UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ST. JUDE MEDICAL, CARDIOLOGY DIVISION, INC.
Petitioner

v.

VOLCANO CORPORATION
Patent Owner

Patent No. 7,134,994
Issue Date: November 14, 2006

MULTIPURPOSE HOST SYSTEM FOR INVASIVE CARDIOVASCULAR DIAGNOSTIC MEASUREMENT ACQUISITION AND DISPLAY

Inter Partes Review No. Unassigned

PETITION FOR INTER PARTES REVIEW

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TECHNICAL FIELD OF THE PETITION

The petition relates to computer software.

GROUNDS FOR STANDING

Petitioner hereby **certifies** that the patent for which review is sought is available for inter partes review and that the Petitioner is not barred from filing the present petition. Petitioner provides the following background:.

On July 27, 2010, Petitioner ("St. Jude") and affiliates filed a complaint in the U.S. District Court in Delaware. The complaint alleged that Patent Owner infringed five United States patents owned by the Petitioner. (Complaint, Ex. 1006). The '994 patent was not asserted in the complaint. On Sept. 9, 2010, the Patent Owner filed an answer and counterclaim against the Petitioner, alleging that the Petitioner infringed the '994 patent. (Answer, Ex. 1007). In its responsive pleading, Petitioner alleged that it did not infringe the '994 patent and that the '994 patent was invalid. (Answer to Counterclaim, Ex. 1008). Two days prior to trial, on Oct. 20, 2012, Patent Owner notified Petitioner that it was dropping the '994 patent counterclaim. (Ex. 1009). On Oct. 21, 2012, the parties stipulated to dismissal of the counterclaim with prejudice. (Stip., Ex. 1009).

The prior allegations do not prevent the current petition. The Petitioner is not prevented from petitioning under 35 U.S.C. § 315(a)(1), because it has never "filed a civil action challenging the validity of a claim of the patent." Nor is the

petitioner prevented from petitioning under 35 U.S.C. § 315(b), because the Petitioner and its privies have never been "served with a complaint alleging infringement of the patent," and all litigation has been subsequently dismissed.

More specifically, the Federal Rules of Civil Procedure ("FRCP") define a "complaint" as the filing that commences a civil action. (FRCP 3, Ex. 1010). The complaint in the Delaware litigation did not include any allegation relating to the '994 patent. Furthermore, FRCP 7 clearly distinguishes between a "complaint" and a "counterclaim" or an "answer". (FRCP 7, Ex. 1011). The allegation of infringement in the Delaware action was made in an "answer". (Ex. 1007).

The clear distinction between a "complaint" and an "answer" or "counterclaim" in the FRCP was carried over into the text of the statute. *See Ariosa Diagnostics v. Isis Innovation, Ltd.*, IPR2012-00022, Decision of Feb. 12, 2013, p. 4 ("As a guide to interpreting the plain meaning of the statute, we look to the Federal Rules of Civil Procedure."). Section 315(b) is entitled "Patent Owner's Action"—in reference to the Patent Owner's required action of initiating the suit with a "complaint", consistent with FRCP 3. The statute also distinguishes in 35 U.S.C. § 315(a)(1) between the act of "fil[ing] a civil action" (by a complaint per FRCP 3), which triggers a bar, and the filing of a "counterclaim" in § 315(a)(3), which does not. When Congress wished to include allegations of infringement broader than a "complaint" under FRCP 3, it used broader terminology, such as "charged

with infringement". *Compare* AIA, Sec. 18(a)(1)(B). Furthermore, the litigation was voluntarily dismissed with prejudice by the Patent Owner, thereby purging the cause of action. *See analogously Macauto USA v. Bos GmbH*, IPR2012-00004 (TLG), Decision of Jan. 24, 2013, pp. 14-15. Thus, § 315(b) is not applicable.

STATEMENT OF PRECISE RELIEF REQUESTED

The Petitioner requests that claims 1-20 of U.S. Patent No. 7,134,994 ("the '994 patent")(Ex. 1001) be canceled based on grounds of invalidity 1-12.

THRESHOLD REQUIREMENT FOR *INTER PARTES* REVIEW

The Petition demonstrates "a reasonable likelihood that the Petitioner would prevail with respect to at least one of the claims challenged in the petition" (35 U.S.C. § 314(a)) as explained below in the proposed grounds of invalidity.

STATEMENT OF REASONS FOR RELIEF REQUESTED

I. Technical Introduction And Examination History Of The '994 patent

A. Claims And Disclosure Of The '994 patent

The '994 patent claims a computer system for displaying invasive cardiovascular diagnostic measurements. Such measurements involve inserting a catheter with one or more sensors through blood vessels, eventually guiding the sensors to the region around the heart. Once there, the sensors take measurements of blood pressure, blood flow, blood temperature, and / or other parameters. These measurements can diagnose the severity of cardiovascular illnesses.

The '994 patent does not purport to teach a novel method of diagnosis. The

diagnostic techniques in the '994 patent were known. ('994 patent, col. 1, ll. 33-34 and col. 2, ll. 3-8). Rather, the '994 patent purports to use these known diagnostic methods with an allegedly new computer system. This computer system, according to the '994 patent, addressed a lack of flexibility in prior art systems. Specifically, the '994 patent states that prior art diagnostic methods used special-purpose monitor consoles that were unable to be easily modified or extended:

> "**The approach taken in the field of interventional cardiac imaging has been to provide multiple, special-purpose monitor consoles**." ('994 patent, Ex. 1001, col. 2, l. 67 – col. 3, l. 7) (emphasis added).

The '994 purports to fix this problem (in mid-2002) by providing a "flexible, multipurpose" host system that can be easily extended:

> "**The present invention provides addresses [sic] a need to provide a flexible, multipurpose host system**…. **The host system includes a number of modularized components….This allows the functionality of the host system to be extended** to include new types of sensors without requiring an overhaul of the existing system software." ('994 patent, Ex. 1001, col. 3, ll. 25-50) (emphasis added).

In order to achieve a "multipurpose" system, the '994 patent abandoned dedicated hardware in favor of a standard personal computer ("PC"). ('994 patent, Ex. 1001, col. 4, l. 66). On this PC, the '994 patent used a graphical user interface ("GUI"). ('994 patent, Ex. 1001, Abstract). The graphical user interface displayed the output of processing functions implemented as modular "components". ('994

patent, Ex. 1001, col. 3, ll. 32-33).

B. Examination History Of The '994 patent

The application leading to the '994 patent was filed with the following claim 1:

> "1. A **multipurpose host system** for invasive cardiovascular diagnostic measurement acquisition and display, the system comprising:
>
> an **external input signal bus interface** for receiving data arising from cardiovascular diagnostic measurement sensors;
>
> a plurality of **measurement processing components** for receiving data of particular sensor types and rendering diagnostic measurement parameter values according to the received data; and
>
> a **multi-mode graphical user interface host** comprising a set of diagnostic measurement user interfaces including display components corresponding to data output rendered by specified ones of the plurality of measurement processing components." ('423 application, Ex. 1012, p. 30)(emphasis added).

The assigned Examiner rejected claim 1 over U.S. Pat. No. 6,322,502 ("Schoenberg"). In response, the Applicants amended claim 1 to require "a component based arrangement", and to specify that the measurement processing components "operate at a user mode level in the multipurpose host system". (Amd. of Sept. 22, 2005, Ex. 1014, p. 2). The Applicants argued that:

> "In contrast to Applicants' recited **user mode component-based architecture**, the Schoenberg patent discloses what appears to be a **statically configured/defined system** that includes specialized low-

> level hardware-based interfaces (I's) for rendering data to a primary interface unit 20." (Amendment of Sept. 22, 2005, Ex. 1014, pp. 9-10) (emphasis added).

The Examiner responded by adding an alternative rejection over Schoenberg in view of U.S. Pat. No. 5,088,036 ("Ellis"). The Examiner found that:

> "Ellis et al teaches that in a computer, applications run in user mode and the operating system runs in kernel mode. Accordingly, since the interface is part of an application, it is clear that it operates at a user mode level. Alternatively, it would have been obvious in view of Ellis to design the system to have the interfaces operate at a user mode level, to allow for better system protection." (Non-final rejection of Feb. 14, 2006, Ex. 1015, p. 3).

The Examiner found claim 33 allowable, however, stating that "[c]laims 33 and 34 define over the art in that none of the art has the **kernel mode drivers**, as claimed". (Non-final rejection of Feb. 14, 2006, Ex. 1015, p. 8) (emphasis added).

In response to this finding, the Applicants amended claim 1 to incorporate language similar to that of claim 33. (Amendment of May 4, 2006, Ex. 1016, p. 3). Thereafter, the Examiner allowed all claims without further comment.

It thus appears the '994 patent issued because the Examiner could not find prior art that included kernel mode drivers, as specified in amended claim 1.

In addition to the "kernel mode drivers", issued claim 1 recites a "component based arrangement", components that "operate at a user mode level", an "external

input signal bus interface" and a "peripheral interface card". Although these terms have the appearance of complexity, that appearance is misleading. The terminology of claim 1 is no more than personal computer jargon describing standard practices at the time of the alleged invention. The relationship of these phrases to the claims and prior art will be discussed in the following subsections.

1. "user mode" and "kernel mode"

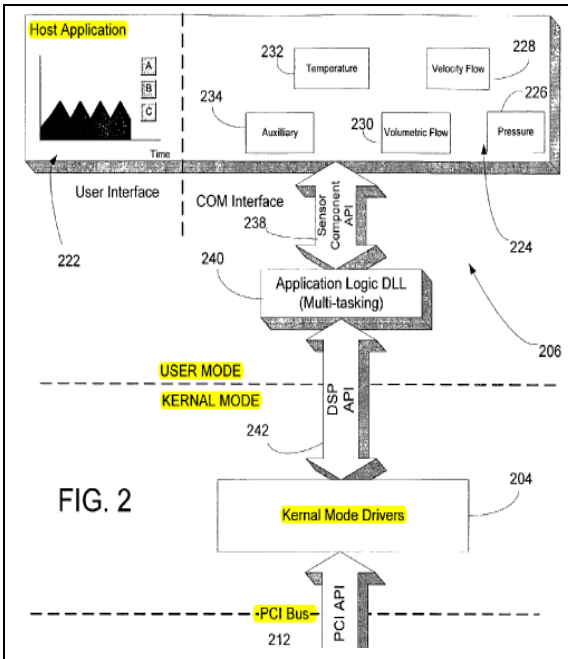
Claim 1 of the '994 patent requires certain components that "operate at a user mode level". Claim 1 also requires "kernel mode drivers". The two modes— "user" and "kernel"— reflect different levels of permission used in the architecture of virtually all personal computers since the 1990s. (Mason Decl., Ex. 1002, ¶¶23-25). In "user mode", software is prevented from carrying out certain operations that are not considered to be secure. In "kernel mode", software is considered "trusted", and has full access to the system. (*Id.*) (*Inside Windows*, Ex. 1004, p. 8).

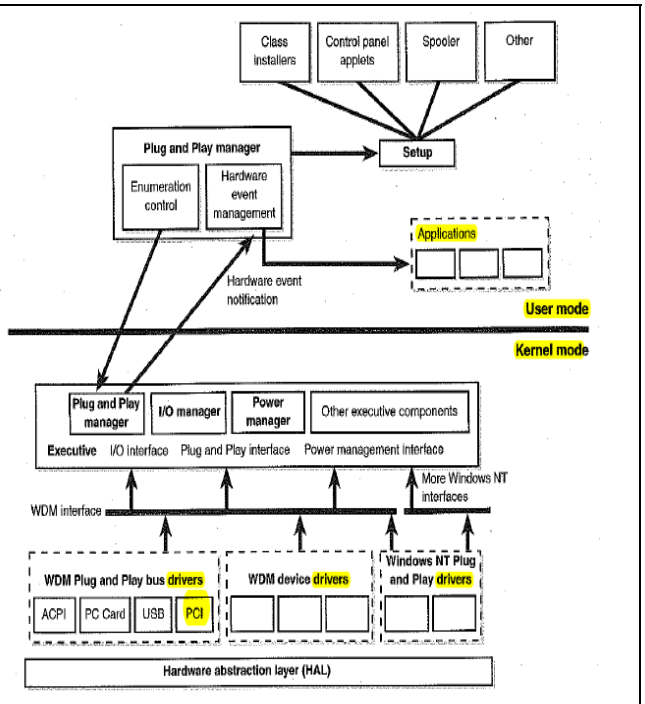
It was the inclusion of "kernel mode drivers" in claim 1 that ultimately convinced the Examiner to allow the claims. (Non-final rejection of Feb. 14, 2006, Ex. 1015, p. 9). The Examiner did understand (based on the Ellis reference) that "in a computer, applications run in user mode and the operating system runs in kernel mode." (Non-final rejection of Feb. 14, 2006, Ex. 1015, p. 3). What the Examiner did not understand, however, is that *device drivers operate in kernel mode*. (Mason Decl., ¶117). For example, the 1998 textbook *Inside Windows*

explains in relation to the then popular Windows® NT operating system that:

> **"Kernel Mode vs. User Mode.** To protect user applications from accessing and/or modifying operating system data, Windows NT uses two *processor access modes* (even if the processor on which Windows NT is running supports more than two): *user mode* and *kernel mode*. **User application code runs in user mode**, whereas **operating system code (such as system services and device drivers) runs in kernel mode**." (*Inside Windows*, Ex. 1004, p. 8) (bold-underline added) (Mason Decl., ¶¶56-62, 117).

