive Pattern), Block 68 (Update Simulated Image Array), Block 69 (Update Pixel Bias Violation Array), "Pixel Power Modulation," "Selective Real Time Drive Sequencing," Block 73 (Generate Difference Array using RMS), Block 74 (Reverse Polarities of Bias Violation Variables) and Block 75 (Generate Drive-Pattern RMS Type) and a ROM memory storing the routines corresponding Blocks 65, 66, 68, 69, 73, 74, and 75."

Defendants' proposed limitation that the routines reside on the ROM memory is unsupportable. The location of the algorithms is not necessary structure to preform the recited function. *See* Default Proof, 412 F.3d at 1298 ("[w]hile corresponding structure need not include all things necessary to enable the claimed invention to work, it must include all structure that actually performs the recited function"). The defendants are correct that the corresponding structure should include the algorithms necessary for the microprocessor 12 to perform the recited function.

The defendants, however, identify more algorithms than are necessary to "controlling the level of said drive signals...." The algorithms that microprocessor 12 must execute are the routines represented by blocks 65 and 66 of Figure 7. *See, e.g.,* '230 Patent at 19:14-26. The court rejects the defendants' proposal to include

more of the algorithms depicted in Figure 7.

For these reasons, the corresponding structure is microprocessor 12 programmed to execute the algorithms represented by blocks 65 and 66; ROM 14; and RAM 16.

7. simulation means for simulating the existing electro-optic condition of said pixels

The parties agree that this limitation should be construed as a means-plus-function limitation. Positive proposes that the recited function, "simulating the existing electro-optic condition of said pixel," does not need further construction. The defendants propose the function be construed to mean "computing and storing both the electrical and optical conditions existing on the pixel."

This limitation is directed toward simulating the electro-optic condition of the pixel, as opposed to the other characteristics taught by the patent. *See* ' 280 Patent at 1:66-2:3 ("[a]spects of the display which are simulated in the present invention include the existing electro-optic condition of the pixel, the accumulated DC bias on the pixels, and the difference between the existing condition of the display and the most recent demanded image"). However, the defendants are correct that the patent uses the term simulation to refer to computation. *See* '280 Patent at 1:64-66 (" 'Real Time Display Simulation' refers to the use of memory and computation means to simulate the condition of the display in real time"). The need for computation is further emphasized by the patent's teaching that the electro-optic conditions are not read from the display, but rather computed. Therefore, the function should be construed to mean "computing and storing the existing electrooptic condition of said pixel."

Positive argues that the corresponding structure that perform this function is microprocessor 12, ROM 14, and RAM 16. Defendants argue that the corresponding structure is "RAM memory partitioned into a first part for storing computed current gray levels displayed at the pixels and a second part for storing the computed bias and polarity of the pixels, and the disclosed microcontroller computing simulated gray levels of what is currently displayed on the pixels and the accumulated DC bias on the pixels." For the same reasons the court rejected defendants' proposed definition of "electro-optic condition of pixels in said array," the court rejects the defendants' proposed partitioning of the RAM memory here.

The court concludes that the corresponding structure is RAM 16, ROM 14, and microcontroller 12 programmed to execute blocks 65 and 68 of Figure 7.

8. second means for applying direct voltages to the elements in accordance with the signals provided for the elements to obtain a display on the display means, ... the second means being operative to apply the direct voltages to the elements in the plurality, in successive ones of the successive frames in the sequence, in accordance with the signals as provided for such elements in such successive frames to obtain the display of the images for such elements in such successive frames on the display means

The parties agree that this limitation should be construed as a means-plus-function limitation. Positive proposes that the recited function does not need to be construed, but its briefing puts forth the following: "In combination, the recited function is clear-for each demanded image (i.e., in successive ones of the successive frames in the sequence), generating direct voltages for application on pixels in accordance with the image data in the successive frames, including the demanded image and the current image." Opening Brief at 22. Defendants propose that the recited function should be construed as "selectively changing the polarity of the voltage applied to each pixel based on an exceptional condition of the pixel in accordance with a stored value derived in response to the signal to be displayed at that pixel and the signal currently

displayed at that pixel."

A jury would benefit from a construction of the recited function as the claim language is convoluted. The term "applying direct voltage" recites a function requiring "drive signals," construed above. The court concludes that the recited function is "applying voltages that do not change polarity in a predetermined and periodic fashion in accordance with a stored value derived in response to the signal to be displayed at that pixel and the signal currently displayed at that pixel."

