United States District Court,
W.D. Washington, at Seattle.

DIGITAL CONTROL INCORPORATED, et al,
Plaintiff(s).
v.
The CHARLES MACHINE WORKS,
Defendant(s).

No. C03-103P

Dec. 11, 2003.

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ORDER ON CLAIM CONSTRUCTION

MARSHA J. PECHMAN**, District Judge.**

This matter comes before the Court on the requested construction of numerous terms in the claim language of several of plaintiff Digital Control Incorporated's ("DCI") patents. DCI brought this lawsuit against Charles Machine Works ("CMW"), alleging that various of CMW's products infringe DCI's patents related to Horizontal Directional Drilling ("HDD") locating technology. The Court granted CMW's request for a claim construction hearing. Having considered the papers and pleadings submitted by the parties, and having heard oral argument on the issues, the Court construes the disputed terms as set forth in the analysis section below.

FACTUAL AND PROCEDURAL BACKGROUND

Plaintiff Digital Control Incorporated holds various patents regarding Horizontal Directional Drilling ("HDD") locating equipment. DCI's HDD patents specify methods and systems that enable operators to drill precise horizontal bores in the ground through which cable, water, gas, and other utility lines can be laid without the need to excavate deep and costly trenches. This is accomplished by enabling an above-ground construction worker to pinpoint the location of the head of the drill as it moves through the ground. The worker can then guide the drill head up or down, left or right, in order to avoid obstacles underground such as other pipe lines, eventually emerging from the ground. The systems and methods disclosed in the patents generally include a means for sensing the orientation of a boring tool, a means of transmitting that

information, as well as information about the location of the tool to the surface, and a means of receiving and displaying that information in a useable format for the worker above ground.

CMW also manufactures products related to HDD locating technology. DCI has brought this lawsuit asserting that CMW's products infringe eight of its patents, all of which relate to a parent patent, United States Patent No. 5,155,442, which is not at issue in this lawsuit. The eight patents involved here originated as "continuation applications" in the patent process, by which an inventor can submit variations on a theme and obtain separate patents on various aspects of the underlying disclosed invention. The patents-in-suit are as follows: Patent No. 5,633,589 (the '589 patent), Patent No. 5,767,678 (the '678 patent), Patent No. 6,057,687 (the '687 patent), Patent No. 6,002,258 (the '258 patent), Patent No. 5,926,025 (the '025 patent), Patent No. 6,232,780 (the '780 patent), Patent No. 6,008,651 (the '651 patent), and Patent No. 6,525,538 (the '538 patent). Each contains a nearly identical specification, with only the introduction and the claim language differing.

On May 2, 2003, plaintiff brought a motion for partial summary judgment regarding some claims of some of the patents at issue. CMW moved for a formal claim construction hearing, arguing that several terms needed to be construed prior to determination of infringement. CMW also contended that arguments regarding equivalency, as well as expert testimony, were first revealed in DCI's reply materials. The Court granted CMW's request, and a four-day claim construction hearing was scheduled for the week of November 10-14. In establishing the procedure for preparation of the claim construction material and briefing, the Court required submission of a Joint Claim Chart that would identify each claim to be construed by the Court, as well as the parties' proposed construction and citations to any intrinsic or extrinsic evidence supporting that construction.

The Joint Claims Chart submitted to the Court included 37 terms and phrases that the parties were asking the Court to construe. FN1 During the course of the hearing, it rapidly became apparent that not all of these claims were truly in dispute. By the end of the hearing, the parties had agreed on the construction of eight of the terms, which have been construed in a separate stipulated order, leaving twenty-nine to be considered by the Court.

FN1. The terms were numbered 1 through 35 with two parts to term 15. During the course of the hearing, it became clear that claim term 20 also had two parts.

LEGAL BACKGROUND

1. *Claim Construction Analysis*

The Federal Circuit has dictated that the first step of an infringement analysis is to properly determine the meaning and scope of the patent claims alleged to be infringed. Markman v. Westview Instruments, 52 F.3d 967, 976 (Fed.Cir.1995), *aff'd* 517 U.S. 370, 116 S.Ct. 1384, 134 L.Ed.2d 577 (1996). In interpreting patents, intrinsic evidence is considered first, which includes the 1) the claim language, 2) the written specification disclosing the best mode embodiment, and 3) the prosecution history of the patent. Vitrionics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 1582 (Fed.Cir.1996). If the claims can not be given meaning through interpretation of intrinsic evidence, extrinsic evidence such as dictionaries, treatises, and expert testimony, may be considered. Bell Atlantic Network Servs. Inc. v. Covad Comm'ns Group, Inc., 262 F.3d 1258, 1268-69 (Fed.Cir.2001)

Claims construction always begins with the language of the claims, as the claim language defines the invention. Phonometrics, Inc. v. Northern Telecom Inc., 133 F.3d 1459, 1464 (Fed.Cir.1998). Claim language is first given its ordinary meaning as viewed by one of ordinary skill in the art. Johnson Worldwide Assocs. Inc. v. Zebco Corp., 175 F.3d 985, 989 (Fed.Cir.1999). The strong presumption in favor of using the ordinary meaning of terms is overcome in two situations: 1) where a patentee is his own lexicographer, giving meaning to terms that differs from their ordinary usage by defining terms in the specification or prosecution history, Vitrionics, 90 F.3d at 1582, or 2) where a claim term "deprives the claim of clarity such that there is no means by which the scope of the claim may be ascertained from the language used." Bell Atlantic, 262 F.3d at 1268 (internal quotations omitted).

For further interpretation of claim language, the court turns to the specification, which must disclose the best mode embodiment of the invention. The claim language is to be read "in view of" the specification. "The specification is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term." Vitrionics, 90 F.3d at 1582. On the other hand, the court must not import limitations from the specification. "It is well established that the preferred embodiment does not limit broader claims that are supported by the written description." Toro Co. v. White Consol. Indus. Inc., 199 F.3d 1295, 1301 (Fed.Cir.1999).

The prosecution history may also be used to interpret claim language. Here, limitations may be imported when the patentee re-defined a term or made arguments interpreting claim language during the prosecution process in an effort to get the patent issued, in particular to distinguish prior art. "The prosecution history is considered to determine whether or not there were any express representations made in obtaining the patent regarding the scope and meaning of the claims." Bell Atlantic, 262 F.3d at 1268.

B. ***Means-Plus-Function Analysis***

The parties request construction of many terms that they state are part of "means-plus-function" claim elements. The Patent Act, 35 U.S.C. s. 112 para. 6 provides:

An 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, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

The statute therefore allows an inventor to claim an invention by reference to the performed function, without identifying in the claim language the precise structure, material, or acts that would carry out that function. IMS Technology, Inc. v. Haas Automation, Inc., 206 F.3d 1422, 1429-30 (Fed.Cir.2000). However, this type of claim element therefore necessarily relies much more heavily on what is described in the specification than other types of claims, and can be limited by it. A claim that actually uses the word "means" will invoke a rebuttable presumption that Section 112 para. 6 applies. CCS Fitness, Inc. v. Brunswick Corp., 288 F.3d 1359, 1369 (Fed.Cir.2002). Whether the presumption is rebutted depends on whether the claim term, when properly construed, invokes sufficient structure to "avoid the ambit of s. 112 para. 6." Personalized Media Communications, LLC, v. Int'l Trade Comm'n, 161 F.3d 696, 704 (Fed.Cir.1998), *see also,* Cole v. Kimberly Clark Corp., 102 F.3d 524, 531 (Fed.Cir.1996) (concluding that "perforation means" was not a means plus function limitation where the claim contained a detailed recitation of its structure).