In fact, Fig. 2 of the '994 patent, which shows "user mode" and "kernel mode" components, bears an uncanny resemblance to standard Windows diagrams:





'994 patent, Fig. 2, PC portion	*Inside Windows*, Ex. 1004, p. 476

The table above shows a side-by-side comparison of the portion of Fig. 2 of the

'994 patent representing the PC (left side) and Fig. 10-3 from the 1998 *Inside Windows* (right side), with highlighting by the Petitioner.

The recitation of "user mode" application components, together with "kernel mode" drivers, is thus not technically significant. It amounts to no more than use of standard methods for the most dominant operating system (Microsoft Windows®) at the time of the alleged invention. (Mason Decl., ¶117).

2. "incorporating a component based arrangement"

Claim 1 also requires a system "incorporating a component based arrangement". It is first worth noting how broad this term is—the system need not be *constructed of* a component based arrangement, it need only *incorporate*, *somewhere*, such an arrangement, even if the remainder of the system is not "component-based". Furthermore, the term "component" is inherently vague; it literally means a "part" or "piece" of something.

The '994 patent does not define the term "component", and standard computing books use the term "component" in different ways. For example the 1989 MacMillan Dictionary of Information Technology defines a "component" as "[a]n essential functional part of a subsystem or apparatus". (MacMillan IT Dictionary, Ex. 1017, p. 105). The 1998 *Inside Windows* textbook uses the term "component" in the following ways (which represent only a few of dozens of examples):

- to mean major pieces of an operating system: "[s]ince then, the Windows NT team has grown to include over 200 full-time engineers who work on the core components (kernel, graphics, drivers, file systems, network, directory services, security, setup, administration, shells, OLE, RPC, and so on)" (p. xvii) (underlining added);

- to mean a specific object-oriented programming standard (COM): "[t]he other major area of the system not explored in this book is COM (Component Object Model)" (xxii) (underlining added);

- to mean necessary data structures for a thread: "[a] thread includes the following essential components: ▪ The contents of a set of volatile registers representing the state of the Processor…." (p. 4) (underlining added).

And so forth. In other words, the term "incorporating a component based arrangement" means that some part of the system must be a "component"—a term that could literally describe any portion of software.

Whatever a component is, one Windows® concept falls squarely within "component based arrangement": the Microsoft **C**omponent **O**bject **M**odel or "COM". (Mason Decl., ¶39). COM is referenced in the '994 patent at col. 8, ll. 18-35. There, the '994 patent describes that its "measurement processing components…are instantiated from …component object model (COM) objects…." ('994 patent, Ex. 1001, col. 8, ll. 21-23) (Mason Decl., ¶¶39-40).

By the time of the alleged invention, COM was a widespread convention for

producing applications in a Microsoft Windows® operating system. (Mason Decl., ¶¶39-40, 141). The 1997 textbook *Inside COM* states:

> "COM was developed more than four years ago at Microsoft to make Microsoft applications more flexible, dynamic, and customizable. **Almost all currently shipping Microsoft applications use COM**." (*Inside COM*, Ex. 1018, p. 2) (emphasis added) (Mason Decl., ¶40).

Thus, the term "component" in claim 1 calls for nothing more spectacular than the use of the dominant prior art programming standard (COM) for the world's dominant operating system (Microsoft Windows®). (Mason Decl., ¶126).

3. "external input signal bus interface" and "peripheral interface card"

Suppose one wished to connect an invasive cardiac sensor to an off-the-shelf PC. How was this achieved at the time of the alleged invention? The most natural way to connect any non-standard equipment to a PC was to use an expansion card slot at the back of the PC. (Mason Decl., ¶152). Such slots were available in most desktop PCs beginning in the 1980s and continuing through the time of the alleged invention. (Mason Decl., ¶¶79, 28). Usually, the slots would accept a "card", which was essentially a circuit board that met a communication standard employed by the slot. (*Id.*).

The '994 patent employed the **P**eripheral **C**omponent **I**nterconnect or "PCI" card slot. ('994 patent, Ex. 1001, Figs. 1-2 and col. 5, ll. 8-12) (Mason Decl., ¶¶61-

64). "PCI" is (and was at the time of the alleged invention) a standard for a computer to communicate with peripherals. A PCI card slot allowed a "peripheral interface card" to be plugged into a PC, providing the PC with greater functionality. The physical card interacted with a *PCI Interface* (or an "external input signal bus interface") on the computer. PCI also had a forerunner known as **I**ndustry **S**tandard **A**rchitecture ("ISA"), which likewise provided an interface to card slots for expansion through peripherals.

Weiss, *et al.* (2000) note that the PCI bus was in most PCs by the year 2000:

> "In just a few years since its introduction, the PCI (peripheral component interconnect) bus[1] has become an industry standard, implemented in most PC systems as well as in some workstations." (Weiss, *et al.*, Ex. 1020, p. 80) (Mason Decl., ¶¶28, 79).

Weiss, *et al.* (2000) also note that the **PCI** bus (and the other previously mentioned bus, **ISA**) connected peripherals to the computer system, via an interface, to card slots:

> "The I/O expansion bus **connects most I/O peripherals into the system**. It consists of **connector slots into which I/O controller cards** can be inserted. A bus standard provides an **interface** between a computer system and I/O peripherals…..**By far the most popular of the expansion buses is the Industry Standard Architecture (ISA)** bus, based on the original IBM PC/AT bus." (Weiss, *et al.*, Ex. 1020, p. 80) (emphasis added) (Mason Decl., ¶31).

After connecting external sensors to a PC using standard peripheral card slots that were "implemented in most PC systems", a computer system would naturally have both "an external input signal bus interface" (*e.g.*, the PCI or ISA interface) and a "peripheral interface card". (Mason Decl., ¶150). Again, the claim language in the '994 patent amounts to no more than using industry standard methods, without calling them by their recognized names.

4. Overall

Claim 1 of the '994 patent is thus the sum of standard and recommended pieces. Known cardiovascular sensor types (peripherals) communicate through a standard expansion card with an everyday PC. This PC runs an operating system with a graphical user interface, employing conventions (components, user mode, kernel mode) typical of the operating system with a dominant market share for PCs at the time—Microsoft Windows®. (Mason Decl., ¶125).

It is important to note that the '994 patent does not purport to *enable* any of these pieces. The '994 does not provide novel sensors, or describe how to make a sensor. (Mason Decl., ¶14). The '994 patent does not describe how to make a peripheral interface card suitable for the system, nor does it discuss how to program its components or drivers. (Mason Decl., ¶15). No source code is provided in the '994 patent—the person of skill in the art is assumed to be able to write the relevant code. (Mason Decl., ¶15).

In fact, the vast majority of the disclosure of the '994 patent does not relate to claim 1 at all. Rather, it is directed to the *visual* arrangement of elements in the user interface. ('994 patent, Ex. 1001, Figs. 3-13) (Mason Decl., ¶¶16-17). This arrangement, however, is effectively printed matter, entitled to little weight in the validity analysis. *See In re Gulack,* 703 F.2d 1381, 1385 (Fed. Cir. 1983).

B. Objective Evidence Of Obviousness.

The Grounds in this petition are based on obviousness. In an obviousness analysis, secondary considerations are relevant. The Mason Declaration at ¶¶335-581 explains that both market trends and prior invention indicate the obviousness of the '994 patent claims. *See KSR Int'l Co. v. Teleflex, Inc.,* 127 S.Ct. 1727, 1739-40 (2007); *See Geo. M. Martin Co. v. Alliance Machine Systems Intern. LLC*, 618 F.3d 1294, 1306 (Fed. Cir. 2010)(simultaneous invention relevant to obviousness).

II. Construction Of The Claims

A claim in *inter partes* review is given the "broadest reasonable construction in light of the specification" *See* 37 C.F.R. § 42.100(b). As stated by the Federal Circuit in the case *In re ICON Health and Fitness, Inc.*: "[T]he PTO must give claims their broadest reasonable construction consistent with the specification…we look to the specification to see if it provides a definition for claim terms, but otherwise apply a broad interpretation." 496 F.3d 1374, 1379 (Fed. Cir. 2007).

For the purposes of this proceeding, claim terms are presumed to take on their

broadest reasonable ordinary meaning. This meaning is explained in certain instances in the following subsections.

A. Prior Litigation Constructions

The claims were previously construed in the litigation styled *St. Jude Medical, et al. v. Volcano Corporation*, Case No. 10-631-RGA (D. Del.). In that case, there were two types of constructions. First, the parties agreed to certain constructions in a Joint Claim Construction Brief ("JCCB") filed July 23, 2012 (Ex. 1021). Second, the parties disputed certain constructions, which were then decided by the court in a claim construction order of October 4, 2012. That order was corrected in an amended claim construction order of October 12, 2012 ("CCO")(Ex. 1022).

B. Construction Of Specific Terms

The following constructions are discussed in the Mason Declaration at ¶¶44-99.

1. Agreed Constructions, Supported By The Specification

In litigation, the parties agreed to the following constructions of terms in claim 1, which constructions are also in accord with the specification, as shown:

"**Multipurpose host system**" means "a personal or other multifunction computer." (JCCB, Ex. 1021, p. 15). This construction is supported by the specification at col. 4, ll. 65-67. "**Component based arrangement**" means a "software arrangement that is extensible, modular". (JCCB, Ex. 1021, p. 15). This construction is supported by the specification col. 7, l. 64 – col. 8, l. 5.

"**Measurement processing components**" means "software components that

process sensor data". (JCCB, Ex. 1021, p. 15). This construction is supported by the specification at col. 3, ll. 42-44. "**Rendering**" means "processing data into a different format including but not limited to drawing". (JCCB, Ex. 1021, p. 15). This construction is supported by the specification at col. 5, ll. 25-27, col. 3, ll. 25-28 and 55-57 and col. 6, ll. 17-22.

2. Court Constructions, Supported By The Specification

In litigation, the court construed the following terms. The Petitioner believes that these constructions are appropriate. "**Kernel mode drivers**" means "software components that execute on the most privileged level in a computer, which permit a computer system to communicate with a device". (CCO, Ex. 1022, p. 9). "**Processed sensor data**" means "sensor data that has been systematically modified, including by means of analog to digital conversion". (CCO, Ex. 1022, pp. 9-10). The specific inclusion of A/D conversion is supported by the specification at col. 5, ll. 34-36. "**Peripheral interface card**" means "a printed circuit board or adapter that can be plugged into a computer to provide added functionality or new capability, which provides specialized services that are not built into the computer, and that interfaces with peripherals." (CCO, Ex. 1022, p. 10). The court found that "**multi-mode graphical user interface host**" meant "software that supports a human-computer interface with at least two distinct displays for presenting diagnostic information of at least two types." (CCO, Ex.

1022, p. 8) (CCO, Ex. 1022, p. 8). The Petitioner notes that the term "display" in this construction can mean *portions* of a graphical user interface window, as taught by the '994 patent at col. 4, ll. 7-11, and as supported by the court's reasoning. (CCO, Ex. 1022, p. 8). Thus, the Petitioner submits that the term "**multi-mode graphical user interface hos**t" should be further construed to mean "software that supports a graphical user interface (including windows or portions of windows) for presenting at least two types of diagnostic information (including within the same window)".

3. Other Constructions

The term "**diagnostic measurement user interfaces**" should mean "a portion of a graphical user interface (including windows) for displaying diagnostic information". This is supported by the specification at col. 3, ll. 52-57. The term "**external input signal bus interface**" should mean a "connection between a peripheral interface card and a host." This construction is supported by the language of claim 1, which requires that the bus be for the purpose of "receiving data arising from cardiovascular diagnostic measurement sensors", by the ordinary meanings of "bus" and "interface" (MacMillan IT Dictionary, Ex. 1017, pp. 69 and 275), and by the '994 patent at Fig. 1, numeral 112 and col. 7, ll. 24-36. The phrase "**for facilitating receiving data of particular sensor types**" should receive its broadest reasonable ordinary meaning. The Petitioner points out that the phrase

only requires "*facilitating*" reception of data, and that the phrase does not *limit* particular components to particular sensor types. Claim 11 requires a "**generic graphical interface specification**". The term is not defined in the specification, and was not construed in litigation. The '994 patent states that "various display interface modes, while different, preferably share a common look and feel based upon a generic graphical user interface specification." ('994 patent, Ex. 1001, col. 9, ll. 20-23) The '994 patent further notes that "FIG. 3 depicts an exemplary generic graphical user interface specification…." ('994 patent, Ex. 1001, col. 9, ll. 23-24). Figure 3 appears to show a standard GUI window, with regions for display components of a certain type. The Petitioner thus submits that "generic graphical user interface specification" means "a layout for one or more GUI elements".

