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Paper 29
Date: November 25, 2020

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

DISH NETWORK L.L.C.,
Petitioner,

v.

CONTEMPORARY DISPLAY LLC,
Patent Owner.

IPR2019-01167
Patent 6,028,643

Before THU A. DANG, JONI Y. CHANG, and JOHN A. HUDALLA, *Administrative Patent Judges*.

HUDALLA, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

Petitioner, DISH Network L.L.C. ("Petitioner"), filed a Petition (Paper 2, "Pet.") requesting an *inter partes* review of claims 1–25 of U.S. Patent No. 6,028,643 (Ex. 1001, "the '643 patent"). Patent Owner, Contemporary Display LLC ("Patent Owner"), filed a Preliminary Response (Paper 6, "Prelim. Resp."). Taking into account the arguments presented in the Preliminary Response, we determined that the information presented in

the Petition established that there was a reasonable likelihood that Petitioner would prevail with respect to its unpatentability challenges. Pursuant to 35 U.S.C. § 314, we instituted this proceeding on December 13, 2019, as to all challenged claims and all grounds of unpatentability. Paper 9 ("Dec. on Inst.").

During the course of trial, Patent Owner filed a Patent Owner Response (Paper 11, "PO Resp."), and Petitioner filed a Reply to the Patent Owner Response (Paper 16, "Pet. Reply"). Patent Owner also filed a Sur-reply. Paper 21 ("PO Sur-reply"). An oral hearing was held on September 15, 2020, and a transcript of the hearing is included in the record. Paper 28 ("Tr.").

Petitioner filed Declarations of Anthony Wechselberger with its Petition (Ex. 1003) and Reply (Ex. 1034). Patent Owner filed a Declaration of Michael C. Brogioli, Ph.D., with its Response. Ex. 2001. The parties also filed transcripts of the depositions of Mr. Wechselberger (Ex. 2004) and Dr. Brogioli (Ex. 1033).

We have jurisdiction under 35 U.S.C. § 6. This decision is a Final Written Decision under 35 U.S.C. § 318(a) as to the patentability of claims 1–25 of the '643 patent. For the reasons discussed below, Petitioner has demonstrated by a preponderance of the evidence that claims 1–25 of the '643 patent are unpatentable.

I. BACKGROUND

A. Real-Parties-in-Interest

Petitioner identifies DISH Network L.L.C., DISH Network Corporation, and DISH Technologies L.L.C. as real-parties-in-interest.

Pet. 1. Patent Owner identifies Contemporary Display LLC as the real-party-in-interest. Paper 7, 1; Paper 27, 2.

B. Related Proceedings

The parties identify the following proceeding related to the '643 patent (Pet. 1; Paper 7, 1; Paper 27, 2): *Contemporary Display LLC v. DISH Network Corp.*, No. 1:18-cv-476 (W.D. Tex. filed June 4, 2018).

In addition, Petitioner filed petitions for *inter partes* review against other patents owned by Patent Owner in IPR2019-01163, IPR2019-01164, and IPR2019-01166. We granted Patent Owner's requests for adverse judgment in each of these proceedings.

C. The '643 Patent

The '643 patent relates to a video adapter in a personal computer that includes at least two television tuners and that sends video data to multiple computer displays. Ex. 1001, 1:7–11. Figure 1 of the '643 patent is reproduced below.

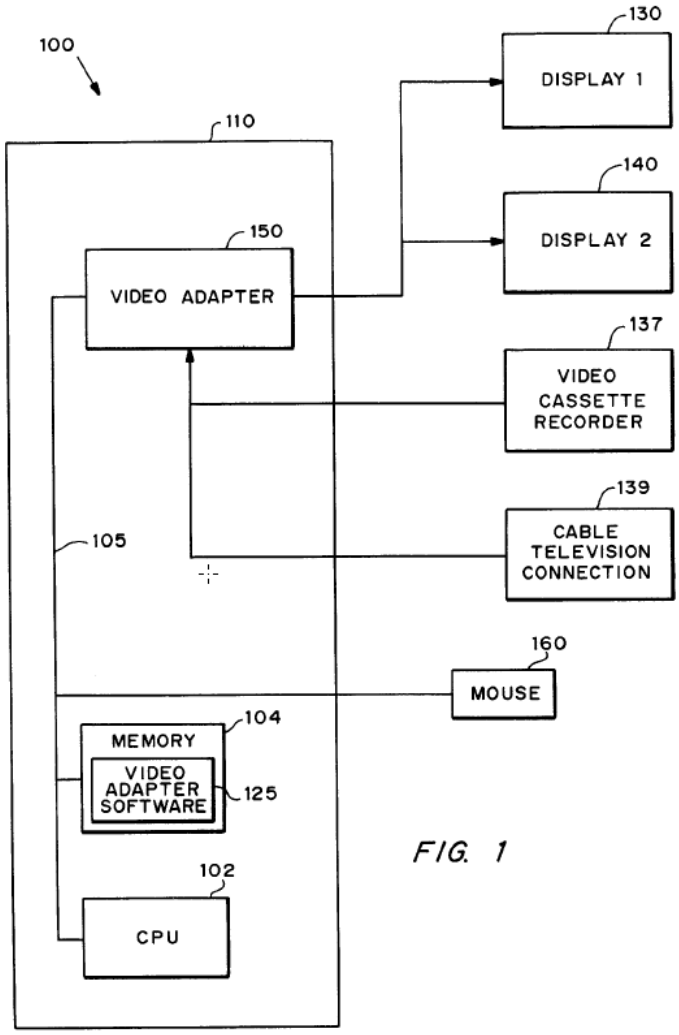
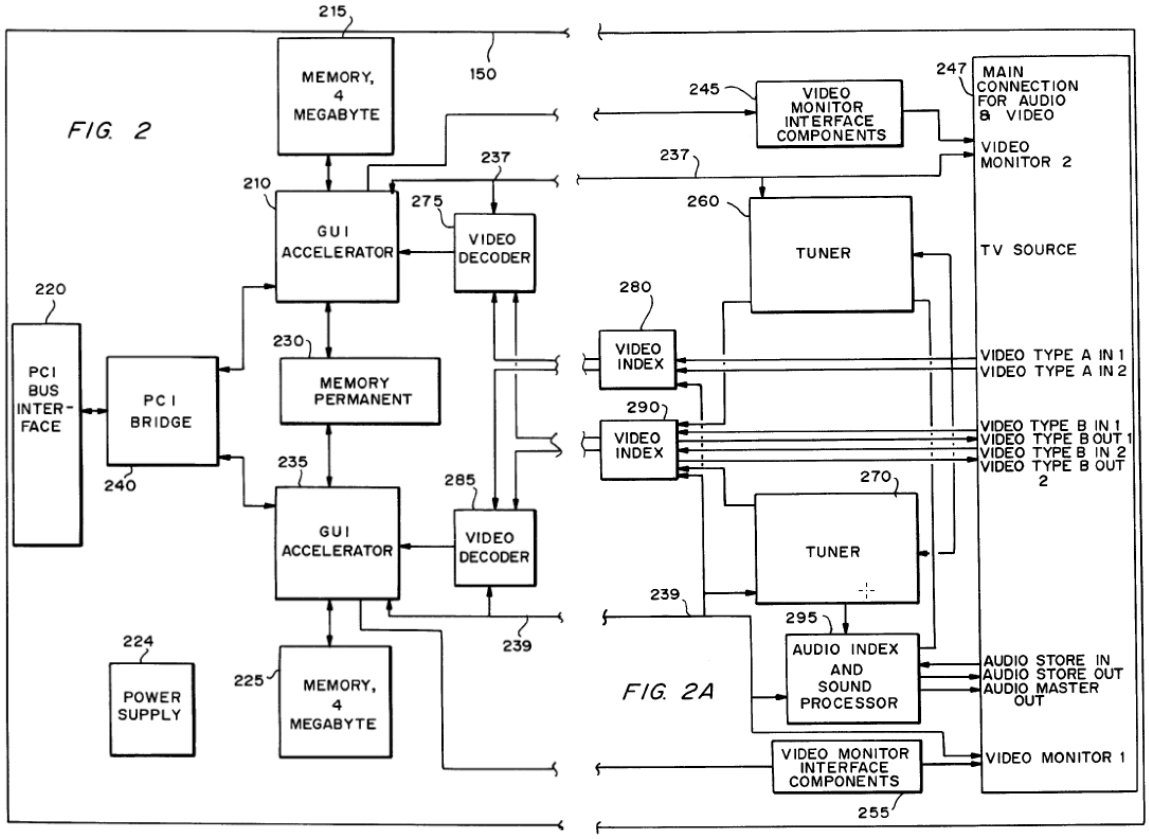