Proper construction of a means plus function limitation requires the court to first identify the *function* recited in the claim language, then to determine what *structures* have been "disclosed in the specification that correspond to the means for performing that function." Epcon Gas Systems, Inc. v. Bauer Compressors, Inc., 279 F.3d 1022, 1032 (Fed.Cir.2002). In order to be covered by the claim language, a structure disclosed in the specification must be clearly linked or associated with, either in the specification or the prosecution history, the function recited in the claim. *Id*. However, the court cannot "import functional limitations that are not recited in the claim, or structural limitations from the written description that are unnecessary to perform the claimed function." Wenger Manuf., Inc., v. Coating Machinery Sys., Inc., 239 F.3d 1225, 1233 (Fed.Cir.2001). Only after the terms are properly construed does the two-step infringement analysis begin. The finder of fact must first determine whether the accused device or method performs the identical function to the one recited in the claim, and second whether the accused device "uses the same structure, materials, or acts found in the specification, or their equivalents." IMS Techonology, 206 F.3d at 1430.

C. ***Step Plus Function Claim Elements***

Section 112 paragraph 6 also applies to "a combination of steps ... in a process claim." O.I. Corp. v. Tekmar Co., 115 F.3d 1576, 1582 (Fed.Cir.1997). Similar to means plus function claim elements, step plus function claim elements typically contain the phrase "steps for," giving rise to a rebuttable presumption that the claim is in step plus function form. Masco Corp. v. United States, 303 F.3d 1316, 1326 (Fed.Cir.2002). And just as means plus function analysis takes place only where the claim terms describe a means plus function "without structure," step plus function analysis is appropriate where the claim terms describe steps plus function "without acts." *Id*. Yet where the language "steps for" is not used by the inventor, "a limitation of that claim cannot be construed as a step-plus-function limitation without a showing that the limitation contains no act." *Id*. at 1327.

D. ***Jepson Claims***

"A 'Jepson' claim is one that begins with a preamble that recites an old device, process or combination, continues with a transition that states 'wherein the improvement comprises' or 'the combination with said [old device] of," and concludes with the body of the claim as the statement of the new elements or improvements upon the old device, process or combination." Donald S. Chisum, Chisum on Patents, Vol. 3, s. 8.06[1][c] (2002). Unlike other claim forms, it is clear that the preamble in this style of claiming constitutes a claim limitation because it not only gives context, it defines the scope of the prior art and the invention itself. Rowe v. Dror, 112 F.3d 473, 479 (Fed.Cir.1997).

ANALYSIS

The Court makes the following determinations regarding the construction of the claims in dispute in this litigation. Variations on claim language are interpreted to be equivalent unless otherwise noted. For convenience and clarity, the Court has grouped certain terms that appear to necessitate consistent interpretation. Claims are referred to by their number as presented on the Joint Claim Chart.

A. ***Means Plus Function Claim Elements***

The parties agree that seven of the terms to be construed are means plus function limitations, and thus fall within the ambit of s. 112 para. 6. CMW asserts that one other, term 29, is likewise a means plus function claim element. DCI disagrees, arguing that the term "orientation sensor means" invokes sufficient structure to rebut the presumption that s. 112 para. 6 applies. The Court must therefore analyze that term to determine

whether, as a threshold matter, it falls within s. 112 para. 6. As explained in detail below, the Court finds the term does indeed invoke sufficient structure such that analysis as a means plus function claim is not warranted.

The parties also disagree on the procedure for interpretation of means plus function claims at the claim construction phase. At oral argument, DCI effectively conceded that its analysis of these terms in the briefing was incorrect, as it did not recite the function revealed in the claim and structure or structures revealed in the specification for each of these terms. DCI instead had repeatedly argued that these claim elements must be construed *at the claim construction phase* to cover "equivalents thereof." DCI argued for the first time at oral argument that 1) it is unclear whether a "range of equivalents" is to be considered and identified at the claim construction hearing, and 2) that its proposed constructions contain functional and structural elements that can now be identified for the Court. Despite an oral ruling by the Court that DCI would not be allowed to present its proposed functions and structures for the first time during the claim construction hearing, DCI elicited testimony from its expert witness during the presentation of its case on this very subject, then submitted the same information in the form of a chart purporting to be a criticism of CMW's proposals.

The Court declines to allow this belated argument, and therefore adopts in greatest part CMW's proposed construction for each of the means plus function claim terms. First, the Court finds no ambiguity in the Federal Circuit's directive that construction of means plus function elements involves identification of the function performed as identified by the claim language, and of the structure, material, or acts as revealed in the specification. There is also no ambiguity in the Federal Circuit's directive that consideration of equivalents is part of the infringement analysis, and is therefore a matter of fact. Finally, there is no conflict between the statute and the Federal Circuit's opinions-one is simply an interpretation of the other, and is binding precedent on this Court. The Court will not engage in the exercise of identifying a "range of equivalents" that might infringe. To do so would be to engage in fact finding and advisory opinion. There is simply no support for this procedure in the Federal Circuit's case law, and the Court declines to start such a practice here.

Next, the Court will not allow DCI to identify for the first time during oral argument its proposed functions and structures. DCI did not present this information in the proper format, and cannot be heard now to say that it included function and structure embedded within its prior proposed construction. Nevertheless, as was mentioned by DCI during closing argument, the Court has a duty to "get it right" even where both parties may have been mistaken. Therefore, the Court adopts CMW's proposed identification of function and structure for each of the means plus function claims as explained below, except where that function or structure is clearly incorrect or incomplete. In addition, some of CMW's proposed constructions cover issues that the Court need not make at this stage. The adopted constructions are therefore limited to the language set forth below.

The following constructions include the functions performed by each means plus function claim element, as well as the minimum structure needed to carry out that function as identified in the patent specification. These constructions are not intended to provide the only structures upon which the patent may read-rather, at the infringement analysis stage, plaintiff will have the burden of establishing "equivalents thereof" as that term has been interpreted by the Federal Circuit.

2. "*transmitter means for transmitting a corresponding orientation electromagnetic signal*"

Claim 7 of the '678 patent includes the following language:

7. In a technique for locating a boring tool which is disposed within the ground, a system for monitoring the orientation of the boring tool, said system comprising: (a) a sensor arrangement carried by said boring tool and including orientation sensor means for sensing at least one particular component of the orientation of the boring tool and ***separate transmitter means for transmitting corresponding orientation electromagnetic signals from the boring tool;*** *...*

(emphasis added). *See also* '780 Patent, Cls. 1 and 2, '651 Patent, Cl. 1.

The function of the transmitting means is to transmit the corresponding orientation electromagnetic signal. Here, two alternative structural arrangements for transmitting an orientation electromagnetic signal have been described in the patent specification. The first embodiment is an oscillator, and amplifier, a Dual-Tone Multi-Frequency ("DTMF") generator, a modulator, and an antenna. '589 Patent, Figure 3A; *and* Col. 9:24-39. FN2

FN2. As has become the practice in this case, specification citations will be to the '589 patent unless otherwise noted.

DCI argues that neither the DTMF generator nor the amplifier are components necessary to perform the function. Yet as was explained at oral argument by CMW's expert, Dr. Ronald P. Rhoten, a modulator needs two inputs FN3-here, the oscillator and the DTMF generator-in order to modulate the carrier with the information to be encoded. Thus, in the specific embodiment disclosed in the specification, the DTMF generator is a necessary component of the "transmitter means" structure. Likewise, within the context of the present invention, and as is clearly envisioned by the specification language and drawings, the amplifier is a necessary component of the transmitter means.

FN3. The experts agreed that Figure 3A contains some drafting errors.

The second structural arrangement described in the specification includes a DTMF generator, an amplifier, an output amplifier (such as a Class D amplifier), an oscillator, and a capacitor/inductor pair. '589 Patent, Fig. 3B, Col. 9:65-Col. 10:15.

5. "***means for receiving said electromagnetic orientation signal and converting it to a corresponding orientation display driving electric signal***"

Claim 7 of the '678 Patent includes the following language:

7. In a technique for locating a boring tool which is disposed within the ground, a system for monitoring the orientation of the boring tool, said system comprising:

(a) ...

(b) an above-ground locator including ***means for receiving said electromagnetic orientation signal and converting it to a corresponding orientation display driving electric signal.***

(emphasis added). *See also,* '651 Patent, Cls. 1 and 6, '780 Patent, Cl. 2.