4. Claims 11-17 And 20 Recite "Printed Matter"

Certain of the claims and claim elements deal with the arrangement of visual elements on a computer display screen. Specifically, claims 11-17 and 20 also relate to the attributes of a "generic graphical interface specification". The '994 patent admits that the purpose of the generic specification is to provide "a common look and feel" for the application display. ('994 patent, Ex. 1001, col. 9, ll. 20-23).

The display of particular kinds of data, the arrangement of particular components on-screen, and provision and attributes of a specification for the user interfaces, constitute mere printed matter. As such, these claims limitations are not

entitled to patentable weight. *See In re Gulack,* 703 F.2d 1381, 1385 (Fed. Cir. 1983); *Ex parte Hackbarth*, Appeal No. 2009-000934, 2010 Pat. App. LEXIS 17699, *2-*3 (BPAI December 1, 2010)(Ex. 1023).

III. Claim-By-Claim Explanation of Grounds for Unpatentability

Ground 1. Claims 1, 10 and 18, are invalid under 35 U.S.C. § 103(a) over the Prucka Manual in view of *Inside Windows*, *Inside COM*, and Hoese.

Claims 1, 10 and 18 are invalid under 35 U.S.C. § 103(a) over the "Prucka CardioLab® 2000/4000/7000 Operator's Manual, Software Version 5.1" (Ex. 1003) in view of "*Inside Windows NT Second Edition*", Microsoft Press, 1998 ("*Inside Windows*")(Ex. 1004), "*Inside COM*", Microsoft Press, 1997 ("*Inside COM*") (Ex. 1018) and U.S. Pat. No. 5,819,115 ("Hoese")(Ex. 1005). The level of ordinary skill in the art at the time of filing of the alleged invention is discussed in the Mason Declaration, ¶¶42-43 (Ex. 1002).

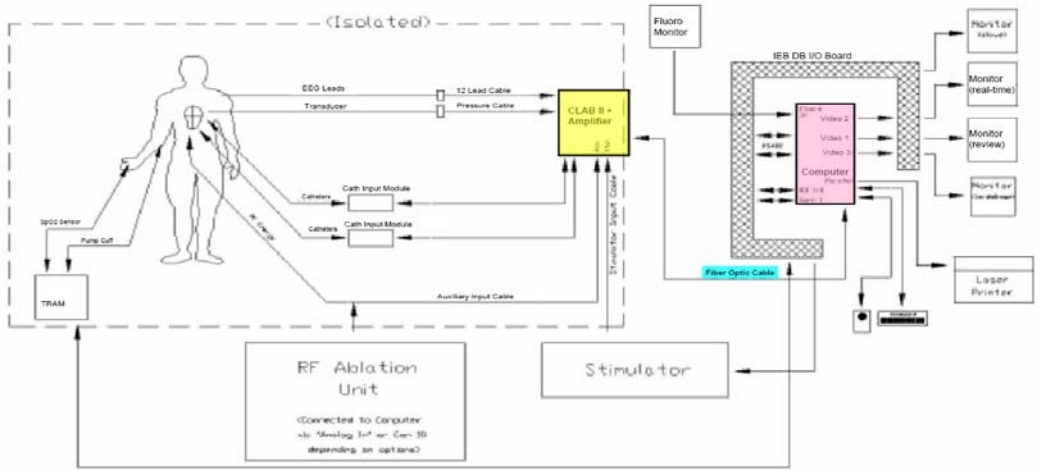
Inside Windows, *Inside COM* and Hoese are prior art under 35 U.S.C. § 102(b). The Prucka Manual is a printed publication as of August 9, 2001, and is thus prior art at least under 35 U.S.C. § 102(a). The facts establishing the Prucka Manual as a printed publication are presented in the Manual itself, as well as in the Vadodaria IPR Declaration, attached as Exhibit 1037.

The Prucka Manual (version 5.1) bears a copyright date on page T-2 and a release date (Aug. 9, 2001) on page 1-3, indicating that it was published.

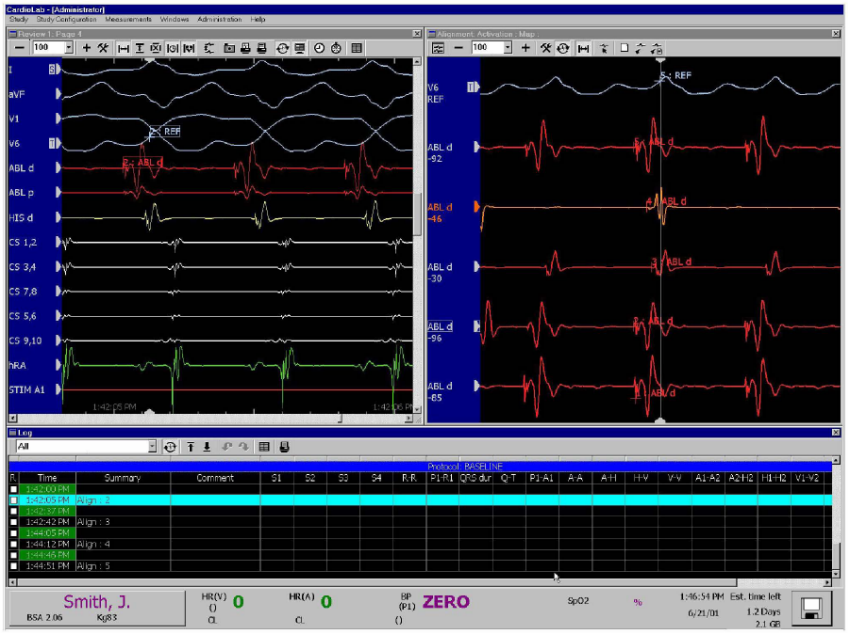
Furthermore, the Prucka Manual describes a commercial product: the Prucka CardioLab. Prucka CardioLab was distributed without restriction together with Prucka CardioLab systems as of the Manual's release date. (Vadodaria Decl., Ex. 1037, ¶¶6-7) (Prucka Man., Ex. 1003, p. 1-3). At that time, GE Medical was selling about 20 Prucka CardioLab systems per month at $135,000 per system, making it the market leader for invasive cardiovascular diagnostic systems. (Vadodaria Decl., Ex. 1037, ¶¶6-7). These facts alone are sufficient to qualify the Prucka Manual as a printed publication. *See Stored Value Solutions v. Card Activation Services*, 796 F.Supp.2d 520 (D. Del. July 20, 2011)(Ex. 1038) *aff'd by Stored Value Solutions v. Card Activation Services,* 2012 WL 6097674, *7, (2012)(Ex. 1039); *One Number Corp. v. Google, Inc.*, 2012 WL 3679746 (BPAI, Aug. 24, 2012)(Ex. 1040).

Beyond this, however, the Prucka Manual was available as a "part" in a widely distributed parts catalog from GE Medical. (Vadodaria Decl., Ex. 1037, ¶7). It was also known in this industry of sophisticated purchasers that one could write to a manufacturer asking for information about a commercially-known system, and receive copies of operator's manuals. (Vadodaria Decl., Ex. 1037, ¶7). GE Medical had a practice of providing such manuals in August, 2001. (Vadodaria Decl., Ex. 1037, ¶¶6-7). The Prucka Manual therefore qualifies as a § 102(a) printed publication as of its release date, Aug. 9, 2001.

The Prucka Manual describes a system ("CardioLab") for invasive cardiovascular diagnostic measurements. (Mason Decl., ¶124). The overall CardioLab setup is shown in the figure on page 2-8 of the Prucka Manual, reproduced here (with some labels clarified and color added by the Petitioner):



This figure shows a patient (left side) with invasive sensors. These sensors feed information to a CLAB II + Amplifer (yellow), which in turn passes the information along a fiber optic cable (blue) to a computer (pink). The computer system runs Windows® NT and CardioLab software. (Prucka Man., Ex. 1003, p. 2-11 – 2-13). This software provides a number of measurement processing functions (Prucka Man., Ex. 1003, chapters 3 and 4), that can be used to display results in a Windows®-based multipurpose graphical user interface. For example, a user interface screen from page 9-7 of the Prucka Manual is shown here:



As can be seen from the screenshot above, a variety of types of data and measurements could be shown in multiple windows. The system overall is thus very similar to that of the '994 patent.

While the Prucka Manual discloses the algorithms used to process sensor data (Prucka Man., Ex. 1003, chapters 3 and 4) (Mason Decl., ¶¶151-157), it has somewhat limited disclosure of a "component based arrangement" (*see* limitation 1.5, below), and does not *expressly* disclose whether its software operates in "user mode", employs "kernel mode drivers", or whether it acquires invasive sensor data through a "peripheral interface card".

These limitations would have been provided, however, simply by following the Prucka Manual's instruction to implement its on a Windows® NT personal computer. Thus, Windows® NT and personal computing references (here *Inside*

Windows, Inside COM and Hoese) render the claims trivially obvious.

Inside Windows describes the Windows® NT operating system. Windows® NT was used by CardioLab as instructed in the Prucka Manual. (Prucka Man., Ex. 1003, pp. 2-3, 2-11). Windows® NT was, at the time of the alleged invention, the most recent version of the Windows® operating systems. (Mason Decl., ¶125). These operating systems held the dominant market share for personal computers of the type described in the '994 patent. (Mason Decl., ¶125). Thus, it would have been obvious to combine the Prucka Manual's disclosure of a computer running Windows® NT with *Inside Windows*, a standard reference work on Windows® NT. (Mason Decl., ¶¶137-144).

Inside COM, in turn, describes a Microsoft Windows® programming standard, known as the "Component Object Model" or "COM". (Mason Decl., ¶¶39-40). The COM standard is referenced in the '994 patent (col. 8, l. 23) as a basis for the claimed "components". COM programming was standard in Windows systems at the time the application leading to the '994 patent was filed . As noted in *Inside COM "*[a]lmost all currently shipping Microsoft applications use COM." (*Inside COM*, Ex. 1018, p. 2) (Mason Decl., ¶40).

Thus, it would have been obvious to combine *Inside COM*, describing a commonly used programming standard for Windows® applications, with the Prucka Manual's Windows® NT –based software, to provide "measurement

processing components" as in the '994 patent. (Mason Decl., ¶¶137-144). Specifically, it would have been obvious to implement each individual CardioLab function as a single COM component. *Inside COM* teaches that it is advantageous to break identifiable functions into smaller tasks, and implement each as a component, because this increases reusability of the components. *Inside COM* explains:

> "A small interface [to a component] represents a single behavior, while a bigger interface represents many behaviors. The more behaviors represented by an interface, the more specific to a situation the interface becomes. The more specific an interface becomes, the less likely it is that it can be reused by another component. If an interface is not reused, client code that uses the interface can't be reused. For example, which is more reusable: a single interface that represents the behaviors of a helicopter, including flying, floating, hovering, lifting; rolling, vibrating, shaking, and falling, or multiple interfaces representing each of these behaviors individually? An interface that represents flying is much more reusable than an interface that represents a helicopter. Hardly anything but a helicopter behaves like a helicopter. However, lots of things fly." (*Inside COM*, Ex. 1018, pp. 27-28) (Mason Decl., ¶147).

Note that the term "interface" is equivalent to "component" in COM. (*Inside COM*, Ex. 1018, p. 16) ("Interfaces are everything in COM. To the client, a component is a set of interfaces.") (Mason Decl., ¶148).

Lastly, it would have been obvious to combine the teachings of the Prucka Manual with teachings regarding fiber-to-PC peripheral interface cards, such as those taught in Hoese. The Prucka Manual teaches a fiber optic network cable connected to its computer. (Prucka Man., Ex. 1003, pp. 1-5). The Prucka Manual discloses a COMMS communication card (Prucka Man., Ex. 1003, pp. 10-18), but does not expressly state that the card is used for the fiber-to-PC connection. Hoese, however, states that fiber optic network cables can be connected to PCs using a Network Interface Card (i.e. peripheral interface card). (Hoese, Ex. 1005, col. 1, ll. 33-67). The Network Interface Cards can use the "Peripheral Interface Connect" (PCI) or "Industry Standard Architecture" (ISA) interfaces, which were available on "most computers" at the time. (Hoese, Ex. 1005, col. 1, col. 4, l. 63 – col. 5, l. 9) (Mason Decl., ¶¶127-132). Exhibits 1056 and 1057 further indicate the commercial availability of fiber-to-PC peripheral interface cards well before the relevant timeframe. (Mason Decl., ¶128).