FIG. 1

Figure 1 depicts a block diagram of a computer system that includes a video adapter and video adapter software according to the invention of the '643 patent. *Id.* at 3:41–43, 4:66–5:1. Computer system 100 includes computer 110 with CPU 102, memory 104, bus 105, first display device 130, second display device 140, and input device 160 (e.g., a mouse). *Id.* at 5:1–5. Adapter 150 is coupled to first display device 130 and second display device 140 by electrical connections. *Id.* at 5:5–7. Memory 104 can include video adapter software 125 that supports graphics processing and control functionality, among other things. *Id.* at 5:11–13.

Figures 2 and 2A of the '643 patent are reproduced below.



Figures 2 and 2A depict a functional block diagram of adapter 150 with support for four television monitors or four computer monitors. *Id.* at 3:44–45, 5:28–29. Video adapter 150 interfaces with computer 110 via PCI (Peripheral Component Interconnect) bridge 240 using 32-bit PCI Version 2.1-compliant bus interface 220 that couples with a single PCI bus expansion slot in computer 110. *Id.* at 5:29–35. Video adapter 150 processes video data from computer 110 via PCI bridge 240, which bridges data from PCI bus interface 220 to multiple accelerators on the card. *Id.* at 5:39–42.

Video adapter 150 includes television tuners 260, 270, which each accept television signals from a cable television connection, a video cassette recorder, a television antenna, or similar television signal source. *Id.* at

5:54–58. Video adapter 150 also includes video multiplexer inputs 280, 290, which accept RCA and S-Video inputs from a variety of sources, including outputs from tuners 260, 270. *Id.* at 5:58–62. Video decoders 275, 285 convert analog video signals from video multiplexers 280, 290 into a digital component stream for use by graphics accelerators 210, 235. *Id.* at 6:4–6.

A user interface for computer 110 is implemented in various windows with menu selections. *Id.* at 5:20–21, 7:2–9, Fig. 3. One such window is illustrated in Figure 23 of the '643 patent, which is reproduced below.

FIG. 23

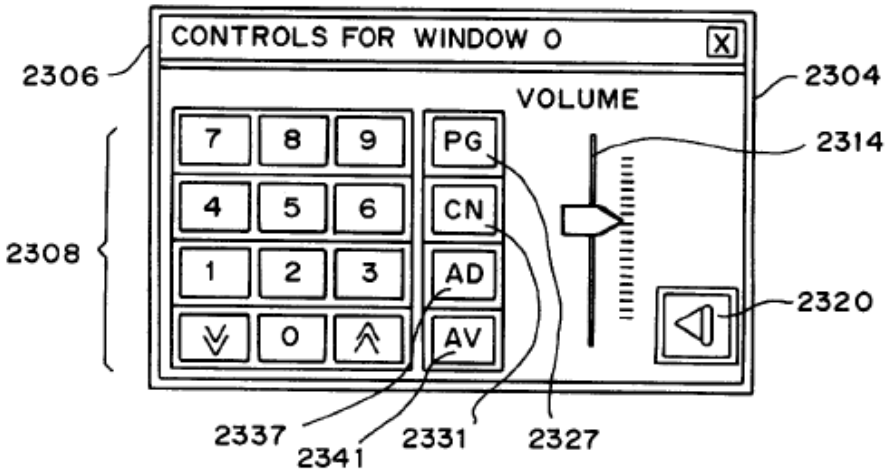


Figure 23 depicts tool window 2302 that a user may select from various menus in the user interface for computer 110. *Id.* at 12:46–48. Tool window 2302 includes, *inter alia*, keypad 2308, which allows the user to select particular audio and video settings for the active window. *Id.* at 12:48–52.

The application from which the '643 patent issued was filed on September 3, 1997. *Id.* at code (22). As discussed below, Petitioner asserts that its asserted references qualify as prior art relative to the September 3, 1997, filing date. *See* Pet. 2–3.

D. Illustrative Claims

Of the challenged claims, claims 1, 12, and 16 are independent. Claims 2–11 depend directly or indirectly from claim 1; claims 13–15 depend directly or indirectly from claim 12; and claims 17–25 depend directly or indirectly from claim 16. Claims 1 and 16 are illustrative of the challenged claims and recite:

> 1. A video adapter for use in a computer having an internal bus, the video adapter comprising:
>
> a first graphic accelerator;
>
> a second graphic accelerator;
>
> at least one video decoder coupled to at least one of the first and second graphic accelerators;
>
> a first television tuner receiving a first television signal
>
> a second television tuner receiving a second television signal;
>
> circuitry for coupling the first and second television tuners to the at least one video decoder; and
>
> a plurality of video monitor outputs.
>
> 16. A method for displaying information on multiple display devices, comprising the steps, performed by a computer, of:
>
> providing a computer containing an adapter which supplies signals to a plurality of monitors, the adapter containing a plurality of video tuners;
>
> displaying a tool window interface coupled to control the adapter, wherein a first display device output window having a group of selectable inputs including at least one video input, and a second display device output window having a group of selectable inputs having at least one video input, are displayed;
>
> inputting an indication that a user wishes to select a first input for the first display device output window;

> inputting an indication that a user wishes to select a second input for the second display device output window;
>
> causing the adapter to display, on the first display device, signals according to the first display device input indication; and
>
> causing the adapter to display, on the second display device, signals according to the second display device input indication.

Ex. 1001, 13:53–65, 14:59–15:15.