The "receiving means" claim term therefore has two functions: 1) To *receive* the electromagnetic orientation signal and (2) to *convert* the signal to an orientation display driving signal. The structure required to perform these functions that is disclosed in the patent specification includes a roll/pitch receiver that includes an antenna or antennae, a CPU interface, and a processor. '589 Patent, Fig. 5a and b, and Col. 12:62-13:26.

This last structural element, the "processor," raises some additional issues. The Federal Circuit has held that "[i]n a means-plusfunction 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). In fact, failure by the district court to identify the algorithm that is part of the recited structure can lead to reversal and/or remand. Tehrani v. Hamilton Medical, Inc., 331 F.3d 1355, 1362 (Fed.Cir.2003). The Court interprets this authority to include a situation, as is present in this case, where a "processor" is one structural element of the disclosed structure in a means plus function claim element.FN4

FN4. Contrary to DCI's assertion at oral argument, none of the above-cited cases indicates that requiring an algorithm as part of the recited structure would require that source code be disclosed in the specification.

As can be determined from the plain language of the claims themselves and the supporting specification, the processor in the present case is programmed to analyze the 4-bit nibbles received from the CPU interface using an algorithm that corresponds to the output of the DTMF generator in the transmitter means, producing an electrical signal representing the orientation of the boring tool, which drives the orientation display. '589 Patent, Col. 13:9-20; *See also* Claim language in '678 Patent, Cls. 7, 24, '780 Patent, Cl. 2; and '651 Patent, Cls. 1, 6.

6. "*sensor means ... for sensing at least one component of the orientation of the boring tool and for transmitting an electromagnetic carrier signal containing a digitally encoded electromagnetic orientation signal*"

Claim 24 of the '678 Patent includes the following language:

24. In a technique for locating a boring tool which is disposed within the ground, a system for monitoring the orientation of the boring tool, said system comprising: (a) ***sensor means*** carried by said boring tool ***for sensing at least one particular component of the orientation of the boring tool and for transmitting an electromagnetic carrier signal containing a digitally encoded electromagnetic orientation signal*** corresponding to said particular component of orientation of the boring tool; ...

(emphasis added).

The "sensor means" as identified in Claim 24 of the '678 Patent has two functions: FN5 1) to sense at least one particular component of the orientation of the boring tool, and 2) to transmit an electromagnetic carrier signal containing a digitally encoded electromagnetic orientation signal. The structure for sensing at least

one component of the orientation of the boring tool, in the context of this claim term, includes both a pitch sensor having a conductive sensor rod, two sections of conductive tubing separated by a small gap, and either an electrically conductive *or* a dielectric fluid disposed within the assembly, ' 589 Patent, Col. 15:25-Col. 17:49, and a roll sensor being a 12-position mercury switch with digital output. ' 589 Patent, Col. 9: 56-60. The structure for transmitting the electromagnetic signals is the same as the transmitter means described in claim term 2, supra.

FN5. This claim term only appears at Claim 24 of the '678 patent and should not be confused with the separate and distinct terms "orientation sensor means" and "transmitter means." The joint claim chart is a bit confusing in this regard. The Court's interpretation of this term is consistent with the interpretation of the two distinct terms.

22. "***means for producing (i) a first signal if any given one of said flux lines impinges said antenna configuration in a first way, (ii) a second signal ... in a second way, and (iii) a third signal ... in a third way.***"

Claim 1 of the '589 Patent contains the following language:

1. A method of locating a generally horizontally extending dipole magnetic field transmitter which is disposed underground within a particular vertical transmitter plane defined by its dipole axis and which generates a magnetic dipole field containing magnetic flux lines, each one of which extends from one end of the transmitter around to its opposite end and all of which are spaced from one another about the dipole axis of said transmitter, said method comprising the steps of:

(a) providing a locating receiver including an antenna arrangement and ***means for producing***

(i) a first signal if any given one of said flux lines impinges said antenna configuration in a first way;

(ii) a second signal if any given one of said flux lines impinges said antenna configuration in a second way;

(iii) a third signal if any given one of said flux lines impinges said antenna configuration in a third way;

(b) ...

(emphasis added). *See also* '025 Patent, Cl. 1.

The function of this "signal producing means" is to produce a first signal if any given one of said flux lines impinges said antenna configuration in a first way, a second signal if any given one of said flux lines impinges said antenna configuration in a second way; and a third signal if any given one of said flux lines impinges said antenna configuration in a third way. The structure identified in the specification necessary to carry out this function includes a central processing unit ("CPU") programmed to follow an algorithm that produces first, second and third signals in response to relative signal strengths detected by an antenna arrangement. '589 Patent, Col. 22:39-Col. 25:4. The specification clearly describes methods by which the transmitter in the boring tool is located using the *strength* of the signal (as opposed to the signal phase). Id. The terms "first," "second," and "third" are not interpreted as temporal, i.e. the first signal does not need to

be produced prior to the second and third. In addition, the Court does not view the antenna arrangement itself or the analog-to-digital ("A/D") converter as part of the necessary structure for the production of signals. By the plain text of the claims, the signal producing means in this claim term is the properly programmed CPU that is producing signals in response to input it receives that corresponds to signal strength.

26. "***means responsive to said magnetic field for determining the particular location of the boring tool as the boring tool moves***"

Claim 1 of the '687 Patent contains the following language:

1. In a system in which a boring tool containing means for producing a dipole magnetic field is steered through the ground by means of a boring machine and in which the position of the boring tool during its movement through the ground is established by means of an above-ground receiver in cooperation with and responsive to said magnetic field, the improvement comprising:

(a) said receiver which is configured to operate alternatively in first and second modes such that

(i) the receiver, operating in said first mode positioned above ground, includes ***means responsive to said magnetic field for determining the particular location of the boring tool as the boring tool moves*** along said path from a first point to a second point, and ...

(emphasis added). *See also,* '687 Patent, Cls. 5 and 6.

The function of this "locator means" is to determine a particular location of the boring tool as the boring tool moves. However, as described more fully below, the Court does not see the use of the words "as the boring tool moves" as a limitation on whether the system may be used to locate a boring tool that happens to be momentarily at rest during an HDD operation. The minimum structure needed to perform this function is an antenna arrangement (which may be comprised of one, two, three or four antennae) and a CPU programmed to follow an algorithm that uses the signal strength received by the antenna structure to determine the location of the boring tool. '589 Patent, Col. 20:57-Col 21:5; Col. 22:39-Col. 25:4.

27. "***means responsive to said magnetic field for establishing said boring tool and said receiver a homing path along which said boring tool is steered***"

Claim 1 of the '687 Patent contains the language quoted immediately above, with the addition of the following language:

(ii) the receiver, operating in said second mode positioned at a fixed point, includes ***means responsive to said magnetic filed for establishing between said boring tool and said receiver a homing path along which said boring tool is steered toward a fixed point.***

(emphasis added). *See also,* '687 Patent, Cls. 5 and 6.

The function of the "homing means" described above is to establish a homing path between the boring tool and the receiver along which the boring tool is steered toward a fixed point. The structure for performing this function that is disclosed in the specification of the patents includes an antenna arrangement (which may be comprised of one, two, three or four antennae) and a CPU programmed to follow an algorithm that

compares the strengths of the signals received by the antenna structure to determine the appropriate direction in which the boring tool must travel in order to reach the fixed point, including any corrections needed. '589 Patent, Col. 24:19-Col. 25:4.

29. "*orientation sensor means for sensing at least one particular component of the orientation of the boring tool*"

Claim 7 of the '678 patent contains the following language:

In a technique for locating a boring tool which is disposed within the ground, a system for monitoring the orientation of the boring tool, said system comprising:

(a) a sensor arrangement carried by said boring tool and including ***orientation sensor means for sensing at least one particular component of the orientation of the boring tool*** and separate transmitter means for transmitting corresponding orientation electromagnetic signals from the boring tool;

(emphasis added). *See also,* '780 Patent, Cls. 1 and 2.