Because the Prucka Manual teaches a connection from a fiber optic network cable to a computer, and because Hoese and Exhibits 1056-1057 teach that such a connection can be achieved with a network interface card using standard interfaces, it would have been obvious to combine Hoese with the Prucka Manual. (Mason Decl., ¶127-133). The resulting combination is no more than the implementation of Prucka Manual software on a Windows® NT-based PC. The

combination is conceptually shown in the Figure below, which has been adapted from Fig. 2 of the '994 patent:

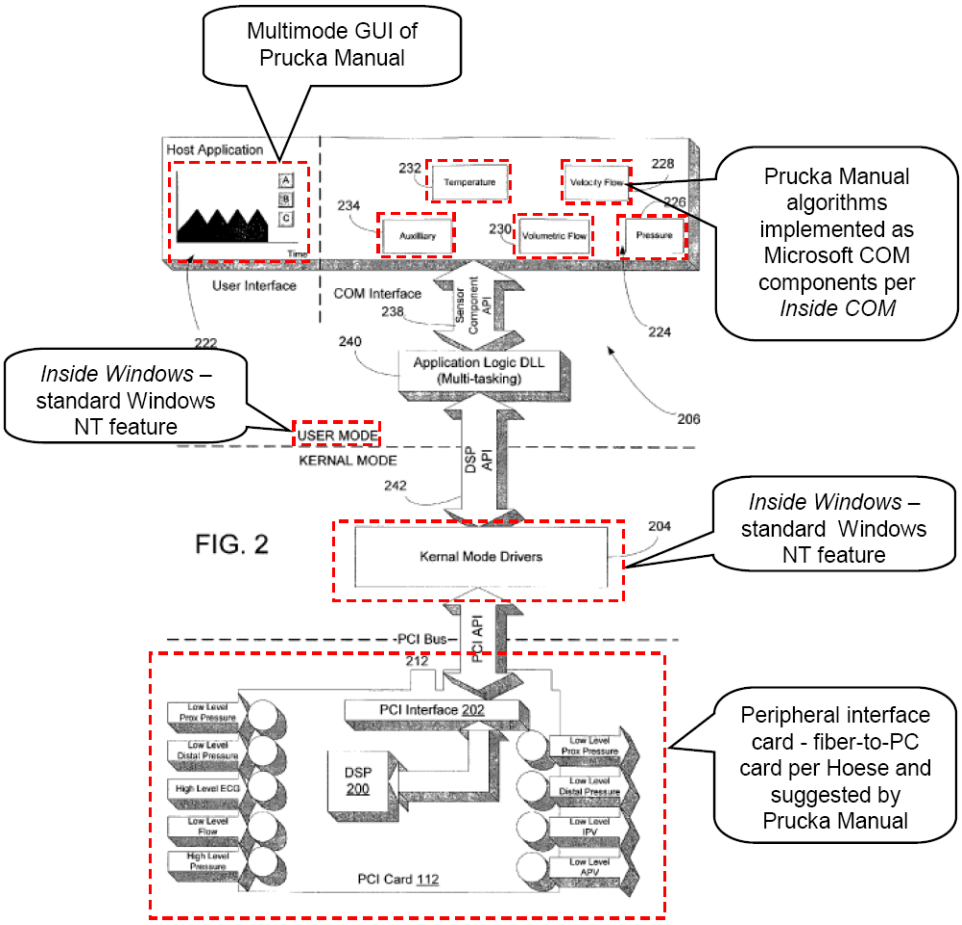


FIG. 2

This combination of the Prucka Manual with *Inside Windows*, *Inside COM* and Hoese would also have been obvious under Supreme Court's decision in *KSR v. Teleflex*, which held that "[t]he combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results." 127 S.Ct. 1727, 1739 (2007). Here, the Prucka Manual, *Inside Windows*, *Inside COM* and Hoese describe known elements, including an invasive cardiovascular diagnostic system, Windows® NT, the "Component Object Model",

and fiber-to-PC ISA network interface cards respectively. (Mason Decl., ¶143). These elements can be combined according to known methods—namely those described in *Inside Windows, Inside COM* and Hoese respectively. (Mason Decl., ¶143). Indeed, the '994 patent describes no method for implementing its graphical user interface, user mode measurement processing components, kernel mode drivers, external input signal bus interface or peripheral interface card. (Mason Decl., ¶¶143, 12-17). This admits that such implementation was within the skill of the ordinary artisan. *See In re Epstein*, 32 F.3d 1559, 1568 (Fed. Cir. 1994).

Furthermore, the results were predictable. The software so constructed will operate as described in the Prucka Manual, *Inside Windows, Inside COM* and Hoese. (Mason Decl., ¶143). The Prucka Manual, Inside *Windows* and *Inside COM*, after all, describe widely used prior art products. *See Stored Value,* 796 F.Supp.2d at 537, n.10 ("At least with respect to the MicroTrax manual, it is clearly enabled because it thoroughly describes a device that had been in public use already."). The '994 patent describes no unpredictable result.

The references are all analogous art. *See Wyers v. Master Lock Co.*, 616 F.3d 1231, 1237 (Fed. Cir. 2010) ("The Supreme Court's decision in *KSR*…directs us to construe the scope of analogous art broadly…."). The Prucka Manual is in the same field of endeavor as the '994 patent. *Inside Windows*, *Inside COM* and Hoese are analogous art at least because they are reasonably related to the problems faced

by the alleged inventors (Mason Declaration in ¶¶132, 137, 141-42).

The following claim chart maps the limitations of claims 1, 10 and 18 to the teachings of the Prucka Manual, *Inside Windows*, *Inside COM* and Hoese.

Claim Element	PRUCKA MANUAL IN VIEW OF INSIDE WINDOWS, INSIDE COM, AND HOESE.
1.0. A multipurpose host system	The Prucka Manual teaches that "CardioLab" software executes on a computer running Windows® NT (Prucka Man., Ex. 1003, pp. 2-3, 2-11),which was a well-known **multipurpose** operating system. (Mason Decl., ¶145).
1.1. for invasive cardiovascular diagnostic measurement acquisition and display	The Prucka Manual states that CardioLab can be used to **invasively acquire,** among other things, **pressure measurement data** (Prucka Man., Ex. 1003, p. 1-15) and **electrocardiogram (ECG) measurement data** (Prucka Man., Ex. 1003, p. 2-5 "ECG inputs") and. The Prucka Manual also describes **displaying diagnostic measurement data** values in, *e.g.*, "Real-Time "and "Review" windows (Prucka Man., Ex. 1003, p. A-3) (Mason Decl., ¶146).
1.2. incorporating a component based arrangement, the system comprising:	The Prucka Manual describes the use of CardioLab software on a Microsoft Windows® NT system. (Prucka Man., Ex. 1003, pp. 2-3, 2-11). The textbook *Inside COM* describes Microsoft's "Component Object Model" ("COM") standard for application development. *Inside COM* teaches that COM is used to build **extensible, and modular** application components. (*Inside COM*, Ex. 1018, p. 3) (Mason Decl., ¶¶147-149).
1.3. an external input signal bus interface	The CLAB II + Amplifier (highlighted in yellow in the wiring diagram shown on page 21) receives multiple diagnostic measurement signals leading from the patient to the PC. (Prucka Man., Ex. 1003, pp. 2-8 and A-5). Furthermore, the signals from the CLAB II + Amplifier unit are carried by a fiber optic cable (blue) to the computer (pink)(highlighting by Petitioner). (Prucka Man., Ex. 1003, p. 1-15). In order to function properly, the optical cable must have an input signal bus interface where it "connects…to back of

	computer". Hoese teaches that it was well known as of the filing date that fiber optic cables could be interfaced to PCs using I/O expansion slots available on most computers. (Hoese, Ex. 1005, col. 1, ll. 33-67). As further noted in Hoese, the interface card can fit into an ISA ("Industry Standard Architecture") expansion card slot. (Hoese, Ex. 1005, col. 4, l. 63 – col. 5, l. 9). Hoese notes that "[t]he expansion bus 206 is coupled to the host bus 202 through an interface bridge or bus controller 208." (Hoese, Ex. 1005, col. 4, l. 66 – col. 5, l. 1). This "interface bridge or bus controller 208" is an "external input signal interface bus". There were a number of fiber-to-PC ISA boards available at the time of the alleged invention. (Mason Decl., ¶¶127-132, 150).
1.4. for receiving data arising from cardiovascular diagnostic measurement sensors;	As discussed immediately above, both the optical cable and the cables leading to the CLAB II + Amplifier carry data **arising from cardiovascular diagnostic measurements sensors**, in particular ECG, intracardiac and pressure sensors. (Prucka Man., Ex. 1003, p. A-5) (Mason Decl., ¶150).
1.5. a plurality of measurement processing components,	The Prucka Manual describes software that performs **measurement processing** functions. There are a large variety of such measurement processing functions, including at least "measurement functions", "signal functions" and "macros". The Prucka Manual describes "**measurement functions**" that perform automated analysis of pressure signals. (Prucka Man., Ex. 1003, p. A-5 and pp. 3-70, *et seq.*) Second, the Prucka Manual discloses "**signal functions**". These signal functions allow various signals, including intracardiac signals, ECG signals and pressure signals to be processed by software prior to display. (Prucka Man., Ex. 1003, pp. 3-20 – 3-29). Third, the Prucka Manual describes the use of macros to automate other tasks (including the measurement and signal functions above). (Prucka Man., Ex. 1003, pp. A-4, 3-34 – 3-35). Macros are "components" because they are separately contained as executables, and are extensible (editable). (Prucka Man., Ex. 1003, pp. 4-9 – 4-10).

	Inside COM describes the standard use of the same modular COM "components" used by the '994 patent, and teaches that it is best to design software such that there is one component per function. (*Inside COM*, Ex. 1018, pp. 27-28)(Mason Decl., ¶¶151-157).
1.6. that operate at a user mode level in the multipurpose host system	The components of the CardioLab application run on Windows® NT, as discussed above under limitation 1.0. The Prucka Manual does not expressly state that the CardioLab application runs in "user mode". However, in Windows® NT, applications ran in user mode. (*Inside Windows*, Ex. 1004, p. 8) (Mason Decl., ¶158).
1.7. for facilitating receiving data of particular sensor types and	As described above for claim elements 1.4 – 1.5, the measurement and signal processing components facilitate receiving data from at least pressure, ECG and intracardiac sensors. For example, the measurement functions provide "automated processing of pressure signals". In order to process, the components must have access to those signals, and therefore must at some point facilitate their own reception of those signals. Likewise, signal functions must also have access to the data they process. The macros facilitate the execution of measurement and signal functions, and therefore also facilitate the reception of data by those functions. (Prucka Man., Ex. 1003, p. A-3) (Mason Decl., ¶159).
1.8. rendering diagnostic measurement parameter values according to the received data;	The measurement functions render diagnostic measurement parameter values, such as "conduction interval values" (Prucka Man., Ex. 1003, p. 3-71), SNRT event parameters such as the pacing interval, the sinus node recovery time and the corrected sinus node recover time (Prucka Man., Ex. 1003, p. 3-73), antegrade refractory periods (Prucka Man., Ex. 1003, p. 3-73), and retrograde refractory periods (Prucka Man., Ex. 1003, p. 3-74). The signal functions render diagnostic data for graphical output, as explained above under limitation 1.5. The macros facilitate the execution of measurement functions and signal functions, and therefore also facilitate the rendering of diagnostic measurement parameter values. (Prucka Man., Ex. 1003, p. A-3) (Mason Decl., ¶159).
1.9. a multi-mode graphical	The Prucka Manual describes that CardioLab software supports a multimode graphical user interface (i.e. a Windows® application running on the well-known GUI-based operating system

user interface host	Windows® NT). (Prucka Man., Ex. 1003, pp. 2-3, 2-11). For example, the Prucka Manual describes the availability of a "Real-Time Window" and "Review Window" (Prucka Man., Ex. 1003, p. A-3), a "Navigator Window" (Prucka Man., Ex. 1003, p. 1-12), a "Patient Information Window" (Prucka Man., Ex. 1003, p. 1-13), a "Study Menu Window" (Prucka Man., Ex. 1003, p. 3-12), an "ADT Search Window" (Prucka Man., Ex. 1003, p. 3-12), a "Login Window" (Prucka Man., Ex. 1003, p. 3-13), a "Filter Catalog Window" (Prucka Man., Ex. 1003, p. 3-74), various software and hardware signal function display setting windows (Prucka Man., Ex. 1003, pp. 3-20 – 3-27), a "Vitals Configuration Window" (Prucka Man., Ex. 1003, p. 3-30), a "Channel Properties Window" (Prucka Man., Ex. 1003, p. 3-37), a "Calipers Window" (Prucka Man., Ex. 1003, p. 3-38), etc. These windows can be displayed at different times, or in separate areas on the same screen. For example, the screenshot on page 9-7 of the Prucka Manual (reproduced on page 22 above) shows the main window of the CardioLab application, and three child windows within the main window arranged at the top-left, top-right and bottom. In addition to the three panels, the CardioLab window also has, at the bottom, a patient information display region and regions for displaying other data. (Mason Decl., ¶¶160-162).
1.10. comprising diagnostic measurement user interfaces	*See* limitation 1.9. There were "real-time" and "review" windows available to review the processed output of sensor data. (Prucka Man., Ex. 1003, p. A-3). The log window is used to record various diagnostic events, such as the recording of data and measurements. (Prucka Man., Ex. 1003, pp. 3-72 – 3-74) (Mason Decl., ¶¶160-162). *See also* limitation 1.11 below.
1.11. including display components corresponding to data output rendered by specified ones of the	The Prucka Manual discloses the output of numerous **display components** that **correspond to the output** of processing functions discussed above under limitation 1.5. For example, the output of multiple different signals is shown in the figure on page 9-7, reproduced above on page 22. (Prucka Man., Ex. 1003, pp. 9-7, A-3). These displayed data are **processed by measurement processing components**. These components include signal functions, which render the data for display. (Prucka Man., Ex. 1003, pp. 3-34 – 3-35). Furthermore, the results of measurement functions for conduction intervals and calipers are displayed on