E. Prior Art

Petitioner relies on the following prior art:

> U.S. Patent No. 5,675,390, filed July 17, 1995, issued Oct. 7, 1997 (Ex. 1005, "Schindler");
>
> U.S. Patent No. 5,923,307, filed Jan. 27, 1997, issued July 13, 1999 (Ex. 1006, "Hogle");
>
> U.S. Patent No. 5,428,730, filed Dec. 15, 1992, issued June 27, 1995 (Ex. 1007, "Baker"); and
>
> U.S. Patent No. 5,794,016, filed Dec. 11, 1995, issued Aug. 11, 1998 (Ex. 1008, "Kelleher").

F. The Instituted Grounds

We instituted *inter partes* review of claims 1–25 of the '643 patent on the following grounds (Dec. on Inst. 41), which are all the grounds presented in the Petition (Pet. 3):

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
16–19, 24, 25	103(a)[1]	Schindler, Hogle

[1] The Leahy-Smith America Invents Act ("AIA"), Pub. L. No. 112-29, 125 Stat. 284, 287–88 (2011), amended 35 U.S.C. §§ 102 and 103. Because the effective filing date of the '643 patent is before March 16, 2013 (the

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
20–23	103(a)	Schindler, Hogle, Baker
1–14	103(a)	Schindler, Kelleher
15	103(a)	Schindler, Kelleher, Hogle

II. ANALYSIS

A. Legal Standards

A claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) where in evidence, so-called secondary considerations.[2] *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). We also recognize that prior art references must be "considered together with the knowledge of one of ordinary skill in the pertinent art." *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994) (citing *In re Samour*, 571 F.2d 559, 562 (CCPA 1978)).

effective date of the relevant amendments), the pre-AIA versions of §§ 102 and 103 apply.

[2] The record does not contain any evidence of secondary considerations of nonobviousness.

B. Level of Ordinary Skill in the Art

Citing testimony from Mr. Wechselberger, Petitioner contends a person having ordinary skill in the art would have had "at least a Bachelor of Science in Computer Science, Computer Engineering, Electrical Engineering, or an equivalent as well as at least two years of relevant academic or industry experience in the field of computer processing and display of analog and digital video signals." Pet. 10 (citing Ex. 1003 ¶ 66). Patent Owner puts forth the same definition with support from Dr. Brogioli. PO Resp. 2 (citing Ex. 2001 ¶ 38).

We adopt the parties' definition of the level of ordinary skill in the art. We are satisfied that this definition comports with the level of skill of skill necessary to understand and implement the teachings of the '643 patent and the asserted prior art.

C. Claim Interpretation

Because this *inter partes* review is based on a petition filed after November 13, 2018, we construe each claim "in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent." 83 Fed. Reg. 51,340 (Oct. 11, 2018).[3] Accordingly, our claim construction

[3] On October 11, 2018, the USPTO revised its rules to harmonize the Board's claim construction standard with that used in federal district courts. CHANGES TO THE CLAIM CONSTRUCTION STANDARD FOR INTERPRETING CLAIMS IN TRIAL PROCEEDINGS BEFORE THE PATENT TRIAL AND APPEAL BOARD, 83 Fed. Reg. 51,340 (Oct. 11, 2018) (amending 37 C.F.R. § 42.100(b) effective November 13, 2018) (now codified at 37 C.F.R. § 42.100(b) (2019)). This rule change applies to petitions filed on or after November 13, 2018.

standard is the same as that of a district court. *See id*. Under the standard applied by district courts, claim terms are generally given their plain and ordinary meaning as would be understood by a person of ordinary skill in the art at the time of the invention and in the context of the entire patent disclosure. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005) (en banc).

In the Petition, Petitioner contended that the terms "video adapter" (in claims 1 and 12) and "adapter" (in claim 16) should be construed to mean "separate video card." Pet. 8–10. In the Preliminary Response, Patent Owner contended that no construction of these or any other terms is necessary and that all terms should be accorded their plain and ordinary meaning. Prelim. Resp. 3–4. In our Decision on Institution, we determined that no terms required construction. Dec. on Inst. 9.

In its Response, Patent Owner repeats its position from the Preliminary Response that no construction of any terms is necessary and that all terms should be accorded their plain and ordinary meaning.[4] PO

[4] At the oral hearing, Patent Owner's counsel put forth new arguments about how we should apply the plain and ordinary meaning of the term "adapter." *See* Tr. 22:16–30:7. These arguments do not appear in Patent Owner's briefs. The oral hearing is limited to "argument on an issue raised in a paper" and is not a vehicle for introducing new argument or evidence to the proceeding. 37 C.F.R. § 42.70(a); *see also* Patent Trial and Appeal Board Consolidated Trial Practice Guide at 85–86 (Nov. 2019) ("Consolidated Trial Practice Guide"), *available at* https://www.uspto.gov/sites/default/files/documents/tpgnov.pdf ("[A] party . . . may only present arguments relied upon in the papers previously submitted."). As such, we do not consider Patent Owner's new arguments. And, as discussed below, Patent Owner does not dispute that the asserted references teach the "adapter" limitations in the challenged claims.

Resp. 3–4. In its Reply, Petitioner argues that "[n]o meaningful claim construction disputes remain, and the Board need not construe any terms to resolve what little controversy is left in this case." Pet. Reply 2.

We agree with Petitioner that no disputes in this case turn on construction of claim terms, so we maintain our determination that no terms require explicit construction. *See, e.g.*, *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) ("[W]e need only construe terms 'that are in controversy, and only to the extent necessary to resolve the controversy' . . . ." (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

D. Obviousness Ground Based on Schindler and Hogle

Petitioner contends the subject matter of claims 16–19, 24, and 25 would have been obvious over Schindler and Hogle. Pet. 11–51; Pet. Reply 2–18. Patent Owner argues that Petitioner has not provided sufficient evidence to show that Schindler and Hogle can be appropriately combined. PO Resp. 4–10; PO Sur-reply 1–13.

1. Schindler

Schindler is a U.S. patent directed to "a system having a high quality monitor to display digitally received broadband video without loss of signal quality." Ex. 1005, 1:7–10. Figure 1 of Schindler is reproduced below.