Plaintiff DCI contends that although this claim term is in the proper format to be a means plus function claim term, that to a person of ordinary skill in the art, the term "orientation sensor means" invokes sufficient structure to "avoid the ambit of s. 112 para. 6." Personalized Media Communications, LLC, v. Int'l Trade Comm'n, 161 F.3d 696, 704 (Fed.Cir.1998). The Court agrees, primarily because defendant's expert Dr. Rhoten testified that the term brought to mind some very specific structures that could be used to sense and describe various aspects of the orientation of the boring tool, including those described in the patent specification. The Court must therefore adopt a more general construction than would be required for a means plus function claim.

Plaintiff's proposed construction is as follows: "An arrangement that can measure the specific orientation (e.g. roll or pitch) of a boring tool." The Court finds this construction to be lacking. The Court finds dictionary definitions to be useful in this context. "Orientation" is simply the process of orienting, or the state of being oriented. The Random House College Dictionary, 937 (1973); Webster's II, 829 (1984). "To orient," in relevant meaning, is "to place or locate in a specified relation to the points of a compass," or "to align or position relative to a reference system." Websters II, 829 (1984). "Sensor" can be defined as "a device sensitive to light, temperature, radiation level, or the like, that transmits a signal to a measuring or control device. The Random House College Dictionary, 1199 (1973). In a more technical sense, a sensor is "the generic name for a device that senses either the absolute value or a change in a physical quantity such as temperature, pressure, flow rate, or pH ... and converts that change into a useful input signal for an information-gathering system. McGraw-Hill Dictionary of Scientific and Technical Terms, 1898 (6th ed.2003).

In the context of these patents, as indicated by the plain language of the claims and the supporting specification, an "orientation sensor means" is a device that is capable of sensing at least one component of the boring tool's orientation, such as pitch or roll angle, and sending that information to an information-gathering system. '589 Patent, Col. 9: 56-60; Col. 15:25-Col. 17:49. However, the transmission/sending of this information in this context is not the same as the function performed by the separate "transmitter means" that sends an electromagnetic carrier with encoded information. The orientation sensor means is simply able to sense orientation and pass along useful information to the next component in the system, i.e.

the multiplexer. '589 Patent, Figs. 3A and 3B.

30. "***means including a visual orientation display ... for displaying ... the particular orientation component of the boring tool's specific orientation***"

Claim 7 of the '678 Patent includes the following language:

In a technique for locating a boring tool which is disposed within the ground, a system for monitoring the orientation of the boring tool, said system comprising:

...

(c) ***means including a visual orientation display*** also forming part of said aboveground locator visually ***for displaying*** at the above-ground locator ***the particular orientation component of the boring tool's specific orientation*** in response to said last-mentioned orientation display driving electric signal.

(emphasis added). *See also,* '651 Patent, Cls. 1 and 6; '780 Patent, Cl. 2.

This term is hardly mentioned in the briefing and was not the subject of any discussion at oral argument. The Court therefore wonders if the term is truly in dispute. Nevertheless, the Court will endeavor to give a construction to the term.

The parties agree that this is a means plus function claim element. The Court must therefore identify the function of the described "means," then identify the structure, material, or acts that carry out that function as described in the specification. The function of the display means is to display the particular orientation component of the boring too's specific orientation. Yet the Court finds no structure in the specification other than a "display." The Court does not know what this means, and so little information on this was presented in any of the materials presented in the briefing or during 4 days of argument, that the Court has no means of determining its meaning. Plaintiff would have the Court include "a printed circuit card" as structure, yet nowhere in any of the citations provided to the Court, even in plaintiff's supplemental submission during closing arguments, does that term appear. *See* '589 Patent, Col. 13:11-30; Col. 14:1-8; Col. 22:13-20. If a display means is simply a "display," the drafter of the claim language certainly could have omitted the word "means." But this was not done. This is a means plus function claim term, and a structure must be identified in the specification. Here, the Court finds none.

B. ***The Electromagnetic Signals Transmitted by the Transmitting Means***

Claim terms 3 and 4 relate to the output of the transmitter means described above. The Court construes these claim terms consistently with each other and consistently with its other constructions.

3. "***electromagnetic carrier signal containing digitally encoded electromagnetic orientation signals***"

Claim 5 of the '678 Patent contains the following language:

A method according to claim 1 wherein said sensing arrangement transmits an ***electromagnetic carrier signal containing said electromagnetic orientation signals*** and wherein said last-mentioned signals are digitally encoded signals.

(emphasis added). Identical or substantially similar phrases can be found in Claims 11, 13, 16, 19, 21, 24, 27, 29, and 31 of the '678 Patent and Claims 2 and 6 of the '651 Patent, all of which refer to the signal that is *transmitted* by the "separate transmitter means" contained in the "sensor arrangement." Consistent with the parties' stipulation regarding the term "sensor arrangement," (*see* Dkt. 144), the Court construes this "separate transmitter means" to be equivalent to the "means for transmitting" interpreted above.

Next, Claim 6 of the '651 Patent contains the following language:

A sensor arrangement for use in a system for monitoring the orientation of an underground boring tool, which system includes (i) an above-ground locator including means for receiving an ***electromagnetic carrier signal containing digitally encoded electromagnetic orientation signals*** corresponding to the particular component of orientation of said boring tool at any given time during operation of the locator and converting it to a corresponding orientation display driving electric signal and (ii) ...

(emphasis added).

Thus, by the claim language itself, any interpretation of the terms "electromagnetic carrier signal" and "electromagnetic orientation signals" must be consistent with what it is to be the output of the transmitter means and what is to be received by the receiving means.

With the specific claim language in its proper context in mind, the Court considers the specification and its indications regarding what is transmitted and what is received. It is clear that the specification anticipates generation of a carrier signal that is modulated by an orientation signal, which may, for example, be produced by the DTMF generator, which generates a "tone pair," a pair of frequencies corresponding to the orientation of the boring tool. ' 589 Patent, Col. 9:24-44, Col. 9:65-Col. 10:21. The specification actually distinguishes this type of electromagnetic carrier signal *containing* the orientation signals from one that involves a pulsed signal on a *separate* carrier frequency that can likewise be used to convey orientation information. '589 Patent, Col. 9:44-48. The Court also gleans insight based on what the specification anticipates that the receiver will receive. In this vein, the specification indicates that the receivers "strip the modulation side-bands from received signal to provide a steady amplitude carrier signal used for range computation by a CPU." '589 Patent, Col. 13:3-13. It is clear from these references to the specification that this invention envisions a carrier that is used for range or depth computation based on signal strength, and orientation signals modulated on the carrier that correspond to the orientation of the boring tool.

Next, the Court turns to some dictionary definitions of some of the component words in the phrase to be interpreted. A "carrier" or "carrier signal" can be defined as "a continuous signal of a single frequency capable of being modulated by a second, data-carrying signal." *See* Pl's Hearing Exhibit 17, "LinuxGuruz" webpage definition. In another definition provided by the plaintiff, a carrier is "a wave of constant amplitude, frequency, and phase that can be modulated by changing amplitude, frequency or phase." Graf, Modern Dictionary of Electronics (7th ed.1999).

Plaintiff proposes the following construction: "An electromagnetic signal oscillating at a carrier frequency on which orientation signals are modulated." *See* Joint Claim Chart at 4. The Court finds that this proposed construction adds nothing to the words already present in the claim term. Defendant, on the other hand, proposes the following: "Each expression means that the 'electromagnetic carrier signal' is an unvarying reference component of the electromagnetic output of the transmitter and that the 'electromagnetic orientation signals' are a variable component of the electromagnetic output which is orientation

information/data." The Court finds this to be substantially more informative and helpful for claim construction purposes. FN6 As is consistent with the claim language itself, the specification, and the plaintiff's own dictionary definitions, the Court interprets the phrase in question to mean that the output of the transmitter (and the input of the receiver) is an electromagnetic signal comprised of a continuous and unvarying carrier of constant frequency, amplitude and phase that is modulated by a varying component that represents the orientation information. This varying component is the "side tones" referred to in the specification. Claim term 4, "electromagnetic orientation signals," is therefore interpreted as this variable component of the entire electromagnetic signal that corresponds to the orientation of the boring tool.