plurality of measurement processing components; and	these signals when they are performed. (Prucka Man., Ex. 1003, pp. 3-71 and 3-75). The results of SNRT, ARP and RRP functions are displayed in a log window, which is also a child window, and therefore a display component. (Prucka Man., Ex. 1003, pp. 3-72 – 3-74 and) (Mason Decl., ¶163-165).
1.12. one or more kernel mode drivers	Hoese teaches notes that a **driver** is required for with a "Network Interface Card" ("NIC") used to connect a fiber cable to a PC. (Hoese, Ex. 1005, col. 2, ll. 1-3) *Inside Windows* likewise explains that drivers are required for the ISA and PCI busses. (*Inside Windows*, Ex. 1004, p. 479, *see also* 477-478). Furthermore, in a Microsoft Windows® NT operating system, driver code operates in the most privileged access mode (**kernel mode**). (*Inside Windows*, Ex. 1004, p. 8) (Mason Decl., ¶¶168-169).
1.13. that extract processed sensor data from a peripheral interface card providing a hardware interface for one or more invasive diagnostic measurement devices.	Hoese teaches the use of a fiber-to-PC **ISA card**, which is a "**peripheral interface card**". As explained under limitation 1.3, the Prucka Manual teaches that data sent through the fiber optic cable has been processed by the CLAB II. This processing includes the application of electronic filtering and gain settings, as explained in the Prucka Manual in various "Hardware Settings" headings. (Prucka Man., Ex. 1003, pp. 3-32, 3-23, 3-25, 3-26, 3-29 and 3-46) (Mason Decl., ¶168-169).

10. The multipurpose host system of claim 1 wherein the plurality of measurement processing components are instantiated from component objects.	*Inside COM* teaches that COM components are created through a process of **instantiation** using the CreateInstance method. (*Inside COM*, Ex. 1018, p. 86 "Creating the Component") (Mason Decl., ¶¶170-171).

18. The multipurpose host system of claim 1 further including a sensor component application interface through which the measurement processing components issue requests to the kernel mode drivers	The use of an application interface (API) was a standard programming practice for Windows NT at the time of the alleged invention. (*Inside Windows*, Ex. 1004, p. 326). Figure 7-1 of *Inside Windows* shows how this was carried out. (Mason Decl., ¶¶172-174).

Ground 2. Claims 11-12 and 20 are invalid over the Prucka Manual in view of *Inside Windows*, *Inside COM*, and Hoese as in Ground 1, in further view of Morris.

Claims 11-12 and 20 are invalid over the Prucka Manual in view of *Inside Windows*, *Inside COM*, and Hoese as in Ground 1, in further view of the Morris textbook, "Object-Oriented Programming for Windows 95 and NT", Butterworth-Heinemann Press (1999)(Ex. 1042). Morris is prior art under § 102(b).

It would have been obvious to combine the Prucka Manual, *Inside Windows*, *Inside COM* and Hoese with Morris. Morris is a reference text for programming Windows® NT, which is the operating system used in the Prucka Manual, and the subject of *Inside Windows* and *Inside COM*. (Mason Decl., ¶176).

Furthermore, Morris describes object-oriented programming techniques, which were widely-used at the time of the alleged invention. (Mason Decl., ¶126). *Inside COM* notes that object-oriented programming languages (such as C++) are commonly used with COM. (*Inside COM*, Ex. 1018, p. xix at top) (Mason Decl., ¶39). Morris also states that object-oriented programming techniques are efficient and essential for Windows applications, as shown in the following quotations:

- "…traditional programming methods—and the languages they used—are no longer viable in the Windows environment. Object-oriented programming methods provide the framework for writing efficient Windows applications…." (Morris, Ex. 1042, p. 4).

- "The obvious place to start is Windows; it is here that object-oriented programming is really essential". (Morris, Ex. 1042, p. 4).

The teachings of the references represent known and indeed standard techniques that the time of the invention, which could be combined in known ways (as described in *Inside COM* and Morris) to achieve predictable results. *See KSR v. Teleflex*, 127 S.Ct. 1727, 1739 (2007). (Mason Decl., ¶176).

Lastly, claims 11-12 and 20 recite only "printed matter", and are entitled to little weight as discussed above in section II.B.4 beginning on page 18.

Morris is a book addressing programming techniques on a Windows® NT platform, and is therefore analogous art for the same reasons given for *Inside Windows* and *Inside COM* under Ground 1. This is reinforced by the fact that Morris discusses how to implement multimode GUIs and particular display components, and claim 1 of the '994 patent specifically recites such elements. (Mason Decl., ¶176).

Claim Element of the '994 patent	**THE PRUCKA MANUAL IN VIEW OF INSIDE WINDOWS, INSIDE COM, AND HOESE AS IN Ground 1, IN FURTHER VIEW OF MORRIS.**
11. The multipurpose	The Prucka Manual discloses a **multi-mode graphical**

Claim Element of the '994 patent	THE PRUCKA MANUAL IN VIEW OF INSIDE WINDOWS, INSIDE COM, AND HOESE AS IN Ground 1, IN FURTHER VIEW OF MORRIS.
host system of claim 1 wherein the multi-mode graphical user interface host supports the set of diagnostic measurement user interfaces through a generic graphical interface specification.	**user interface host supporting a set of diagnostic measurement user interfaces**, as explained under Ground 1, limitations 1.9 – 1.11. Furthermore a GUI layout (**generic graphical interface specification**) is shown in the Prucka Manual on page 1-14. Moreover, Morris teaches a **generic graphical interface specification**. Specifically, Morris teaches that when designing a Windows-based GUI, the programmer must create the overall window and child GUI controls (Morris, Ex. 1042, chapter 6), like menus, checkboxes, etc. Each of these are separate objects, and each has properties that determine its position and appearance. (Morris, Ex. 1042, pp. 160, 180-184). Morris states: "When developing a form there is a background grid of points for aligning controls. If you change the controls' size or position by dragging, the control corners 'snap' to the nearest grid points." (Morris, Ex. 1042, p. 182). The collection of the main window properties together with control properties determines the application GUI layout, and constitutes the "**generic graphical interface specification**". Such a specification would be present in any Windows application. (Mason Decl., ¶¶177-181).

12.0 The multipurpose host system of claim 11 wherein the generic graphical interface specification includes: a patient information display region; and a mode-specific data display region including graphical display components	As shown in the screenshot on page 9-7 of the Prucka Manual, the CardioLab screen contained a **patient information display region** at the bottom left (with name and weight: "Smith, J. kg83". (Prucka Man., Ex. 1003, p. 9-7, see also p. 1-14, showing "patient status bar") (Mason Decl., ¶¶182-185). The Prucka Manual also states that there are **windows corresponding to different display modes** (also shown in the figure on page 9-7). For example, the "Realtime Window" allows signals to be seen in real-time. The "Review Window" allows signals to be seen in the past.

corresponding to data output rendered by specified ones of the measurement processing components associated with a current display mode.	The "Log Window" allows various events to be seen. *See* Ground 1, limitations 1.9 – 1.11. Each of these are modes. These windows display **output rendered by measurement processing components** as discussed above under Ground 1, limitations 1.9 – 1.11. The **generic graphical interface specification includes** these elements, as discussed in under claim 11, because the programmer must specify the size, location and appearance of the child windows, dialog boxes and control components in object properties when the windows are initially drawn. *See* claim 11, above.

20. The multipurpose host system of claim 12 wherein the generic graphical interface specification includes a system message display region.	The Prucka Manual shows a "**system message display region**" in the lower right-hand corner of the display (p. 9-7), which shows the current date and time, as well as the storage space remaining in days and GB. The Prucka Manual further notes that the disk icon will change when disk properties or operations are selected. (Prucka Man., Ex. 1003, pp. 1-16 (top), 3-51, bottom). The display region is **included in the generic graphical interface specification** on page 1-14 of the Prucka Manual. (Mason Decl., ¶¶186-188).

Ground 3. Claims 1, 10-11 and 18 are invalid under 35 U.S.C. § 103(a) over the '669 patent in view of *Inside Windows* and Krauss 1999.

Claims 1, 10-11 and 18 are unpatentable under 35 U.S.C. § 103(a) over U.S. Pat. No. 6,193,669 ("the '669 patent")(Ex. 1024) in view of the Krauss, *et al.,* "LabView™ for sensor data acquisition", Trends in Analyt. Chem., Vol. 18, No. 5, 1999 ("Kraus 1999")(Ex. 1025) and David A. Solomon, "*Inside Windows NT Second Edition*", Microsoft Press, 1998 ("*Inside Windows*")(Ex. 1004). Each of the references is prior art under 35 U.S.C. § 102(b).

The '669 patent describes a system for invasive cardiovascular diagnostic measurements. (Mason Decl., ¶197). The first two sentences of the abstract state:

> "This invention relates to a method and devices for detection, localization and characterization of occlusions, aneurysms, dissections stent position, dissections stent mal-position, wall characteristics and vascular bed. The invention is based on introducing an artificial pressure or flow excitation signal (a single signal or more) into the blood vessel (or in other tubular flowing fluid conduits), measurement and analysis of the pressure and or flow." ('669 patent, Ex. 1024, Abstract).

The overall system setup for the '669 patent is shown in Fig. 1, reproduced here:

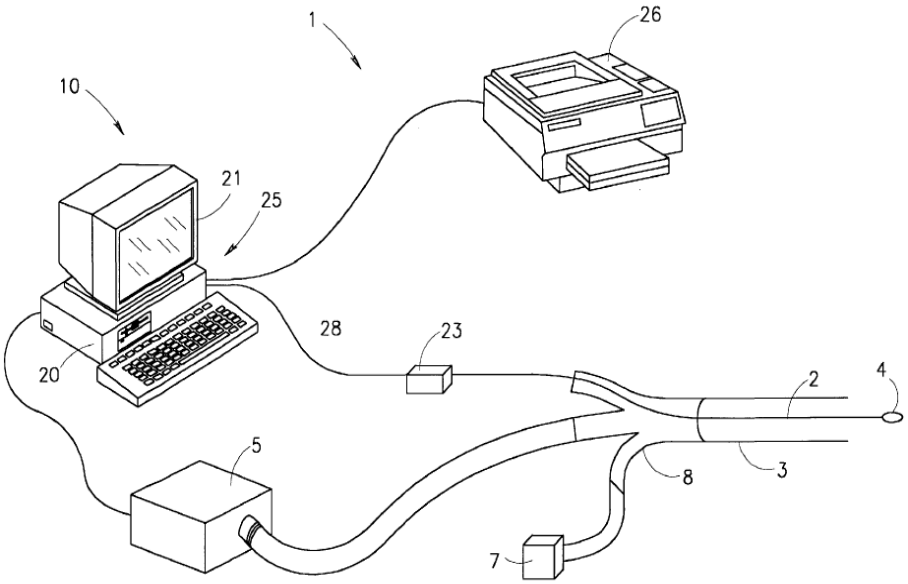


FIG.1

Figure 1 of the '669 patent shows a pressure sensor 4 attached to a guidewire 2. The guidewire 2 is invasively inserted into a patient to take diagnostic cardiovascular measurements. ('669 patent, Ex. 1024, col. 14, ll. 42-47) (Mason

Decl., ¶201). These measurements produce electronic signals, which are received from the invasive sensors are processed by a signal conditioning unit 23. After the signal conditioner 23, the signals are passed to an analog to digital converter 28, and then acquired by means of a peripheral interface card (not shown) by a standard personal computer ("PC") 25. ('669 patent, Ex. 1024, col. 17, ll. 48-56 and col. 13, ll. 9-16) (Mason Decl., ¶202). The PC 25 processes the signals, and displays graphical data on display 21. ('669 patent, Ex. 1024, col. 13, ll. 25-29) (Mason Decl., ¶202). The system overall is thus very similar to that of the '994 patent.

While the '669 patent provides extensive disclosure of the algorithms used to process sensor data (*e.g.,* '669 patent, Ex. 1024, col. 18, l. 14 – col. 22, l. 6) (Mason Decl., ¶213), the '669 patent does not *expressly* disclose whether its software incorporates a "component based arrangement", that it operates in "user mode", or employs "kernel mode drivers".

These limitations were, however, obvious in view of *Inside Windows* and Krauss 1999. *Inside Windows* was described under Ground 1, beginning on page 23. It would have been obvious to combine the '669 patent's disclosure of a "PC" with *Inside Windows*, a standard reference work on the most common PC operating system. (Mason Decl., ¶204).