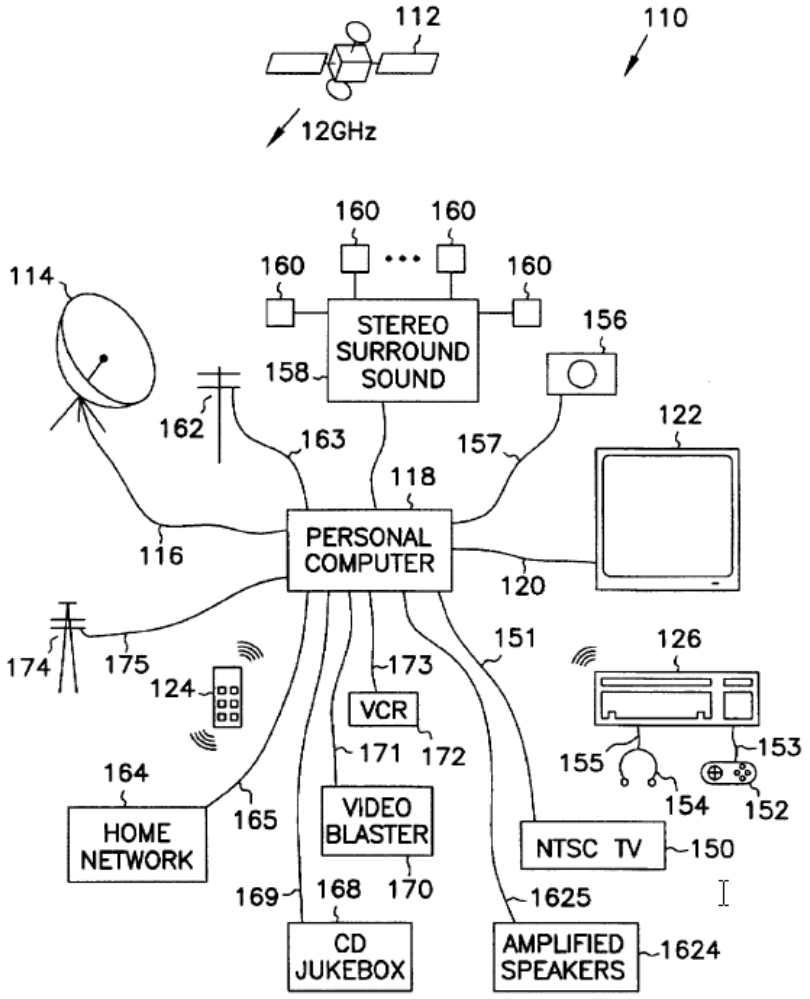


FIG. 1

Figure 1 depicts home entertainment system 110 for processing and displaying high quality video. *Id.* at 6:37–39, 7:44–45. In system 110, antenna 114 receives satellite signals, and personal computer 118 contains circuitry and software to demodulate and decode signals from antenna 114 to produce a video graphics array (VGA) signal. *Id.* at 7:50–53, 7:61–65. The VGA signal is provided via cable 120 to drive monitor 122. *Id.* at 5:58–59, 7:65–8:2. In addition, personal computer 118 may receive signals from camera 156, public switched telephone network (PSTN) 162, CD jukebox 168, VCR 172, and cable source 174. *Id.* at 21:8–25. Personal

computer 118 may also drive multiple monitors, including National Television Systems Committee (NTSC) TV 150. *Id.* at 21:25–28. A user controls system 118 via handheld remote control 124 (with standard television controls and numeric keypad) and computer keyboard 126. *Id.* at 8:2–12.

Figure 3 of Schindler is reproduced below.

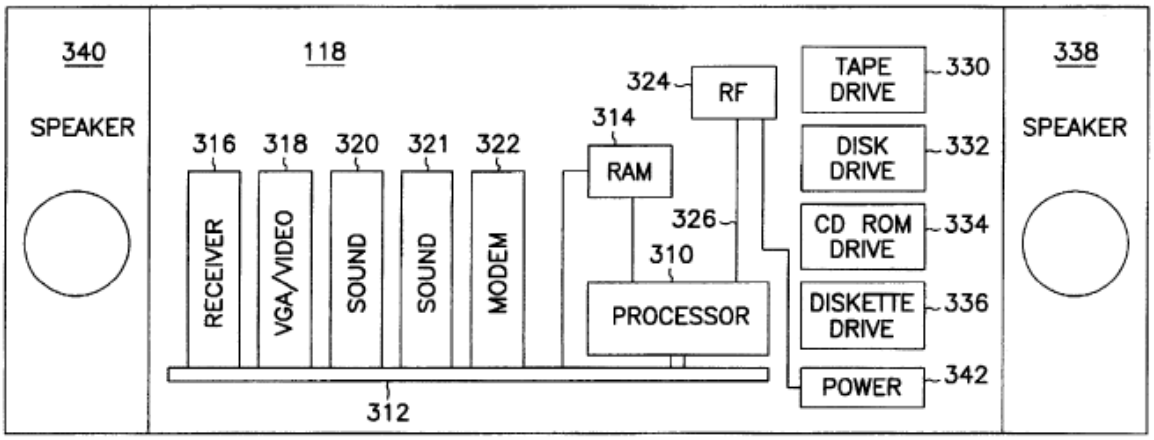


FIG. 3

Figure 3 is a block diagram showing the major components of personal computer 118. *Id.* at 6:43–45, 8:66–67. Processor 310 resides on a system board containing industry standard PCI bus 312. *Id.* at 8:67–9:1. Computer 118 also includes receiver 316, "video graphics adapter, VGA converter card 318," sound card 320, and modem 322. *Id.* at 9:5–7. Radio frequency (RF) receiver 324 receives RF signals from remote controls 124, which provide indications of the keys being pressed along with the identity of the remote control 124 or keyboard 126 sending the signal. *Id.* at 9:24–26. A system controller program running on processor 310 supervises software drivers, which are programmed to distinguish the source of the

remote key signals and control the particular program the signals affect. *Id.* at 9:31–34.

Figure 11a of Schindler is reproduced below.

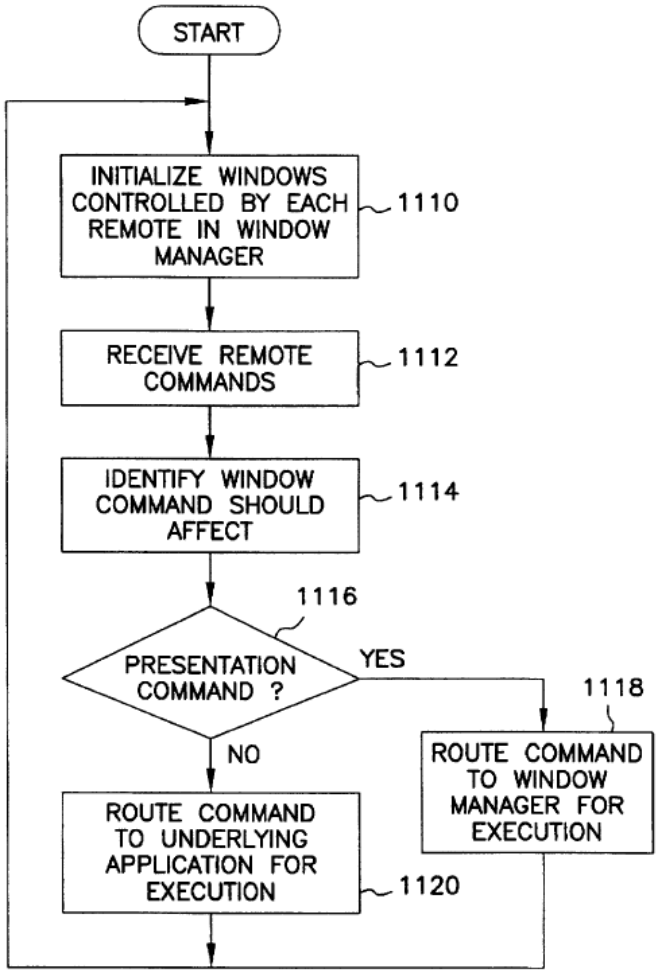


FIG. 11A

Figure 11a is a flowchart showing how commands issued from different remote control devices are interpreted by processor 310 to control different applications. *Id.* at 15:13–16. At step 1110, when an application is started in a window (as in a Windows 3.11 or Windows 95 environment), the application is initialized and associated with a particular remote control. *Id.* at 15:16–18. At step 1112, RF circuitry 324 receives signals from a remote

control and identifies the command (i.e., the identity of the key that was pressed and the remote device from which it came) to processor 310. *Id.* at 15:26–29. At step 1114, processor 310 identifies the application in a window to which the command should be applied. *Id.* at 15:29–31. If the command is a presentation type of command (e.g., enlarging a window or opening a window) as determined at step 1116, the command is routed to the window manager for execution at step 1118. *Id.* at 15:31–34. If the command is not a presentation type of command as determined at step 1116, the command is executed at step 1120 in the application underlying the window. *Id.* at 15:34–36.