FN6. The Court is aware that plaintiff's expert Dr. Afromowitz strongly disagrees with this use of the term "component" to describe the carrier and orientation signals. Yet this is precisely the word used by Dr. Mercer himself during his testimony at the Claim Construction Hearing. *See* p. 145-46, uncertified transcript, hearing day 2. He also referred to the carrier as "unvarying."

It has become clear to the Court through the briefing and during oral argument and testimony at the claim construction hearing that one of the critical issues in these terms and those of "constant" and "continuous" treated below is whether the "electromagnetic carrier signal containing ... electromagnetic orientation signals" includes a pulsed signal. As explained in more detail below, the Court finds that it does not. As it relates to this specific claim term, the Court finds particularly enlightening the fact that the inventor himself distinguished a pulsed signal on a separate carrier frequency from the arrangement described in the claim language itself. Yet this limitation does not come from the specification-rather it is contained in the claim language itself. The Court of course makes no finding as to whether a pulsed signal is an "equivalent" of the described signal, for doctrine of equivalents purposed or otherwise.

C. "*Continuously*" *and* "*Constant*"

Along the same lines as the arguments discussed above, the parties dispute a number of terms that relate to the "continuous" and/or "constant" nature of the electromagnetic carrier signal. Specifically, the parties dispute whether these terms indicate that the signal is transmitted continuously in space, i.e. through 360 degrees of the boring tool's roll angle, or continuously in a temporal sense, i.e. without interruption as would be the case in a pulsed signal or on-off keying. The terms to be interpreted include claim terms 15 and 15a ("constant") and claim terms 9 and 31 ("continuously"). The terms as shown on the Joint Claim Chart, in simplified form, are as follows:

9. "*transmitting said electromagnetic signal continuously*"

15. "*constant electromagnetic signal with time*"

15a. "*constant calibration signal with time*"

31. "*whereby the depth of the boring tool can be continuously monitored as it moves from said first point to said second point*"

First, the Court looks to the terms as they appear in the context of the claims themselves. As the context of the claim terms is particularly important for these claim terms, the Court quotes heavily from the language of the claims. Claim 1 of the '258 Patent includes the following language:

1. In a method for locating a boring tool that moves through the ground from a first point to a second point in directions dependent on the roll orientation of the boring tool and during which time the roll orientation of the boring is controllably changeable throughout 360 degrees of roll orientation in order to steer it between said first and second points, said method using (1) a transmitter and power supply carried by the boring tool within an electrically conductive housing for transmitting to an above ground location an electromagnetic signal containing information which is used in obtaining the location of the boring tool and (2) a receiver located at said above ground location for receiving and processing said electromagnetic signal whereby to determine the location of the boring tool, the improvement comprising the steps of:

transmitting said electromagnetic signal continuously as said boring tool moves from said first point to said second point independent of the roll orientation of the boring tool at any point throughout its 360 degree of roll orientation, whereby the transmitter is able to transmit and the receiver is able to receive said information containing signal irrespective of the roll orientation of the boring tool so that the depth of the boring tool can be determined regardless of its direction of movement from said first point to said second point; and

maintaining the strength of said signal substantially constant with time at any given point relative to said transmitter as the signal is being continuously transmitted,

whereby the depth of the boring tool can be continuously monitored as it moves from said first point to said second point.

(emphasis added). Similarly, Claim 4 of the same patent includes the following language:

4. In a method for locating a boring tool that moves through the ground from a first point to a second point, said method using (1) a given transmitter ... and (2) a receiver ... whereby to determine the location of the boring tool, the improvement comprising the steps of:

(a) providing a specific positional relationship between said transmitter and receiver and, while maintaining that positional relationship, ***transmitting a CONSTANT electromagnetic signal with time from said transmitter and receiving said CONSTANT signal*** from said receiver;

(b) obtaining distance and electromagnetic signal field strength measurements (i) based on said positional relationship between the transmitter and receiver and (ii) based on the transmission and reception of said constant signal by said transmitter and receiver, respectively, and using those measurements, establishing a proportionality constant k of said dipole FOR SAID GIVEN TRANSMITTER AND RECEIVER ...

(c) thereafter, using said proportionality constant and a CONSTANT electromagnetic signal with time, causing said receiver to determine the depth of said boring tool.

(emphasis added). Finally, in regards to claim term 15a, Claim 9 of the same patent contains the following language:

9. In a method for locating a boring tool that moves through the ground from a first point to a second point during which time at least the roll orientation of the boring tool changes, said method using: (1) a given transmitter ... and (2) a given receiver ... whereby to determine the location of the boring tool, the

improvement comprising the steps of:

(a) providing a specific positional relationship between said transmitter and receiver and, while maintaining that positional relationship, ***transmitting a CONSTANT electromagnetic calibration signal with time from said transmitter and receiving said CONSTANT signal*** from said receiver;

(b) obtaining distance and electromagnetic signal field strength measurements (i) based on said positional relationship between the transmitter and receiver and (ii) based on the transmission and reception of said constant signal by said transmitter and receiver, respectively, and using those measurements, establishing a proportionality constant k of said dipole FOR SAID GIVEN TRANSMITTER AND RECEIVER ...

(c) thereafter, using said proportionality constant and a CONSTANT electromagnetic signal, causing said receiver to determine the depth of said boring tool.

(emphasis added).

Plaintiff would have these terms be limited to a continuousness or constancy of spatial orientation, in other words that the transmitter simply be *capable* of transmitting a signal throughout the entirety of its roll. Defendant, on the other hand, argues for an interpretation of these terms in a temporal sense. Defendant argues that "continuously" should mean that the electromagnetic signal is transmitted without interruption, and that "constant" should mean that the signal is uninterrupted and of unchanging magnitude.

The Court finds that the parties' interpretations are both in part correct and in part incorrect. First, claim term 9 "continuously" is presented in the following context: "transmitting said electromagnetic signal *continuously* as said boring tool moves from said first point to said second point independent of the roll orientation of the boring tool *at any point throughout its 360 degree of roll orientation*." '258 Patent, Claim 1 (emphasis added). The context in which the word "continuously" is found thus indicates that it relates to the spatial orientation of the boring tool. This is consistent with certain parts of the specification and prosecution history in which the inventor describes the prior art, which involved a window through which the signal could be transmitted. This design was inferior to the present design (using "slots" or "apertures") because the former design had a "blind spot" through twenty degrees of its rotation during which depth information could not be obtained, and a variation in signal strength depending on the roll angle of the boring tool. *See* '589 Patent, Col. 5:61-Col. 6:4; Prosecution History of the '258 Patent, 11/19/98 Amendment at 5 (Pl's Hearing Ex. 9) ("the location of the boring tool is continuously available throughout the entire 360 degrees of its roll orientation, that is, it is independent of roll orientation."). Thus, the Court interprets the term "continuously" to mean that the signal is always available throughout the roll angle of the boring tool, in other words that the transmitter is capable of transmitting and the receiver is capable of receiving the electromagnetic signal independent of the roll angle of the boring tool.

The Court interprets claim term 31 in a similar fashion. In its proper context in Claim 1 of the '258 patent, it is clear that this claim term is describing a method in which the boring tool depth may be monitored without regard to the roll angle of the boring tool. This is shown most aptly by the language in the claim itself prior to the language of the claim term: "*at any point throughout its 360 degree of roll orientation,*" "*irrespective of the roll and orientation of the boring tool*." As these claim terms are found within the same claim, they should be construed consistently. Claim term 31 refers to continuousness in a spatial sense.

Nevertheless, this interpretation does not compel an identical interpretation of the claim terms that include

the word "constant." There is a distinction to be drawn between a signal that is "continuously transmitted" and one that is of "constant strength." The first instance of this word is in Claim 1 of the '258 Patent, which states: "maintaining the *strength* of said signal *substantially constant with time* at any given point relative to said transmitter as the signal is being continuously transmitted." (emphasis added). In Claims 4 and 9 of the same patent, the following phrase is seen: "transmitting a CONSTANT electromagnetic signal with time from said transmitter and receiving said CONSTANT signal." Here, the language of the claims, taken in the proper context, indicates that the *signal* is constant. The Court does not know how else to read the term "constant with time" other than to say that the signal remains constant *with time*. With a standard dictionary definition of the word "constant" being "a value that does not change during a particular process," McGraw-Hill Dictionary of Scientific and Technical Terms, 468 (6th ed.2003), this term does not appear to allow for a signal that is on-off keyed, such as a pulsed signal.