Positive argues that the corresponding structures that performs this function are: "display controller or processor (including related signal lines and memory), RAM memory, row and column drivers, and equivalents thereof. *See,* '280 fig. 1 ("MCU 12", "ROM memory", "RAM memory 16", "column driver 26", and "row driver 24"), col. 15:30-39 (the "difference array"), col. 15:40-col. 17:25 (describing a process), col. 14:14-18, col. 16:14-38, and col. 19:14-26 and 36-37." Opening Brief at 22.

The defendants identify the same elements, however, they propose four additional limitations: (1) the algorithms disclosed that create the difference array, (2) the algorithms disclosed that reside on the ROM 14, (3) a serial connection between the column and row drivers, and (4) the partitioning of the RAM 16 disclosed in the specification.

The algorithms disclosed that create the difference array are those necessary for the microprocessor to perform. These include blocks 65 and 66 of Figure 7.

The defendants' second proposed limitation, that the algorithms be stored on ROM, is not persuasive. Provided the microprocessor has the ability to perform the algorithm, the location where the algorithm is stored is not clearly linked to the recited function.

For the reasons discussed in the "driver means ..." section above, there is no support for including a limitation that requires a serial connection between the column and row drivers. Likewise, for the reasons discussed in the "memory means ..." section above, there is no support for including a limitation as to how the RAM memory is partitioned.

The court concludes that the corresponding structure is column driver 26, row driver 24, RAM 16, and microcontroller 12 programmed to execute blocks 65 and 66 of Figure 7.

9. second means for processing the signals in each successive sequence to determine the difference between the signals for each individual one of the elements in such successive sequence and the previous sequence

The parties agree that this limitation should be construed as a means-plus-function limitation. Consistent with the reasoning provided in the preceding means-plus-function limitations, the court concludes that the recited function does not need construction. The corresponding structure is RAM, ROM, and microprocessor 12 programmed to perform block 65 of Figure 7.

10. third means for displaying the image from each individual one of the elements in the display means in each successive sequence in accordance with the difference signal from the second means for that element in that sequence and the previous sequence

The plaintiff argues that the function does not need to be construed. The defendants propose "displaying the

image at each pixel in accordance with the calculated difference between the computed value of the gray level currently displayed at the pixel and the demanded gray level of the pixel."

Consistent with the reasoning provided in the preceding means-plus-function limitations, the court concludes that the recited function does not need construction. The corresponding structure is column and row drivers, RAM, ROM, and microprocessor 12 programmed to perform block 66 of Figure 7.

11. image

Positive proposes that this term does not need construction. The defendants propose this term mean "gray level displayed by an individual pixel." The court rejects the defendants' proposal. In light of this rejection, and absent some showing that there is a dispute as to claim scope over the meaning of this term, the court declines to construe the term "image."

12. direct voltage

Positive proposes that this term mean "an electrical signal having a voltage level." The defendants propose that this term mean "non-alternating voltage selectively changing polarity based on an exceptional condition of the pixel." For the reasons provided in the "drive signals" and "second means for applying direct voltages ..." section, the court concludes that the term direct voltage means "voltages that do not change polarity in a predetermined and periodic fashion." FN7

FN7. The term "direct voltages" does not appear in the '280 patent and is not found in the common specification of the patents-in-suit. Rather, this term appears only in the claims of the '457 and '588 patents.

13. "applying direct voltage to at least some of the elements simultaneously" and "at least some of said pixels being driven simultaneously"

Positive proposes the plain and ordinary meaning of "simultaneously," i.e. no construction is needed. The defendants do not address these terms in their response. Absent a showing that there is a dispute as to claim scope over the meaning of this term, the court declines to construe this term.

14. in real time

The term "real time" is defined in the specifications: " '[r]eal time' means that the drive signals are applied as generated by the control system as a continuous response to the most recent demanded image." *See* '280 Patent at 5:21-24. The court, therefore, concludes that the term "in real time" means "the drive signals are applied as generated by the control system as a continuous response to the most recent demanded image."

IV. Conclusion

The court adopts the constructions set forth in this opinion for the disputed terms of the '280, '457, and '558 patents. The parties are ordered that they may not refer, directly or indirectly, to each other's claim construction positions in the presence of the jury. Likewise, the parties are ordered to refrain from mentioning any portion of this opinion, other than the actual definitions adopted by the court, in the presence of the jury. Any reference to claim construction proceedings is limited to informing the jury of the definitions adopted by the court.

The court notes that the parties, through appendices to their briefing, have identified numerous means-plus-function limitations at issue in this case. The parties are instructed that the additional limitations the parties briefed in their respective appendices would be construed in accordance with the court's reasoning contained in this Order. This Order addresses all of the terms the parties argued at the claim construction hearing. Based on the representations made by counsel at that hearing, the constructions contained in this Order resolves the parties' disputes regarding the scope of the claims.

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