Krauss 1999 describes a common programming platform for interacting with

external sensors, known as "Labview". Labview is referenced in the '669 patent, which states "[t]he I/O board was controlled by a Labview graphical programming software, commercially available from National Instruments Inc., TX, U.S.A." ('669 patent, Ex. 1024, col. 17, ll. 54-56) (Mason Decl., ¶¶203, 206-207).

Krauss 1999 describes that Labview is a universal programming system, designed for exactly the purpose specified by the '669 patent: "data acquisition, data handling and data display" from external sensors. (Kraus 1999, Ex. 1025, p. 312). Krauss 1999 further states that Labview "makes it easy to form an attractive and structured GUI", (Kraus 1999, Ex. 1025, p. 312, middle of right column) (Mason Decl., ¶208).

Regarding a "component based arrangement", Kraus 1999 teaches that software is formed from components called "virtual instruments". (Kraus 1999, Ex. 1025, pp. 312, bottom of left column). Krauss 1999 further teaches dividing a program into "virtual instruments" and "sub-virtual instruments", each corresponding to particular sensor. (Kraus 1999, Ex. 1025, pp. 316-317) (Mason Decl., ¶¶209-212). This enhances modularity. Krauss 1999 states:

> "This **modular program structure** allows the project partners to adapt and to optimize the software part related to their sensors. Numerous functions such as log-ins for different users and programmers, program history displays and info windows for user-defined remarks give valuable support to the programming team. **This**

> **support and the modularity were the main reasons for choosing LabView for the project.**" (Kraus 1999, Ex. 1025, pp. 316-317) (emphasis added).

Krauss 1999 further notes that the Labview system is a "very powerful" system for developing data acquisition, handling and display programming in teams:

> "**LabView is a promising alternative to conventional compilers for programming data acquisition, data handling and storage, and data display software**. The advantage is the easy realization of simple and small tasks with emphasis on a visual interface. Its boundary conditions are not time-critical programs and the hardware is supported by LabView. After an indispensable intense training period and after getting accustomed to the graphical programming, **the user of LabView has a very powerful system for software development in teamwork**." (Kraus 1999, Ex. 1025, p. 318) (emphasis added) (Mason Decl., ¶209-212).

Thus, it would have been obvious at the time of the invention to have combined the '669 patent with the teachings of Krauss 1999. The '669 patent specifically references Labview, which is the subject of Krauss 1999. ('669 patent, Ex. 1024, col. 17, ll. 48-56) (Mason Decl., ¶203). Furthermore, the '669 patent is concerned with the acquisition, handling and display of data from external sensors—exactly the subject of Krauss 1999. Both the '669 patent and Krauss 1999 acquire sensor data using a National Instruments peripheral interface card, and Labview was produced by the same National Instruments for handling the data functions of such

cards. (Krauss 1999, Ex. 1025, p. 314 left column) ('669 patent, Ex. 1024, col. 17, ll. 48-56) (Mason Decl., ¶¶206-207). Krauss 1999 teaches that separate virtual instruments should be designed to process output for specific sensors. (Krauss 1999, Ex. 1025, pp. 316-317) (Mason Decl., ¶¶209-212).

The resulting combination is shown in the following Figure, which has been adapted from Figure 2 of the '994 patent:

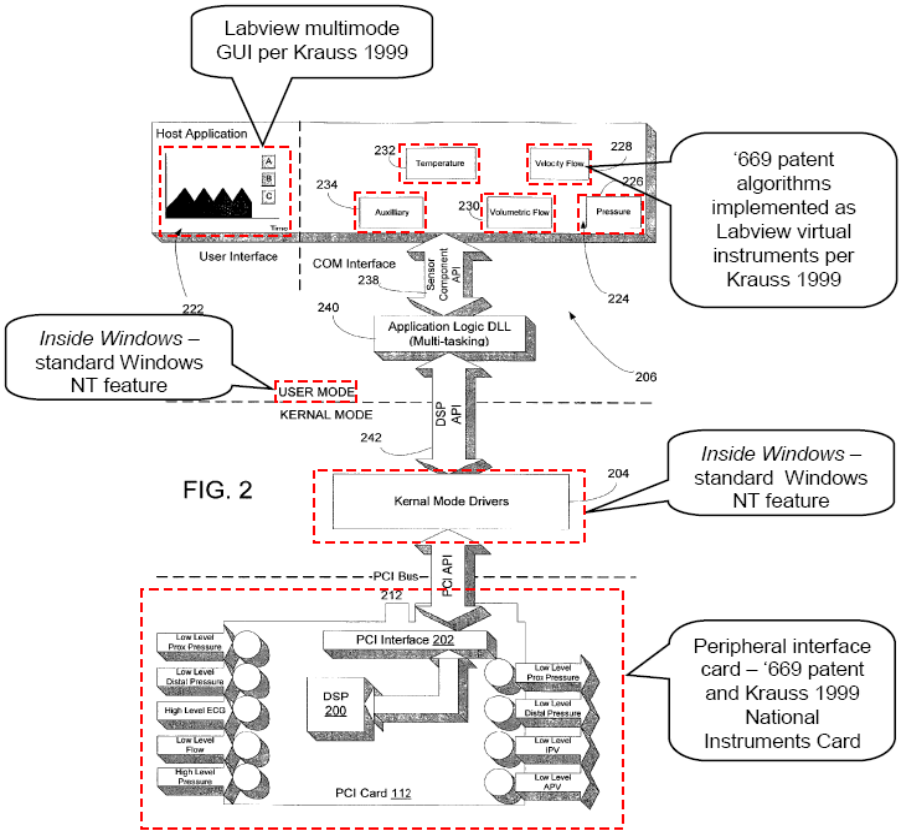


FIG. 2

This combination of the '669 patent with *Inside Windows* and Krauss 1999 would also have been obvious under Supreme Court's decision in *KSR v. Teleflex*. Here, the '669 patent, *Inside Windows* and Krauss 1999 describe known elements, including an invasive cardiovascular diagnostic system, Windows® NT and

Labview respectively. (Mason Decl., ¶227). These elements can be combined according to known programming methods—namely those described in *Inside Windows* and Kraus 1999. (Mason Decl., ¶227). Indeed, the '994 patent describes no method for implementing its graphical user interface, user mode measurement processing components, kernel mode drivers, external input signal bus interface or peripheral interface card. (Mason Decl., ¶¶16-17). This effectively admits that such implementation was within the reach of a person of ordinary skill. *See In re Epstein*, 32 F.3d 1559, 1568 (Fed. Cir. 1994). Furthermore, the results were predictable. The software so constructed will operate as described in the '669 patent, *Inside Windows* and Kraus 1999. (Mason Decl., ¶¶227, 230). The '994 patent describes no unpredictable result that arises. (Mason Decl., ¶¶14-17).

The '669 patent is in the same field of endeavor as the '994 patent. *Inside Windows* and Krauss 1999 are analogous art at least because they are reasonably related to the problems faced by the alleged inventors, as explained in the Mason Declaration in ¶¶228-229.

The following claim chart maps the limitations of claims 1, 10 and 18 to the teachings of the '669 patent, *Inside Windows* and Kraus 1999.

Claim Element	**'669 PATENT IN VIEW OF INSIDE WINDOWS AND KRAUSS 1999.**
1.0. A multipurpose	The '669 patent teaches that its "[d]ata acquisition was performed using a PC (Pentium 586)". ('669 patent, Ex. 1024, col. 17, ll. 50-51). A PC is a **personal computer** and thus a multipurpose host

host system	system. (Mason Decl., ¶197).
1.1 for invasive cardiovascular diagnostic measurement acquisition and display	As shown in Fig. 3, the '669 patent teaches using probes 4 to invade artery 30 in order to perform **invasive cardiovascular diagnostic measurement acquisition**. ('669 patent, Ex. 1024, Abstract, col. 15, ll. 1-12). The '669 patent teaches **displaying** measurements and processed measurements. ('669 patent, Ex. 1024, Abstract, col. 13, ll. 16-29) (Mason Decl., ¶¶198-201).
1.2 incorporating a component based arrangement, the system comprising:	The '669 patent teaches that its "I/O board was controlled by a Labview graphical programming software". ('669 patent, Ex. 1024, Abstract, col. 17, ll. 54-55). Krauss 1999 teaches the Labview software is entirely composed of "virtual instruments". (Kraus 1999, Ex. 1025, pp. 312, bottom of left column). Each "virtual instrument" can be divided into "sub-virtual instruments" ("sub-VIs"), each of which is a **component**. (Kraus 1999, Ex. 1025, pp. 315-316). Labview is further "extensible" and "modular". (Kraus 1999, Ex. 1025, p. 316 top of left column and pp. 316-317) (Mason Decl., ¶¶209-212).
1.3 an external input signal bus interface	The '669 patent teaches several **external input signal bus interfaces**, including a signal conditioner 23, shown in Fig. 1, which "is operatively connected to the pressure sensor 4 for amplifying the signals of the pressure sensor." ('669 patent, Ex. 1024, col. 13, ll. 9-11). The '669 patent also teaches an "analog to digital (A/D) converter 28 connected to the signal conditioner 23 for receiving the conditioned analog signals therefrom." ('669 patent, Ex. 1024, col. 13, ll. 11-14). Third, the '669 patent teaches the use of an National Instruments I/O ("input – output") board (also labeled 28) for data acquisition. ('669 patent, Ex. 1024, col. 17, ll. 51-56) (Mason Decl., ¶202).
1.4 for receiving data arising from cardiovascular diagnostic measurement sensors;	The signal conditioner 23, the A/D converter 28 and the board 28 each **receive data arising from cardiovascular diagnostic measurement sensors**. ('669 patent, Ex. 1024, col. 13, ll. 5-29, col. 17, ll. 51-56) (Mason Decl., ¶202).
1.5 a plurality	The '669 patent discloses both **software and the processing of**

of measurement processing components,	**measurements**. The '669 patent discloses a "program for controlling said processing unit". ('669 patent, Ex. 1024, col. 4, l. 16, col. 4, ll. 33-34, col. 7, l. 44, col. 10, ll. 17-18, claim 1, col. 27, l. 42). The '669 patent further discloses numerous ways of processing cardiovascular diagnostic measurements. ('669 patent, Ex. 1024, col. 13, ll. 25-29) (emphasis added). These include pressure sensor signal analysis for diagnostic purposes. ('669 patent, Ex. 1024, col. 9, l. 35 – col. 11, l. 41, , col. 18, l. 14 – col. 22, l. 6). Kraus 1999 likewise teaches the use of Labview software to perform measurement processing in software components. (Kraus 1999, Ex. 1025, p. 312). The processing includes mathematical functions, like the ones taught by the '669 patent. (Mason Decl., ¶209-212).
1.6 that operate at a user mode level in the multipurpose host system	In a Microsoft Windows® NT operating system, application code (such as Labview described in Krauss 1999) **ran in user mode**. (*Inside Windows*, Ex. 1004, p. 8)(Mason Decl., ¶219).
1.7 for facilitating receiving data of particular sensor types and	Krauss 1999 teaches that the Labview software is divided into virtual instruments and sub-virtual instruments (components) that should each correspond to a particular sensor type and that **facilitate the reception of data** of particular sensor types. (Kraus 1999, Ex. 1025, p. 312, pp. 316-317) (Mason Decl., ¶¶219-222).
1.8 rendering diagnostic measurement parameter values according to the received data;	The '669 patent teaches **rendering diagnostic measurement parameter values according to the received data**. Specifically, the processing described above under limitation 1.5 takes diagnostic sensor data as input and produces diagnostic measurement parameter values. ('669 patent, Ex. 1024, col. 9, l. 35 – col. 11, l. 41, col. 9, l. 35 – col. 11, l. 41, col. 20, ll. 14-16, col. 18, l. 14 – col. 22, l. 6). The '669 patent further teaches **displaying the results of this processing**. ('669 patent, Ex. 1024, col. 13, ll. 25-29, col. 5, ll. 58-60, col. 6, ll. 10-12, and col. 6, ll. 23-29) (Mason Decl., ¶¶219-222). In addition, Krauss 1999 teaches code that is "designed for programming data acquisition, data handling and data display." (Kraus 1999, Ex. 1025, p. 312) (Mason Decl., ¶222).