Other sources, both intrinsic and extrinsic, support this construction. The specification, for example, touts the invention's ability to provide the user with "precise and continuous depth and periodically updated orientation measurements." '589 Patent, Col. 6:24-26. This is consistent with DCI's own literature, describing its device as providing "depth shown *continuously* " (emphasis in original) and "roll updated every 1/4 second." *See* Def's Hearing Ex. 227. Further, this is consistent with the testimony of Dr. Mercer, both in his deposition taken during a prior case against Radiodetection Corp., and his testimony given during the claim construction hearing. First, during the Radiodetection case, Dr. Mercer was asked about the "constant electromagnetic signal with time" and how such a signal might not be constant. He replied "It could be varying on and off." Mercer Dep. 09/13/00 at 286-87. More convincing, however, is his testimony during the hearing. When asked about the carrier frequency, he explained:

Basically there is a characteristic of the signal that is unvarying with time and rotation angle. And based on that unvarying component of the signal that's being received we can determine the depth because of the one-to-one relationship between depth and signal strength.

Mercer Testimony, p. 145-46, uncertified transcript.

All of the above evidence, both intrinsic and extrinsic, indicates that the terms "constant electromagnetic signal with time" and "constant electromagnetic calibration signal with time" mean that they are uninterrupted signals over time. This necessarily excludes signals that are pulsed or on-off keyed. These constructions are also consistent with the Court's interpretations of the means plus function claims above, as well as the constructions concerning the electromagnetic signals.

D. *Terms Related to Calibration*

The parties dispute a number of terms that relate to the calibration of the transmitter/receiver pair. Much of the debate regarding these claims focuses on the difference between "one-point" and "two-point" calibration. A brief background will be helpful in the analysis below. Succinctly stated, one point calibration is a simple technique in which the transmitter and receiver are placed at a known distance apart (which can be calculated with something as simple as a tape measure), the strength of the electromagnetic field is measured, allowing for the calculation of a "proportionality constant" ("k") using the equation:

$B = k/d^3$

where B is the measured magnetic field strength and d is the distance between the transmitter and receiver.

In the HDD context, that constant can then be used to calculate the distance between the transmitter and receiver based on measured magnetic field strengths as the boring tool is moved from place to place through the ground. Problems arise when environmental conditions affect the measured field strength. Distance measurements calculated using the original "k" will therefore be inaccurate if the perceived "B" has been so affected.

Two-step calibration, on the other hand, is an ingenious technique in which new and updated "k" constants can be calculated whenever desirable during the course of an HDD operation. This technique takes advantage of the mathematic formula above, but goes a step further. As would be typically done during an HDD operation, the boring tool with its transmitter would be in the ground and the "locator" with its receiver would be above ground. A field strength measurement would be taken at one position, such as with the locator on the ground, directly above the transmitter. At this point, only "B" would be known in the above equation. The locator is then moved to a precisely known distance above the ground, designated "d," and another field strength measurement "B" is taken. These measurements can be designated B_1 and B_2. The three unknowns "k," "d_1," and "d_2," can then be solved for by relatively simple algebra using the three equations:

$B_1 = k/d_1^3 B_2 = k/d_2^3 d = d_2 - d_1$

Thus, even if the perceived "B" measurements are affected by environmental conditions, a new "k" and distance measurements can be calculated at any given time during the operation.

Claim terms 16 and 18 directly relate to the calculation of the proportionality constant. The disputed terms are as follows:

16. "*obtaining distance and electromagnetic signal field strength measurements (i) based on said positional relationship between the transmitter and receiver and (ii) based on the transmission and reception of said constant signal by said transmitter and receiver, respectively, and using those measurements, establishing a proportionality constant*"

18. "*obtaining a proportionality constant*"

The Court sets forth once again the language of Claim 4 of the '258 Patent so that the language of claim term 16 may be taken in its proper context:

4. In a method for locating a boring tool that moves through the ground from a first point to a second point, said method using (1) a given transmitter ... and (2) a receiver ... whereby to determine the location of the boring tool, the improvement comprising the steps of:

(a) providing a specific positional relationship between said transmitter and receiver and, while maintaining that positional relationship, transmitting a CONSTANT electromagnetic signal with time from said transmitter and receiving said CONSTANT signal from said receiver;

(b) ***obtaining distance and electromagnetic signal field strength measurements (i) based on said***

positional relationship between the transmitter and receiver and (ii) based on the transmission and reception of said constant signal by said transmitter and receiver, respectively, and using those measurements, establishing a proportionality constant k of said dipole FOR SAID GIVEN TRANSMITTER AND RECEIVER, which said proportionality constant relates to the cube root of the magnetic field strength of said dipole; and

(c) thereafter, using said proportionality constant and a CONSTANT electromagnetic signal with time, causing said receiver to determine the depth of said boring tool.

(emphasis added). *See also,* '258 Patent, Claim 9.

Plaintiff DCI proposes a construction for claim term 16 that reads: "Calculating a proportionality constant based on the signal strength of a detected, non-degrading, and recurrent electromagnetic signal at a known distance." Defendant meanwhile asserts that this term should mean "one distance and two field strength measurements are taken after the transmitter is placed below ground and the receiver is placed above ground in two different locations." In this instance, based solely on the clear language in claims 4 and 9 of the '258 Patent, the Court finds that plaintiff's construction is closer to the mark. The claim language in claims 4 and 9 of the '258 Patent clearly describe a one-step calibration technique. The steps of the improvement in the Jepson claim include (a) placing the transmitter and receiver at a known distance apart, (b) taking a magnetic field strength measurement to calculate a proportionality constant (using the above first equation as verbally described in the claim language), and (c) "*thereafter*" using the proportionality constant to obtain the depth of the boring tool during HDD operations. Thus, this term means calculating a proportionality constant based on the strength of a constant electromagnetic field strength at a known distance.

The Court does not see this claim term as being limited in a spatial sense as defendant suggests. The Jepson claim format, while defining the context and scope of the prior art and the invention itself, does not impose such a limitation in this instance. The improvement described after the preamble is discussing a method of *calibrating* the transmitter/receiver pair to be used in the method for locating a boring tool as described in the preamble. Thus, the improvement is not limited by the below-ground transmitter / above-ground receiver configuration described therein. It is also clear that these claims do not describe two-step *calibration* by taking one distance and two field strength measurements as argued by the defendant.

Nevertheless, the Court notes that the specification *does* not specifically describe a one-step calibration method. To show this, the Court quotes heavily from the relevant specification text:

The aforementioned factors and parameter relationships indicate, and the prior art has recognized, that the distance between transmitter and receiver can be obtained using magnetic field strength measurements alone once the proportionality constant has been determined.

The proportionality constant depends upon a variety of parameters, such as soil characteristics, tool body attenuation and battery strength. As a result, locator/monitors of the present invention should be calibrated (i.e. the proportionality constant should be determined) before use under new conditions or after a substantial period of continual use. Since calibration is required often, a simple procedure therefor, as provided by the present invention, is desirable.

A method to accurately determine the proportionality constant in an antennae separation-insensitive manner is to measure the magnetic field strength at two position using a "single antenna location" device (e.g. two

orthogonal antennae dispose in close spatial proximity), such as the locator/monitor of the present invention. In such a device, the single antenna location is moved between two measurement positions by an operator. Consequently, the spacing between the two measurement positions can be much larger than that of a spatially separated two-antennae device, since packaging requirements do not limit the distance between measurements positions in locator/monitors of the present invention.

In the practice of the present invention, the magnetic field strength (B_1) is measured by the orthogonally disposed antennae at a first position that is located a distance d_1 from transmitter. Similarly, magnetic filed strength (B_2) is measured at a second position that is vertically displaced from the first position and located a distance d_2 from transmitter. If the distance d between the first and second positions is known, the variables k, d_1 and d_2 may be calculated by solving the following equations:

$$B_1 = k/d_1^3$$

$$B_2 = k/d_2^3$$

$$d = d_2-d_1$$

An important feature of this process is that d is accurately ascertainable. As a result, an accurate independent measurement system is incorporated into receiver of locator/monitors of the present invention, so that the distance between the two measurement positions can be determined. The independent distance measuring means could also be separate from the receiver, but such a configuration is not preferred.