Figure 14a of Schindler is reproduced below.

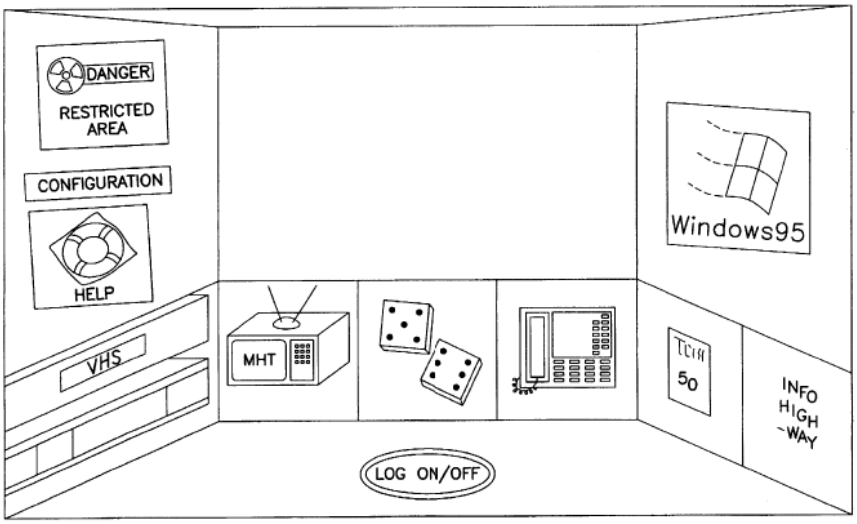


FIG. 14A

Figure 14a depicts a "first screen display" user interface for interacting with the entertainment system of Schindler. *Id.* at 7:12–14, 18:57–58. The first screen display, which includes a set of icons, acts as an application manager, allowing the user to launch other applications and utilities from within it. *Id.* at 18:58–65. The first screen display "is organized into the following areas,

each of which leads to further menus: Entertainment, Information Services, Productivity, and Logon/Help/Configuration controls." *Id.* at 18:65–19:1.

Figure 14c of Schindler is reproduced below.

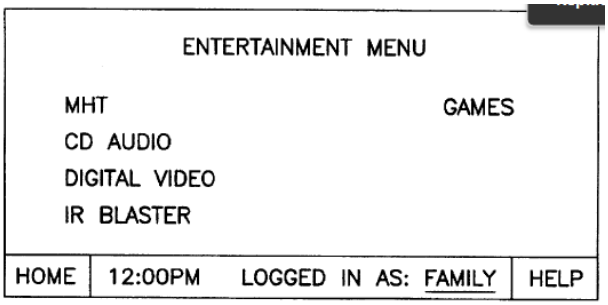


FIG. 14C

Figure 14c depicts an entertainment menu that is activated by selecting an appropriate icon in a higher-level menu. *Id.* at 19:12–19. The entertainment menu includes "selections such as Microsoft Home Theater, CD audio, Digital Video, IR Blaster and Games, all of which may be launched from this window." *Id.* at 19:19–23.

Figure 13 of Schindler is reproduced below.

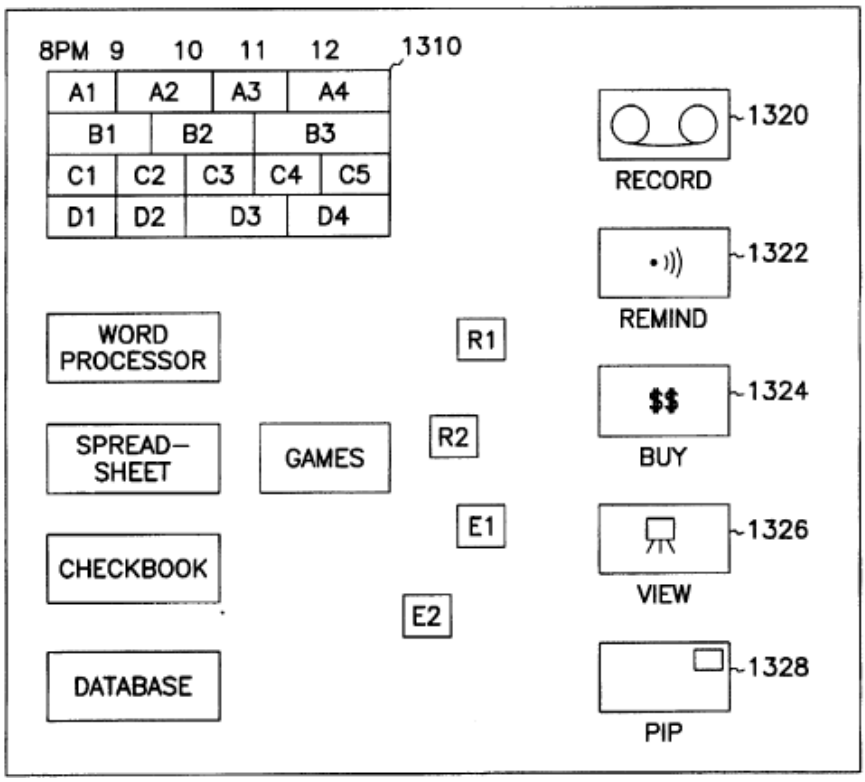


FIG. 13

Figure 13 depicts a user interface for controlling broadband video. *Id.* at 7:10–11, 17:57–62. Television schedule 1310 includes a timeline across the top and various cells (e.g., A2, C5) indicating programs on four channels, A, B, C, and D. *Id.* at 17:61–18:9. To view a program, a user either double-clicks on a cell or drags the cell to view icon 1326 and drops it there. *Id.* at 18:21–22.

Petitioner contends Schindler qualifies as prior art under 35 U.S.C. § 102(e) based on its filing date. Pet. 3. Patent Owner does not dispute the prior art status of Schindler. We have no evidence of an invention date other than the earliest possible effective filing date of the challenged claims. Thus, we determine that Schindler qualifies as prior art under 35 U.S.C. § 102(e) because Schindler's filing date of July 17, 1995, is before the

earliest possible effective filing date of the challenged claims, which is September 3, 1997. Ex. 1001, code (22); Ex. 1005, code (22).