1.9 a multi-mode graphical user interface host	Krauss 1999 teaches displaying **multiple sensor outputs** and diagnostic calculations as separate components in one or more **GUI** windows. (Kraus 1999, Ex. 1025, p. 316, Fig. 7). The '669 patent also teaches displaying multiple graphs resulting from calculations on diagnostic sensor output. ('669 patent, Ex. 1024, col. 13, ll. 25-29 col. 14, ll. 18-19) (Mason Decl., ¶¶217-218).
1.10 comprising diagnostic measurement user interfaces	*See* limitation 1.9, where each graph / sensor output is such a diagnostic measurement user interface. (Mason Decl., ¶¶217-222).
1.11 including display components corresponding to data output rendered by specified ones of the plurality of measurement processing components; and	As discussed above under limitations 1.8 and 1.9, Krauss 1999 in Fig. 7 (p. 316) teaches **display components showing the output of specified "virtual instruments"** corresponding to temperature, humidity and air flow, among others. Krauss 1999 also teaches that it is best to dedicate sub-virtual instruments to specific sensors (Kraus 1999, Ex. 1025, pp. 316-317). This would naturally lead to a display corresponding to the specific sensors. (Mason Decl., ¶¶217-222).
1.12 one or more kernel mode drivers	The '669 patent discloses the use of a National Instruments I/O board to acquire sensor data. '669 patent, Ex. 1024, col. 17, ll. 50-56) (Mason Decl., ¶203). Krauss 1999 likewise discloses a National Instruments board, and states that "[e]very data acquisition card operated within Lab-View requires a special driver." (Kraus 1999, Ex. 1025, p. 312, lower right) (emphasis added). In a Microsoft Windows® NT operating system, **driver** code operates in the most privileged access mode (**kernel mode**). (*Inside Windows*, Ex. 1004, p. 8) (Mason Decl., ¶¶203-207).
1.13 that extract processed sensor data from a	The '669 patent teaches that its **sensor data is processed** (e.g. A/D converted) prior to being acquired by computer 25. ('669 patent, col. 13, ll. 11-17). Krauss 1999 states that processing functions can be advantageously moved from the host computer to a digital signal processor ("DSP") on the card. (Kraus 1999, Ex.

peripheral interface card providing a hardware interface for one or more invasive diagnostic measurement devices.	1025, pp. 314-315) (Mason Decl., ¶206).

10. The multipurpose host system of claim 1 wherein the plurality of measurement processing components are instantiated from component objects.	Krauss 1999 teaches that each sensor or part of a sensor should be implemented as a sub-virtual instrument to an overall virtual instrument to increase modularity. (Kraus 1999, Ex. 1025, pp. 316-317). The sub-virtual instruments are thus "**instantiated**" (*i.e.* created) **from component objects** (virtual instruments or other sub-virtual instruments). (Mason Decl., ¶¶231-233).

11. The multipurpose host system of claim 1 wherein the multi-mode graphical user interface host supports the set of diagnostic measurement user interfaces through a generic graphical interface specification.	As shown in Fig. 3 of Krauss 1999 and the related caption, the user is able to design a GUI layout by dragging specific graphical elements to a generic panel, thus creating a layout for a GUI panel. (Mason Decl., ¶¶234-235).

18. The multipurpose host system of claim 1 further including a sensor component application interface through which the measurement processing components issue requests to the kernel mode drivers.	The use of an application interface (API) was a standard programming practice for Windows NT at the time of the alleged invention. (*Inside Windows*, Ex. 1004, p. 326). Figure 7-1 of *Inside Windows* shows how this was carried out. (Mason Decl., ¶¶236-238).

Ground 4. Claims 2, 4-6, 8-9, 12-13, and 15-17 are invalid under 35 U.S.C. § 103(a) over the '669 patent in view of *Inside Windows* and Krauss 1999 as in Ground 1, in further view of the SmartFlow Manual.

Claims 2, 4-6, 8-9, 12-13, and 15-17 are invalid under 35 U.S.C. § 103(a) over the '669 patent in view of *Inside Windows* and Krauss 1999 as in Ground 1, in further view of the SmartFlow Manual ("SF Man.")(Ex. 1027). The SmartFlow Manual is a printed publication as described in the Barak IPR Declaration, Ex. 1028, ¶¶1-8, with the legal basis being similar to that provided under Ground 1.

It would have been obvious to combine the SmartFlow Manual with the '669 patent. Both the SmartFlow Manual and the '669 patent belonged to the same assignee (Florence Medical). (Mason Decl., ¶240). Furthermore, both relate to the problem of identifying arterial lesions using invasive sensors ('669 patent, Ex. 1024, col. 3, l. 66 – col. 4, l. 6)(SF Man., Ex. 1027, p. 5, §1.1) (Mason Decl., ¶241). Both references teach an identical architecture: invasive sensors providing signals to a signal conditioning unit, providing signals to a National Instruments data acquisition board and ultimately to a PC for processing and display. ('669 patent, Ex. 1024, col. 17, ll. 48-56 and col. 13, ll. 9-16) (SF Man., Ex. 1027, p. 10, §3.1) (Mason Decl., ¶241). *See Ex parte Mettke*, Appeal 2008-0610, 2008 Pat. App. LEXIS 6761, *43-*44 (BPAI Sept. 30, 2008) ("Exhibits C, D, E, and F are all from the same corporation and all relate to versions of the same pay-for-use

terminal. One skilled in the art would have been motivated to combine the teachings in one reference with teaching in another reference because they are all related to the same terminal apparatus, i.e., there is not the usual obviousness problem of explaining why one skilled in the art would have sought to combine two references from unrelated sources.")(Ex. 1029)(emphasis added).

Moreover, both references teach known technologies that could be combined using predictable methods (such as those described in Krauss 1999) to produce predictable results. (Mason Decl., ¶242). Notably, the '994 patent does not describe how to implement its software system, and describes no unpredictable results. (Mason Decl., ¶¶14-17 and 242). The combination thus would have been obvious under *KSR v. Teleflex*, 127 S.Ct. 1727, 1739 (2007) (Mason Decl., ¶242).

The following claim chart maps the limitations of claims 2, 4-6, 8-9, 12-13, and 15-17 to the Ground 4 prior art:

Claim Element	**'669 PATENT IN VIEW OF *INSIDE WINDOWS* AND KRAUSS 1999 AS IN GROUND 1, IN FURTHER VIEW OF THE SMARTFLOW MANUAL.**
2. The multipurpose host system of claim 1 wherein the plurality of measurement processing components includes a blood pressure processing component and a blood velocity processing component	Regarding pressure, the SmartFlow Manual discloses measurements of **pressure** and extensive calculation and rendering of pressure measurements. (SF Man., Ex. 1027, p. 5, §1.1 and Figs. 15, 17 and 19). Regarding blood **velocity**, the SmartFlow Manual describes processing to compute Coronary Flow Reserve ("CFR"). (SF Man., Ex. 1027, p. 6). The '669 patent discloses that a velocity sensor can be used to provide data for computing CFR. ('669 patent, col. 2, ll. 50-64) (Mason Decl., ¶¶243-245).

4. The multipurpose host system of claim 2 wherein the diagnostic measurement user interfaces include a pressure measurement display interface wherein a ratio of a first measured pressure and a second measured pressure is rendered.	The SmartFlow Manual teaches computing FFR, which is "the **ratio** of the mean post-stenotic **pressure** to the aortic **pressure** during vasodilatation." (SF Man., Ex. 1027, p. 7) (bold added). The SmartFlow manual further teaches **displaying on the user interfaces** the FFR. (SF Man., Ex. 1027, p. 17) (Mason Decl., ¶¶246-248).

5. The multipurpose host system of claim 2 wherein the diagnostic measurement user interfaces include a pressure measurement display interface wherein a pressure gradient between a first measured pressure and a second measured pressure is rendered.	The SmartFlow Manual teaches **displaying on the user interfaces** hyperemic **pressure gradient** (HPG) and base **pressure gradient** (BPG) (SF Man., Ex. 1027, p. 32) (Mason Decl., ¶¶249-250).

6. The multipurpose host system of claim 2 wherein the diagnostic measurement user interfaces include a flow measurement display interface wherein a ratio of flow velocity under high flow conditions and low velocity conditions is rendered.	The SmartFlow Manual discloses calculating CFR, which is the "**ratio** between the hyperemic **flow** to the **flow** at rest in an artery". (SF Man., Ex. 1027, p. 6) (bold added). The SmartFlow manual further teaches **displaying on the user interfaces** the CFR in Fig. 17 on page 27. (SF Man., Ex. 1027, p. 17) (Mason Decl., ¶251).

8.0 The multipurpose host system of claim 1 wherein the multi-mode graphical user interface host includes a first display interface mode wherein blood pressure measurements are displayed and a second display interface mode wherein blood flow measurements are displayed.	The SmartFlow Manual discloses allowing a user to switch between **pressure and flow display modes** using a "show signals menu". (SF Man., Ex. 1027, p. 25 and Fig. 15) (Mason Decl., ¶¶252-254).

9. The multipurpose host system of claim 8 wherein the multi-mode graphical user interface host further includes a third display interface mode graphically depicting a combination of display elements including one or more pressure measurement display elements from the first display interface mode and one or more flow measurement display elements from the second display interface.	The SmartFlow Manual teaches a **third display interface mode** in Fig. 17 (page 27), which shows **pressure signals and CFR**, which is the "ratio between the hyperemic flow to the flow at rest in an artery" (*see* claim 6). (SF Man., Ex. 1027, p. 27, Fig. 17). Fig. 17 shows FFR (a ratio of pressures, *see* claim 4). The signal data can be changed to flow data (*see* claim 8). (Mason Decl., ¶¶255-256).

12.0 The multipurpose host system of claim 11 wherein the generic graphical interface specification includes: a patient information display region; and a mode-specific data display region including graphical display components corresponding to data output rendered by specified ones of the measurement processing components associated with a current display mode.	As shown in Figs. 15, 17 and 19, each of the "Measure" windows described by the SmartFlow Manual have **measurement processing information** (*see* claim 9), but also include **patient information** in the form of a name/initials and patient ID in the upper left corner. (SF Man., Ex. 1027, p. 22)(Mason Decl., ¶¶257-260).

13.0 The multipurpose host system of claim 12 wherein the generic graphical interface specification includes a first set of tabs for selecting one of a set of supported display modes, wherein each supported display mode includes a specified set of graphical display components rendered in the mode-specific data display region.	The SmartFlow Manual teaches displaying a variety of tabs in its various display modes, for example, "proximal", "distal", "vaso" and "wedge" in Figs. 15, 17 and 19. These tabs are included in the layout. (SF Man., Ex. 1027, pp. 25, 27-28) (Mason Decl., ¶¶261-263).

15. The multipurpose host	The SmartFlow Manual teaches computing **fractional**

system of claim 12 wherein a pressure display mode supports rendering a fractional flow reserve value.	**flow reserve ("FFR")**. (SF Man., Ex. 1027, p. 7). The SmartFlow manual further teaches **displaying** on the user interfaces the FFR in Fig. 17 on page 27. (SF Man., Ex. 1027, p. 17) Fig. 17 represents a **pressure display mode**. (Mason Decl., ¶¶246-248).

16. The multipurpose host system of claim 11 wherein the generic graphical user interface specification includes a touch screen interface for selecting display components.	The SmartFlow Manual teaches providing a **touch screen keyboard interface**. (SF Man., Ex. 1027, p. 10). A **layout for the touch screen** is shown in Fig. 24 on page 31 of the Manual (SF Man., Ex. 1027, p. 31, Fig. 24) (Mason Decl., ¶¶264-266).

17. The multipurpose host system of claim 16 wherein a touch screen keyboard is supported by the generic graphical user interface specification.	*See* claim 16, above. The keyboard is shown in Fig. 24 on page 31 of the Manual. It is necessarily included in a layout for a GUI element, because specific keys have specific locations relative to one another. (Mason Decl., ¶¶267-269).

Ground 5. Claims 8-9 are invalid under 35 U.S.C. § 103(a) as in Ground 1, in further view of Kern 1997.

Claims 8-9 are invalid under 35 U.S.C. § 103(a) as in Ground 1, in further view of Kern, *et al.*, J. Am. Coll. Cardiol. 1997; 30(3):613-620 ("Kern 1997"). Kern 1997 is § 102(b) prior art, and is in the same field as the '994 patent.

Regarding **claim 8**, Kern 1997 teaches displaying **blood flow velocity** related measurements in Fig. 1, and separately in Fig. 2, displaying **pressure** related measurements. (Kern 1997, Ex. 1030, pp. 614-615, Figs. 1 and 2) (Mason Decl., ¶¶280-284). It would have been obvious to combine the references in Ground 1

with Kern 1997. Kern 1997 expressly teaches that it is valuable to measure both pressure and blood velocity values to calculate CFR and FFR. (Kern 1997, Ex. 1030, pp. 616). It thus would have been obvious to allow display of both, particularly in the same window (*e.g.* **claim 9**). Furthermore, the combination is obvious under *KSR v. Teleflex.* Kern 1997 is a review of invasive cardiovascular diagnostic techniques and their effectiveness at diagnosing disease. (Kern 1997, Ex. 1030, Abstract). Kern 1997 represents standard knowledge in the field, which can be combined with the '669 patent using standard techniques (e.g. those discussed in Krauss 1999), to achieve only predictable results. The '994 patent describes neither the software implementation of claims 8 and 9, nor any unpredictable results. (Mason Decl., ¶¶280-289).

Ground 6. Claims 2 and 4-6 are invalid under 35 U.S.C. § 103(a) as in Ground 1, in further view of Kern 1997 and Hastings.

Claims 2 and 4-6 are invalid under 35 U.S.C. § 103(a) as in Ground 1, in further view of Kern 1997 (*see* Ground 5) and U.S. Pat. No. 5,873,835 ("Hastings"). Hastings and Kern 1997 are § 102(b) prior art.