'589 Patent, Col. 12:1-49. This description does not encompass a simple one step calibration followed by depth measurements taken during operation. Rather, it discussed the two-step calibration method using *two* field strength measurements and a known distance between measurement positions. As a matter of claim construction, the Court will not use the specification language to give the claim language a different meaning than is plainly obvious. Whether this has implications regarding the "enablement" requirement of the specification, however, is an issue for another day.

While the above revelation may not immediately affect the Court's construction of claim term 16, it does significantly influence the construction of claim term 18. This claim term is found solely in Claim 10 of the '258 Patent:

10. In a method for locating a boring tool that moves through the ground from a first point to a second point during which time at least the roll orientation of the boring tool changes, said method using: (1) a given transmitter defining an axis and power supply carried by the boring tool within an electrically conductive housing for transmitting by means of a dipole field to an above ground location an electromagnetic signal containing information which is used in obtaining the location of the boring tool and (2) a given receiver located at said above ground location for receiving and processing said electromagnetic signal, whereby to determine the location of the boring tool, the improvement comprising the steps of:

(a) ***obtaining a proportionality constant*** for said given transmitter and said given receiver;

(b) thereafter, using said given transmitter [as the boring tool moves] ...

(c) causing said given receiver to receive and process [the signal] ...

(d) monitoring and displaying the depth of said boring tool as it moves through the ground from said first point to said second point using the signal processed by said receiver.

(emphasis added). Defendant argues that this claim element should be read as a "step plus function" limited claim element. While it is true that the preamble does not contain the so-called magic words "steps for" and is therefore rebuttably presumed to *not* be in step plus function format, the Court agrees that the phrase "obtaining a proportionality constant" itself provides no information as to how this step is to be carried out. In short, this claim element contains no "acts." This is in direct contrast to Claim 4 of the same patent, which verbally describes the use of the field-strength proportionality equation within the claim language, and Claim 9's description using the equation itself. Therefore, the Court reads this to be a step plus function claim element, and the phrase "obtaining a proportionality constant" must be limited to the acts described in the specification for achieving the function of the step.

As noted above, the only description of calibration contained in the specification is that quoted above. The acts described are a two-point calibration technique as described above. *Two* field strength measurements are taken at two different distances from the transmitter, the difference in the distances being known. A proportionality constant is then calculated via the three equations above, and the depth of the boring tool can be calculated during the HDD operation.

The above constructions in turn dictate the proper construction of claim term 14:

14. "*providing a specific positional relationship between said transmitter and receiver*"

'258 Patent, Cls. 4 and 9. As stated above, the Court does not import the positional above-ground/ below-ground relationship set forth in the preamble as a limitation on the calibration procedure described in the improvement steps. The Court therefore adopts plaintiff's construction of the term-"positioning the receiver and transmitter at a known distance from each other. As stated in the interpretation of claim term 16, this construction is based solely on the plain meaning of the claim language read in its proper context and is not based on the specification, which contains no such method of calibration.

In turn, each of the above constructions dictates the construction of claim term 8:

8. "*transmitter ...for transmitting to an above ground location*"

'258 Patent, Cls. 1 and 4, preamble. Defendant argues that this term means that the transmitter is located above ground and the receiver is located above ground. This is true, but the question becomes *when*. As stated above, the preamble describes a method of locating the boring tool during an HDD operation. But this does not necessarily provide a ground for so limiting the positional relationship of the transmitter and receiver at all times. The Court finds that whether or not this below-ground transmitter / above-ground transmitter positional relationship in these claims emanates from the language *after* the preamble. In claim 1, it is clear that the post-preamble language is describing depth measurements during the operation of the boring tool-in Claim 1, it is true that the transmitter is above ground and the receiver is above ground. However, in Claim 4, the calibration procedure described in the improvement steps is carried out prior to the implementation of the method of locating the boring tool described in the preamble. In that claim, therefore,

the "above ground location" language does not limit the calibration procedure to an above ground implementation.

E. *Depth Measurements as the Boring Tool "Moves Through the Ground"*

The next family of constructions relate to terms that describe the monitoring of the movement and depth of the boring tool as it "moves through the ground." The debate in each of these terms is whether the boring tool must actually be moving while the particular method or methods described in the claims are practiced, or if the methods must simply be capable of being performed while the boring tool is moving. The claim terms involved in this construction are claim terms 13 and 19:

13. "*moves through the ground*"

19. "*monitoring and displaying the depth of said boring tool as it moves through the ground*"

Defendant argues that each of these terms limits the methods described to being practiced while the boring tool is in the ground moving from one point to another. Plaintiff, in contrast, provides various constructions of these phrases, but omits any reference to a requirement that the boring tool be in motion. While the Court does not find the plaintiff's proposed constructions particularly helpful, it does agree that the boring tool need not be in motion in order to practice the method taught by the patents.

The Court begins, as always, with the claim language in its proper context. Claim term 13 is found in the preambles to several Jepson claims in the '258 patent. The preamble to Claim 1, for example, states:

1. In a method for locating a ***boring tool that moves through the ground from a first point to a second point in directions dependent on the roll orientation of the boring tool*** and during which time the roll orientation of the boring is controllably changeable throughout 360 degrees of roll orientation in order to steer it between said first and second points, said method using (1) a transmitter and power supply carried by the boring tool within an electrically conductive housing for transmitting to an above ground location an electromagnetic signal containing information which is used in obtaining the location of the boring tool and (2) a receiver located at said above ground location for receiving and processing said electromagnetic signal whereby to determine the location of the boring tool, the improvement comprising the steps of:

(emphasis added). *See also* Claims 3, 4, 9, 10, 13 of the '258 Patent.

The plain language of the claims state "in a method for locating a boring tool *that* moves through the ground ..." (emphasis added). Grammatically, this claim language simply indicates that the boring tool is capable of moving through the ground, and that there is a method for locating that boring tool. This language does not dictate that the method must be practiced *while* the boring tool is in motion, such as might be the case if the method was for locating the boring tool while it moves through the ground. Defendant points to no evidence in the specification or otherwise that would mandate a contrary result. Thus, the term indicates that there is a method for locating a boring tool, and that the boring tool is capable of moving through the ground. Therefore, the method *may* be used while the boring head is in motion. As analyzed above in the Court's construction of terms related to the positional relationship of the transmitter and receiver, this term likewise does not indicate that the post preamble steps must be performed while the boring head tool is in the ground. This limitation proposed by the defendant is therefore denied as well.

Claim term 19 is found in Claim 10 of the '258 Patent:

10. In a method for locating a boring tool that moves through the ground from a first point to a second point during which time at least the roll orientation of the boring tool changes, said method using: (1) a given transmitter defining an axis and power supply carried by the boring tool within an electrically conductive housing for transmitting by means of a dipole field to an above ground location an electromagnetic signal containing information which is used in obtaining the location of the boring tool and (2) a given receiver located at said above ground location for receiving and processing said electromagnetic signal, whereby to determine the location of the boring tool, the improvement comprising the steps of:

(a) obtaining a proportionality constant for said given transmitter and said given receiver;

(b) thereafter, using said given transmitter [as the boring tool moves] ...

(c) causing said given receiver to receive and process [the signal] ...

(b) ***monitoring and displaying the depth of said boring tool as it moves through the ground from said first point to said second point using the signal processed by said receiver.***

(emphasis added).

Again, the defendant argues that this term indicates that the method described in Claim 10 must be practiced while the boring tool is underground and in motion. And again, the Court refuses to adopt such a restrictive interpretation. Defendant point to no citation in the specification that would indicate that the method must be practiced while the boring tool is actually moving. In fact, its only citation to the specification in the Joint Claim Chart has nothing to do with this claim term. *See* '589 Patent, Col. 19:53-Col. 10:5. On the other hand, in light of the entire specification, and specifically in reference to those parts which describe the nature of HDD operations, the Court reads this claim term to include situations in which the boring tool comes to a stop during operations. *See* '589 Patent, Col. 1:33-45. While the method is capable of being practiced while the boring tool is in motion, there is no indication that the method *must* be so practiced.