2. Hogle

Hogle is a U.S. patent directed to "configuring monitor screen displays in a multiple monitor environment." Ex. 1006, 1:4–5. Figure 3 of Hogle is reproduced below.

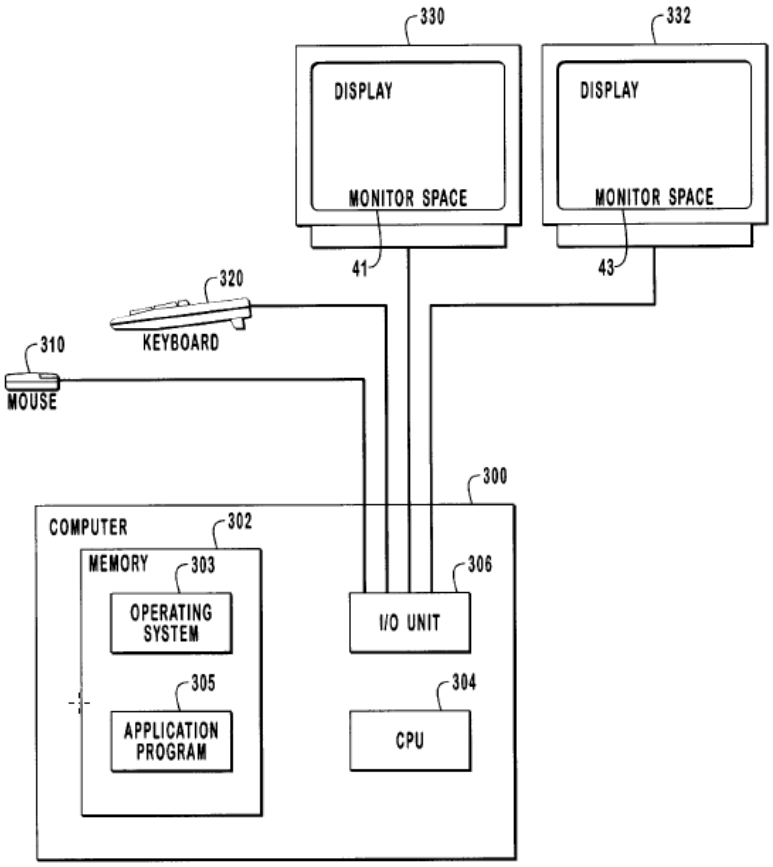


FIG. 3

Figure 3 is a block diagram of a computer system including monitors 330 and 332 with monitor spaces 41 and 43, respectively, defined by the logical height and width of each display. *Id.* at 1:53–57. The combination of the monitor spaces 41 and 43 may be treated as a single, continuous display

space. *Id.* at 1:57–62. Computer 300 includes central processing unit 304, input/output unit 306 and memory 302 containing operating system 303 and application programs 305. *Id.* at 1:8–11.

Figure 4 of Hogle is reproduced below.

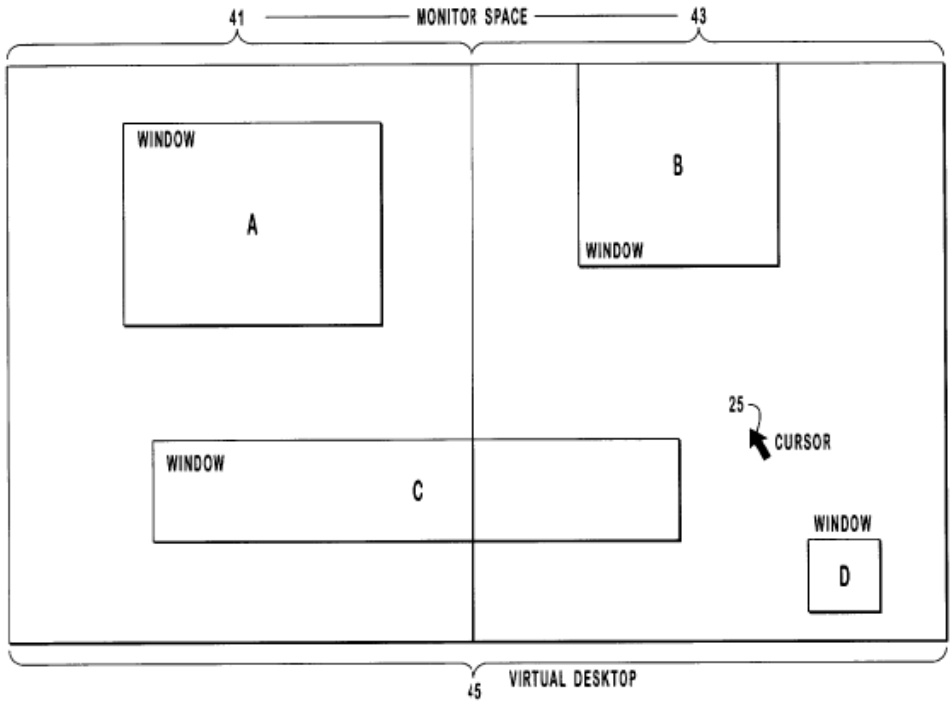


FIG. 4

Figure 4 is a screen diagram showing display regions in a graphical user interface as used in the computer system of Figure 3 above. *Id.* at 4:42–44. Virtual desktop 45 includes monitor spaces 41 and 43. *Id.* at 1:57–62. A user may move objects, such as windows A, B, C, and D and cursor 25, back and forth between monitor spaces 41 and 43 and may position an object (e.g., window C) so that it spans monitor spaces 41 and 43. *Id.* at 1:62–67.

Figure 6 of Hogle is reproduced below.