It would have been obvious to combine the '669 patent with Kern 1997 for the reasons given in Ground 5. It would further have been obvious to combine the '669 patent with Hastings. Hastings is analogous art because it is in the same field as the '994 patent. Hastings relates to an "intravascular pressure and flow sensor" (Hastings, Ex. 1031, title).

Regarding **claim 2**, the '669 patent teaches using both pressure and flow sensors. ('669 patent, Ex. 1024, claims 10-11). Kern 1997 teaches that both types of measurements are desirable (Kern 1997, Ex. 1030, p. 616), and Hastings concurs (Hastings, Ex. 1031, col. 1, ll. 56 - col. 2, l. 7). Hastings teaches a combined pressure and flow sensor that ideally allows combined measurements to be made. (Hastings, Ex. 1031, col. 2, ll. 7-17). Hastings teaches that blood flow measurements can be made using **blood velocity measurements** in a constant diameter lumen. (Hastings, Ex. 1031, col. 12, ll. 13-16). It would thus have been obvious to add components for these sensors for the reasons given in Ground 1, limitation 1.5. (Mason Decl., ¶¶288-291).

Regarding claims 4-6, Kern 1997 teaches the calculation and display of FFRmyo, which is a ratio of pressures (**claim 4**) (Kern 1997, Ex. 1030, p. 614 (top left) and 615, Fig. 2), a gradient of pressures (**claim 5**) (Kern 1997, Ex. 1030, p. 615, Fig. 2 caption), and CFR, which is a ratio of flow velocities under high and low flow conditions (**claim 6**) (Kern 1997, Ex. 1030, p. 614 right column, Fig. 1B).

It would further have been obvious to combine the references in Ground 1 with Kern 1997 and Hastings under *KSR v. Teleflex*. Hastings represents a standard sensor used for the type of work described in the '994 patent. (Hastings, Ex. 1031, Abstract). Hastings can be combined with the '669 patent using standard techniques (e.g. adding the sensor to the guidewire), to achieve only predictable

results. The '994 patent describes neither how to implement sensors, nor any unpredictable results, and admits that different temperature sensors can be used predictably ('994 patent, Ex. 1001, col. 8, ll. 46-51). (Mason Decl., ¶¶292-298).

Ground 7. Claim 19 is invalid under 35 U.S.C. § 103(a) as in Ground 1, in further view of Hastings and Svanerudh.

Claim 19 is invalid under 35 U.S.C. § 103(a) as in Ground 1, in further view of Hastings (*see* Ground 6) and U.S. Pat. No. 6,754,608 ("Svanerudh"). Svanerudh is prior art under 35 U.S.C. § 102(e) as of its provisional application filing date (May 23, 2001). *See In re Giacomini*, 612 F.3d 1380, 1384-85 (Fed. Cir. 2010). The provisional application is incorporated-by-reference into Svanerudh. (Svanerudh, Ex. 1032, col. 1, ll. 5-9). Citations will hereinafter be to the page and line number of the Svanerudh provisional application (Svanerudh Prov., Ex. 1033).

Regarding **claim 19**, Hastings teaches that *in situ* **temperature** measurements can be made to calibrate instrumentation. (Hastings, Ex. 1031, col. 12, ll. 52-57) Hastings is concerned with CFR measurements. CFR measurements are useful in diagnosis as discussed above under claim 6. Svanerudh is also concerned with the calculation of CFR. Svanerudh teaches that temperature measurements can be used to calculate CFR in an improved fashion. (Svanerudh Prov., Ex.1033, p. 1, ll. 12-24, p. 9, ll. 7-13).

It would have been obvious to combine the '669 patent with Hastings for the reasons given in Ground 6. It would further have been obvious to combine the

'669 patent with Svanerudh. Svanerudh is analogous art because it is in the same field as the '994 patent. Svanerudh relates to "in vivo flow measurements in blood vessels using coronary flow reserve (CFR) measurement technique." (Svanerudh Prov., Ex.1033, p. 1, ll. 5-7). The '669 patent likewise teaches using flow values to compute CFR. ('669 patent, Ex. 1024, col. 2, ll. 60-64), as does the '994 patent ('994 patent, Ex. 1001, col. 2, ll. 14-15). Svanerudh further teaches "improvements to a thermodilution technique" which are useful for calculating CFR. (Svanerudh Prov., Ex. 1033, p. 1, ll. 12-24). It would have been obvious specifically to take and process temperature measurements in order to allow correction for temperature drift of instrumentation as taught in Hastings, or to allow for calculation of CFR as taught by Svanerudh. (Hastings, Ex. 1031, col. 12, ll. 52-57). It further would have been obvious to process these **measurements in processing components** for the reasons given in Ground 1, limitations 1.3 - 1.5. (Mason Decl., ¶¶299-303).

Ground 8. Claim 3 is invalid under 35 U.S.C. § 103(a) as in Ground 6, in further view of Ben-Haim.

Claim 3 is invalid under 35 U.S.C. § 103(a) as in Ground 6, in further view of U.S. Pat. No. 6,083,170 ("Ben-Haim"). Ben-Haim is prior art under § 102(b). Ben-Haim is analogous art, because it is in the same field as the '994 patent.

Ben-Haim teaches the use of a position sensor as required by **claim 3**. It would have been obvious to include a position sensor, because Hastings (cited in Ground 6, claim 2) teaches that positioning of the sensors at the correct point in the artery

is important, and that positioning can be done in a variety of ways known in the art. (Hastings, Ex. 1031, col. 12, ll. 52-57) (Mason Decl., ¶¶304-308). Ben-Haim further teaches that positioning is standard practice, and that a position sensor can help reduce the need for X-Ray positioning that causes radiation damage, and can help reduce the likelihood that collision with an arterial obstruction. (Ben-Haim, Ex. 1034, col. 1, ll. 35-42, col. 3, ll. 14-27) (Mason Decl., ¶¶304-308).

Furthermore, Ben-Haim teaches a standard position sensor used for the type of work described in the '994 patent. (Ben-Haim, Ex. 1034, col. 3, ll. 14-27). Ben-Haim can be combined with the '669 patent using standard techniques (e.g. adding the sensor to the guidewire), to achieve predictable results. The '994 patent describes neither how to implement sensors, nor any unpredictable results, and in fact admits that different temperature sensors can be used predictably ('994 patent, Ex. 1001, col. 8, ll. 46-51). It further would have been obvious to process the position measurement in a processing component for the reasons given in Ground 1, limitations 1.3 - 1.5. (Mason Decl., ¶¶304-308).

Ground 9. Claim 7 is invalid under 35 U.S.C. § 103(a) as in Ground 6, in further view of Ben-Haim and Svanerudh.

Claim 7 is invalid under 35 U.S.C. § 103(a) as in Ground 6, in further view of Ben-Haim (*see* Ground 8) and Svanerudh (*see* Ground 7). It would have been obvious to combine the '669 patent with Ben-Haim and Svanerudh for the reasons given in Ground 8 and Ground 7, respectively. It would further have been obvious

to include a temperature and positioning sensor as in **claim 7**, because Hastings teaches that when taking temperature measurements one should position the sensor in a variety of ways known in the art. (Hastings, Ex. 1031, col. 12, ll. 37-41). Ben-Haim teaches that positioning is standard practice, and that a position sensor can help reduce the need for X-Ray positioning techniques that cause radiation damage, and can help reduce the likelihood that collision with an arterial obstruction. (Ben-Haim, Ex. 1034, col. 1, ll. 35-42, col. 3, ll. 14-27). It further would have been obvious to process the position measurement in a processing component for the reasons given in Ground 1, limitations 1.3 - 1.5. (Mason Decl., ¶¶309-311).

Ground 10. Claims 12-13 and 20 are invalid under 35 U.S.C. § 103(a) as in Ground 1, in further view of Schoenberg.

Claims 12-13 and 20 are invalid under 35 U.S.C. § 103(a) as in Ground 1, in further view of U.S. Pat. No. 6,322,502 ("Schoenberg"). Schoenberg is § 102(b) prior art. Schoenberg was cited during the examination leading to the '994 patent, where the applicants did not contest Schoenberg applied to issued to claims 12-13, 16-17 and 20. (Response, Ex. 1016, p. 7).

Regarding **claims 12-13**, Krauss 1999 teaches a generic graphical user interface specification. Schoenberg, in Figs 2A-3B shows a consistent layout indicative of such an interface. The layout has patient information regions at the top and bottom (e.g. bed number and date of admission). In Fig. 2B, there are also a variety of

display regions that can be mode-selected for particular sensors, e.g. "VITAL SIGNS, RESPIRATION…." (Schoenberg, Ex. 1035, col. 7, ll. 28-32) (Mason Decl., ¶¶312-318). Regarding **claim 20,** Schoenberg teaches that system messages appear on screen. (Schoenberg, Ex. 1035, col. 7, ll. 53-56) (Mason Decl., ¶¶319-320).

It would have been obvious to combine the '669 patent with Schoenberg. Schoenberg is analogous art because it is in the same field as the '994 patent and is reasonably related to the problems faced by the '994 patent's alleged inventors. Specifically, like the '994 patent, Schoenberg relates to a "medical information system receives patient data and information from various sources and displays such information in a variety of formats…." (Schoenberg, Ex. 1035, Abstract). Furthermore, the '669 patent potentially provides numerous forms of information simultaneously. ('669 patent, Ex. 1024, col. 18, l. 15 – col. 22, l. 5). Schoenberg teaches that "[t]here exists a need for all data and information obtained from and about a patient in a hospital to be immediately and selectively accessible to various members of the medical team in a hospital in accordance with the function performed by those members." (Schoenberg, Ex. 1035, col. 2, ll. 36-39). Schoenberg addresses this by "provid[ing] a medical information system which presents multiple types of patient data simultaneously." (Schoenberg, Ex. 1035, col. 2, ll. 63-65) (Mason Decl., ¶¶315, 320). It would further have been obvious to

have these display regions correspond to **specified measurement processing components** for the reasons given under Ground 1, limitation 1.5.

Ground 11. Claims 14, and 16-17 are invalid under 35 U.S.C. § 103(a) as in Ground 10, in further view of Snell.

Claims 14 and 16-17 are invalid under 35 U.S.C. § 103(a) as in Ground 10, in further view of U.S. Pat. No. 5,724,985 ("Snell"). Snell is § 102(b) prior art. Snell is analogous art for the reasons given in the Mason Declaration, ¶278.

Regarding claim 14, Snell teaches a display (Fig. 4) having vertical tabs 202 and horizontal tabs 204. The physician can choose between display modes using the vertical tabs, and within modes, can choose display options using the horizontal tabs. (Snell, Ex. 1036, col. 15, ll. 32-54) (Mason Decl., ¶332). It would have been obvious to include a hierarchical display mode with tabs as taught by Snell. Snell teaches that ease of specific devices is "very important", because the physician may use the device for only a few hours a month, often where potentially distracting interactions with a patient is necessary. (Snell, Ex. 1036, col. 3, ll. 26-40). To address this need, Snell teaches "an improved apparatus and improved method for viewing, manipulating and annotating both real-time and stored medical data" (Snell, Ex. 1036, col. 5, ll. 50-52), for receiving "several channels of data". Additionally, the tabs of Snell were a common element of GUIs at the time of the alleged invention. (Mason Decl., ¶333). The inclusion of the relationship of Snell into the GUI of a Windows-based GUI of the '669 patent is the combination

of known elements, using known methods, having no unpredictable result and is thus obvious under *KSR v. Teleflex*. (Mason Decl., ¶¶331-334).

Regarding claims 16 and 17, Snell teaches the use of a touchscreen display to select and control display elements. (Snell, Ex. 1036, Abstract). A "pen is used to select programming options by tapping portions of the digitizer based on visual images on the display". (*Id.*). Regarding claim 17, Snell teaches: "on the digitizer display screen 104 (FIG. 1) as in the configuration of a standard typewriter keyboard (QWERTY keyboard) is another known input scheme for text." (Snell, Ex. 1036, col. 4, ll. 44-48). A touch screen keyboard would necessarily (and obviously) have had a layout within the graphical user interface, thus indicating that it is "supported" by the generic user interface specification. It would further have been obvious to combine the '669 patent with Snell for reasons given above for claim 14. (Mason Decl. ¶¶323-330).

Ground 12. Claim 15 is invalid under 35 U.S.C. § 103(a) as in Ground 10, in further view of Hastings and Kern 1997.

Claim 15 is invalid under 35 U.S.C. § 103(a) as in Ground 10, in further view of Hastings and Kern 1997 (*see* Ground 6). Claim 15 is nearly identical in scope to claim 4, and would have been obvious for reasons given under Ground 6, claim 4. (Mason Decl. ¶¶321-322).

Respectfully submitted,

Dated: April 30, 2013 By: /Matthew A. Smith/ Reg. No. 49,003

CERTIFICATE OF SERVICE

The undersigned hereby certifies that a copy of the foregoing Petition for Inter Partes Review together with all exhibits and other papers filed therewith was served on April 30, 2013, by placing a copy into FEDERAL EXPRESS directed to the attorneys of record for the patent at the following address:

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