F. "*Locating*"

Next, the Court interprets the ubiquitous claim term number 7, "locating." The parties dispute whether this claim term dictates that methods of "locating" must involve locating the boring tool in either two or three dimensions or only in three dimensions. The Court's short answer is, it depends. This claim term arises throughout the claims of many of the patents. For example, Claim 1 of the '589 Patent contains the following language:

1. A method of ***locating*** a generally horizontally extending dipole magnetic field transmitter which is disposed underground within a particular vertical transmitter plane defined by its dipole axis and which generates a magnetic dipole filed containing magnetic flux lines, each one of which extends from one end of the transmitter around to its opposite end and all of which are spaced from one another about the dipole axis of said transmitter, said method comprising the steps of:

(a) providing a locating receiver including an antenna arrangement and means for producing

(i) a first signal ...;

(ii) a second signal ...;

(iii) a third signal ...;

(b) moving said locating receiver above the ground at a predetermined orientation and ...;

(c) thereafter, again moving said locating receiver above the ground at said predetermined orientation and within a second vertical receiver plane transverse to the vertical transmitter plane ...;

(d) thereafter, still again moving said locating receiver above the ground within a third vertical receiver plane transverse to the vertical transmitter plane containing the axis of said transmitter either ahead of or behind the transmitter with respect either ahead of or behind the transmitter with respect to its general direction of movement so as to cause said receiver to produce successively first, second and third signals in a predetermined way ***which will establish a point above ground directly over the transmitter.***

(emphasis added). In this case, it is clear that what is being achieved is the location *on the surface* directly above the boring tool, which is underground. Location "on the surface" is two dimensional. This is true for the term in the context of many other claims. *See* '678 Patent, Claim 1; ' 780 Patent, Claim 1; '025 Patent, Claim 1 ("method of finding a point on the ground" over the boring tool); '538 Patent, Claim 1. However, in Claim 8 of the '539 Patent, it is clear that the method of locating also involves a depth calculation once the place on the ground above the boring tool has been located. Therefore, whether this claim term refers to a three dimensional locating method or a two dimensional locating method will depend on the context in which the term is used. This is supported by appropriate references in the specification as well. *See* '589 Patent, Col. 14:9-19. The Court will therefore in part adopt the plaintiff's construction, defining "locating" as the act of determining the location of the boring tool relative to a known position or reference.

G. *Other Processor Terms*

The parties have agreed to the following construction of the second term contained in claim term 20: an "electronic processor for receiving said electrical signals at least substantially simultaneously" is jointly defined as "a processor coupled to receive, approximately concurrently, the first and second electrical signals generated by a receiver in response to the receiver sensing first and second components of a three dimensional electromagnetic signal." *See* Dkt. No. 144. The first phrase in claim term 20, however, was not agreed upon:

20a. "*electronic processor ... configured for responding to movement of the above ground portable locator, which movement causes variation in the electrical signals*"

Further, defendant argues that a variation on these constructions is present in the same claims of the '538 Patent. Specifically, claim term 21 reads:

21. "*electronic processor ... configured ... for using the electrical signals to determine the location of said transmitters*"

DCI contends that this phrase does not in effect exist and has too much language omitted to be worthy of

construction. The Court agrees in part, but finds that the more complete interpretation would be to construe the entire phrase contained within subsection (b) of Claim 1 of the '538 Patent. Put in its proper context, Claim 1 of the '538 Patent includes the following language:

1. An above-ground portable locator for locating an elongated boring tool positioned underground and within a region, said boring tool including a transmitter arrangement which transmits within said region an electromagnetic dipole orientation signal, said locator comprising:

(a) a receiver arrangement including at least first and second antennae positioned transverse to one another, said first and second antennae simultaneously sensing at least respective first and second orthogonal components of said electromagnetic orientation signal, said receiver arrangement producing respective first and second, at least substantially simultaneous, electrical signals, which last-mentioned electrical signals are functions of said first and second orthogonal components sensed by said first and second antennae; and

(b) an ***electronic processor*** for receiving said electronic signals at least substantially simultaneously and ***configured for responding to movement of the above ground portable locator, which movement causes variation in the electrical signals,*** as detected by the portable locator, ***for using the electrical signals to determine the location of said transmitter*** within said region.

While this claim is a grammatical mess, the Court will endeavor to give meaning to its constituent parts. What is clear is that the electronic processor is configured to respond to movement of the locator-this comes directly from the claim language-and that this is important for determining the location of the transmitter.

The dispute between the parties primarily focuses on whether there is a temporal component implied by the language "responding to movement" term. DCI asserts that CMW is relying on its interpretation of claim term 22 involving the "ways" in which the flux lines impinge the various antennae. Yet there does not appear to be any reference to that claim term, which is found in the '589 and '025 Patents, in CMW's briefing regarding claim terms 20 and 21. *See* CMW Opening Brief at 26-27. Although the Court agrees that claim term 22 does not involve a temporal component, the same is not true for claim term 20. The specification has numerous reference to a comparison being made between previously received signals and later received signals in the location process of the boring tool. *See* '589 Patent, Col. 14:9-19; Col. 21:34-43; Col. 22:3-19. Therefore the Court construes term 20a to mean that the electronic processor is configured for responding to movement of the above ground portable locator by comparing previously received signals to currently received signals.

Defendant also argues that the determination of the location of the transmitter must be in three dimensions in construing claim term 21. DCI argues that this claim term is too cut up to be capable of interpretation. While the Court finds that the claim term can be interpreted, it does not agree with CMW's proposed construction. Consistent with the Court's interpretation of claim term 7 "locating," the Court finds that location does not have to be in three dimensions. In fact, Claim 1 of the '538 Patent appears to be describing a locator that locates the transmitter in two dimensions-i.e. locates the point on the ground above the transmitter-as there is no reference to a depth measurement being taken, and no mention of the method by which such a depth would be determined.

Read together, claim terms 20a, 20b, and 21, show that there is a locator that contains a processor that 1) receives from the receiver signals that are generated in response to the receiver sensing first and second components of a three dimensional electromagnetic signal, 2) compares those signals to previously received

signals, and 3) uses this information to determine the two dimensional location of the transmitter.

22. ***Undiscussed Terms***

The following claim terms were included as terms in the Joint Claim Chart, but were not discussed by Charles Machine Works in its briefing or during the claim construction hearing. As the terms were not important enough for defendant to analyze, they are not important enough for the Court to analyze. The Court therefore adopts the constructions of DCI to a large extent as follows:

11. "*slots*" are defined as narrow slits. While it may be true in the context of these patents that the slots are distributed around a cylindrical surface, the Court sees no reason why they should be so limited.

12. "*apertures*" are defined as narrow slits. While it may be true in the context of these patents that the apertures are distributed around a cylindrical surface, the Court sees no reason why they should be so limited. The claims and specification indicate that the terms slots and apertures are used interchangeably, and therefore should be given an identical construction.

23. "*first vertical receiver plane*" is defined as a vertical plane located in front of or behind an in-ground transmitter and which is perpendicular to the vertical plane containing the transmitter axis.

24. "*by means of a locator positioned a particular distance above ground*" means that the locator is some distance above the ground to perform the method of determining the depth of the boring tool.

25. "*mode*" refers to two different methods of operation of the receiver. One is the "locating" mode and the other is the "homing" mode.

28. "*moving said locating receiver above the ground at a predetermined orientation*" means moving the locating receiver above ground while holding it at a consistent orientation with respect to the vertical plane containing the transmitter axis.

CONCLUSION

Having considered the all of the papers and pleadings submitted by the parties, and having heard numerous hours of oral argument and testimony on the issues, the Court interprets the disputed claim terms as discussed above.

The Clerk is directed to send copies of this order to all counsel of record.

W.D.Wash.,2003.
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