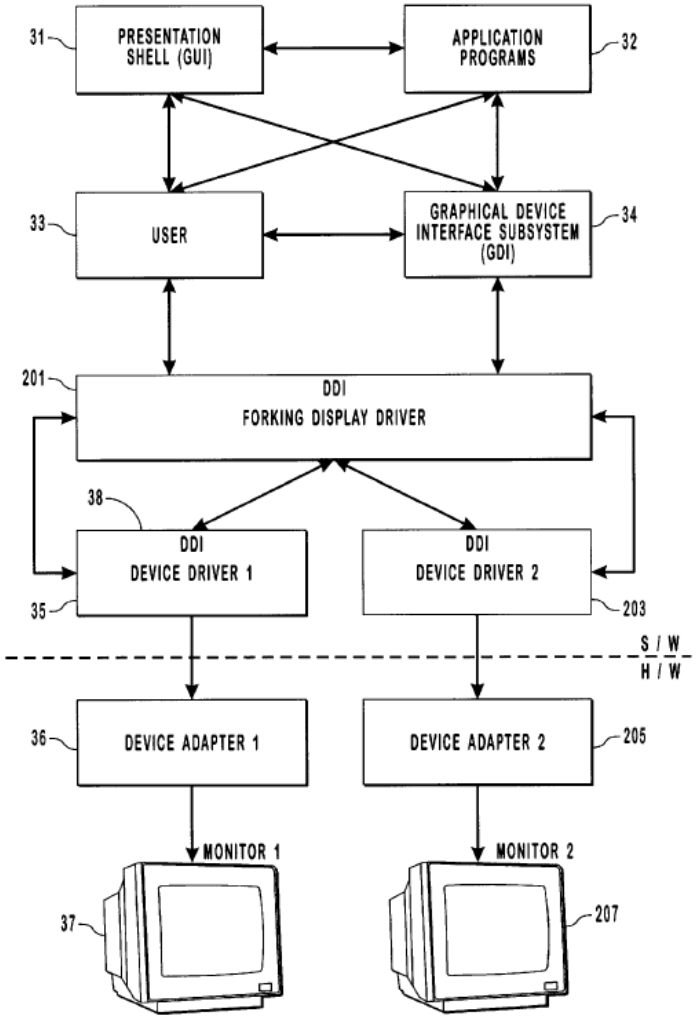


FIG. 6

Figure 6 depicts a multiple monitor display architecture including two device drivers 35, 203 and two monitors 37, 207. *Id.* at 9:43–45. Presentation shell 31 (e.g., a graphical user interface or "GUI") allows an end-user to communicate with the operating system and application programs 32. *Id.* at 5:51–53. An application running on the computer system may display information in one or more of the display regions through a graphical device interface subsystem 34 ("GDI") provided by the operating system. *Id.* at 5:53–56. Forking display driver 201 is software

code that effectively splits the graphics stream from GDI 34 into a number of parts equal to the number of monitors being used (e.g., two parts for two monitors) and thus distributes the virtual desktop across multiple monitors. *Id.* at 9:45–54. USER subsystem 33 provides functions relating to the GUI, including functions to create, move, size, and remove screen objects such as display windows, selection menus appearing in the display windows, graphical icons, and the like. *Id.* at 7:66–8:2. USER subsystem 33 also provides the end-user with a continuous display space (e.g., virtual desktop) regardless of the number of monitors (one or more) from which the display space is composed. *Id.* at 10:8–11.

Petitioner contends Hogle qualifies as prior art under 35 U.S.C. § 102(e) based on its filing date. Pet. 3. Patent Owner does not dispute the prior art status of Hogle. We have no evidence of an invention date other than the earliest possible effective filing date of the challenged claims. Thus, we determine that Hogle qualifies as prior art under 35 U.S.C. § 102(e) because Hogle's filing date of January 27, 1997, is before the earliest possible effective filing date of the challenged claims, which is September 3, 1997. Ex. 1001, code (22); Ex. 1006, code (22).

3. Claim 16

a. Preamble and Claim Limitations

The preamble of claim 16 recites "[a] method for displaying information on multiple display devices." Ex. 1001, 14:59–61. Petitioner cites Schindler's teaching about personal computer 118, which "is set up to drive multiple monitors." Pet. 24–25 (citing Ex. 1005, 5:58–59, Fig. 1). Petitioner also relies on Hogle's teaching of a computer system that

"arranges multiple monitors in logical space to form a contiguous and non-overlapping region." *Id.* at 25 (quoting Ex. 1006, 2:1–7) (emphasis omitted); *see also id.* at 19 (citing Ex. 1006, 1:53–57, Fig. 3) (describing monitors 330, 332).

Patent Owner does not dispute Petitioner's analysis of the preamble of claim 16. Neither party addresses whether the preamble is limiting. Because Petitioner has shown that Schindler (*see, e.g.*, Ex. 1005, 5:58–59, Fig. 1 (computer 118 driving VGA monitor 122 and NTSC TV 150)) and Hogle ((*see, e.g.*, Ex. 1006, 1:53–57, Fig. 3) (monitors 330, 332)) both teach the preamble, we need not determine whether the preamble is limiting. *See Nidec*, 868 F.3d at 1017.

Claim 16 further recites "providing a computer containing an adapter which supplies signals to a plurality of monitors, the adapter containing a plurality of video tuners." Ex. 1001, 14:62–64. For the computer, Petitioner cites Schindler's personal computer 118. *Id.* at 26 (citing Ex. 1005, 8:66–9:7). For the adapter, Petitioner cites Schindler's PCI bus 312, receiver 316 and VGA adapter 318; Petitioner contends that an ordinarily skilled artisan would have known to integrate these components on a single card (using PCI bus 312) that enables personal computer 118 to interface with NTSC and VGA displays. *Id.* (citing Ex. 1003 ¶¶ 106–108; Ex. 1005, 4:23–26, 8:66–9:7). For "suppl[ying] signals to a plurality of monitors," Petitioner cites VGA adapter 318 and its provision of output signals to VGA monitor 122 and NTSC monitor 150. *Id.* at 27–29 (citing Ex. 1005, 11:17–21, 11:31–37, 11:40–58, Fig. 5). For the "plurality of video tuners," Petitioner cites Schindler's tuners 410 and 526. *Id.* at 29–30 (citing Ex. 1003 ¶¶ 106–109; Ex. 1005, 10:13–15, Figs. 3–5).

Patent Owner does not dispute Petitioner's analysis of the "providing" limitation.[5] Schindler's personal computer 118 is commensurate with the recited "computer," and Petitioner persuasively shows how Schindler's PCI bus 312, receiver 316, and VGA adapter 318 act as the recited "adapter" because they "enable[] Schindler's PC 118 to interface with NTSC and VGA displays." *See* Pet. 26–29; *see also* Ex. 1003 ¶¶ 103–108 (Mr. Wechselberger's supporting testimony regarding the same). Petitioner also shows how Schindler's VGA adapter 318 outputs signals to VGA monitor 122 and NTSC monitor 150, which teaches that the adapter "supplies signals to a plurality of monitors." Pet. 27–29 (citing, *inter alia*, Ex. 1005, 11:17–21, 31–37, 11:40–58, Figs. 3, 5; Ex. 1003 ¶¶ 104–105). Petitioner additionally establishes that receiver 316 includes tuner 410 and VGA adapter 318 includes tuner 526, so Schindler teaches the recited "plurality of video tuners." *Id.* at 29–30 (citing Ex. 1005, Figs. 3–5). Thus, we find that the combination of Schindler and Hogle teaches the "providing" limitation of claim 16.

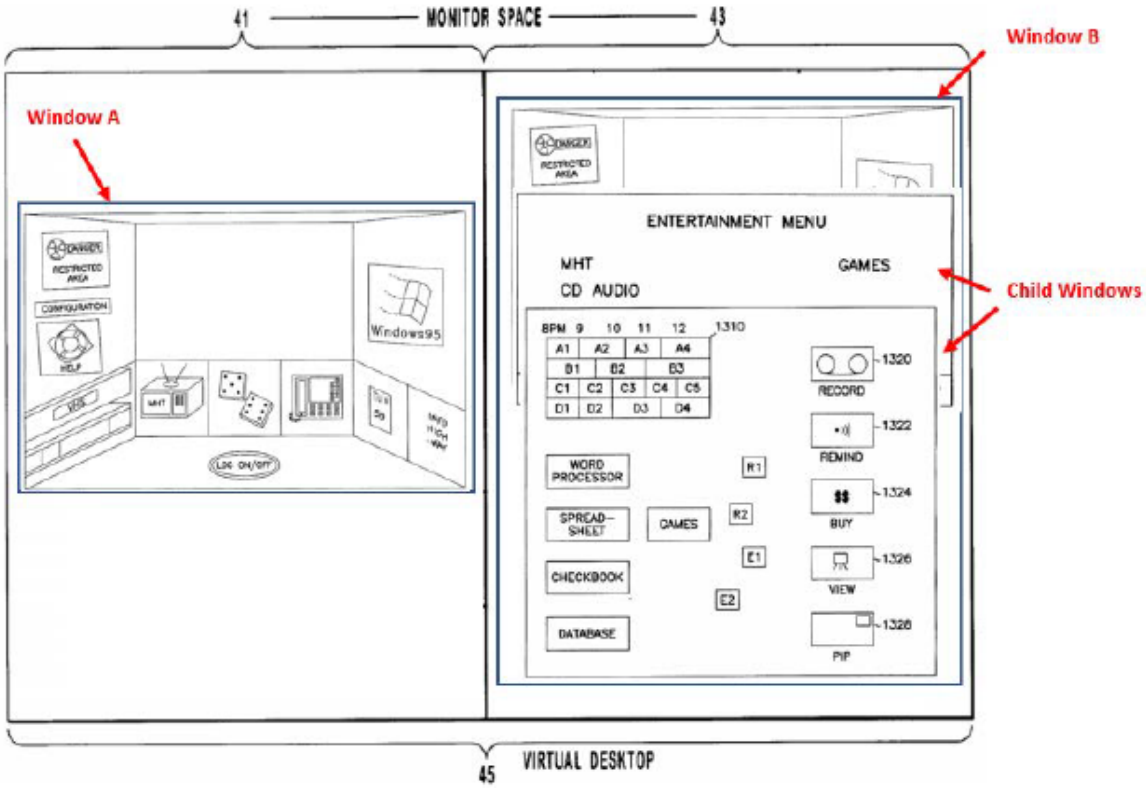
Claim 16 further recites "displaying a tool window interface coupled to control the adapter." Ex. 1001, 14:65–66. Petitioner contends that Schindler's personal computer 118 achieves control using a windows architecture and a virtual desktop. *Id.* at 30–31 (citing Ex. 1003 ¶¶ 112–113; Ex. 1005, 15:40–46, 18:57–19:4). In particular, Petitioner cites Schindler's

[5] At the oral hearing, Patent Owner's counsel put forth new arguments about how Petitioner had not established that the combination of Schindler and Hogle teaches the recited "adapter" recited in claim 16. *See* Tr. 33:12–34:12. These arguments do not appear in Patent Owner's briefs. For the same reasons discussed above, we do not consider Patent Owner's new arguments. *See supra* note 4.

front-end menu displayed on VGA monitor 122 and contends that an ordinarily skilled artisan also would have known to display the menu on NTSC monitor 150. *Id.* at 32 (citing Ex. 1003 ¶ 116; Ex. 1005, 11:51–55, 18:57–58). Petitioner further contends that Schindler teaches "simultaneous interaction by users with different display windows." *Id.* (citing Ex. 1005, 15:6–9, 15:44–46). Thus, in light of Schindler's and Hogle's teachings about Windows-based interfaces and Hogle's teachings about using multiple monitors (*see id.* at 31 (citing Ex. 1003 ¶¶ 113–114; Ex. 1005, 15:40–46; Ex. 1006, Fig. 4)), Petitioner contends that a system combining Schindler and Hogle would have resulted in a virtual desktop that "includes a first window on the first monitor and a second window on the second monitor." *Id.* at 32–33 (citing Ex. 1003 ¶ 117).

Petitioner also cites Schindler's various menu displays from which a user may select programs for viewing. *See id.* at 33–35 (citing Ex. 1003 ¶¶ 118–119, 122; Ex. 1005, 15:40–42, 17:60–18:6, 18:21–23, 19:12–24, Figs. 13, 14a, 14c). According to Petitioner, the user may select a channel via these displays, which causes the device driver executing on processor 310 to send the adapter appropriate commands to produce the required output. *Id.* at 35–36 (citing Ex. 1006, 6:35–36). This may include "processor 310 of the PC 'send[ing] the command over the PCI bus 312 to receiver 316, where tuner 410 tunes in a different channel.'" *Id.* at 36 (quoting Ex. 1005, 10:41–45). Petitioner contends that an ordinarily skilled artisan would have "recognize[d] that selection of any input source listed in any of Schindler's menus would also '*control the adapter*' because the adapter would be required to interact with software executing on processor 310." *Id.* (citing Ex. 1003 ¶ 123).

As mentioned above, Petitioner contends "the virtual desktop can be split across two monitors." *Id.* at 31 (citing Ex. 1003 ¶ 114; Ex. 1006, Fig. 4). An annotated drawing of Petitioner's proposed virtual desktop is reproduced below.



Id. at 37. In this annotated drawing, Petitioner has depicted its conception of virtual desktop in the combined dual monitor system of Schindler and Hogle. *Id.* at 36 (citing Ex. 1003 ¶ 124). The proposed virtual desktop includes Window A on a first monitor and Window B on a second monitor, each of which is displaying Schindler's front-end menu (i.e., Schindler's Figure 14a). *Id.* at 36–37. Petitioner asserts that child menus, such as the entertainment menu (i.e., Schindler's Figure 14c) and broadband menu (i.e., Schindler's Figure 13) depicted on the second monitor, can be activated from Schindler's front-end menu. *Id.* According to Petitioner, "[t]he virtual desktop in the combined system is the recited '*tool window interface*'

because it is the interface used to present menus controlling content displayed in each window on each monitor." *Id.* at 37 (citing Ex. 1003 ¶ 126[6]).

Patent Owner does not dispute Petitioner's analysis of this limitation. We are persuaded that Schindler's window-based menu displays, such as those depicted in Figures 14a ("first screen display"), 14c ("entertainment menu"), and 13 ("broadband video" interface), teach the recited "tool window interface." As implemented in Petitioner's proposed virtual desktop in the combined dual monitor system of Schindler and Hogle, these displays "control the adapter" because a user's inputs in the virtual desktop result in changes to the video outputted to the monitors. *See* Ex. 1005, 10:41–45 (channel-changing command); Ex. 1006, 6:34–36 (adapter producing "required output" in response to function call); Ex. 1003 ¶ 123 (Mr. Wechselberger's testimony regarding same). Thus, we find the combination of Schindler and Hogle teaches "displaying a tool window interface coupled to control the adapter."

Claim 16 further recites "a first display device output window having a group of selectable inputs including at least one video input, and a second display device output window having a group of selectable inputs having at least one video input, are displayed." Ex. 1001, 14:66–15:3. Continuing its analysis of the combined system of Schindler and Hogle, Petitioner contends the windows containing Schindler's menus in each of the monitors is a "display device output window." *Id.* at 38 (citing Ex. 1003 ¶ 127).

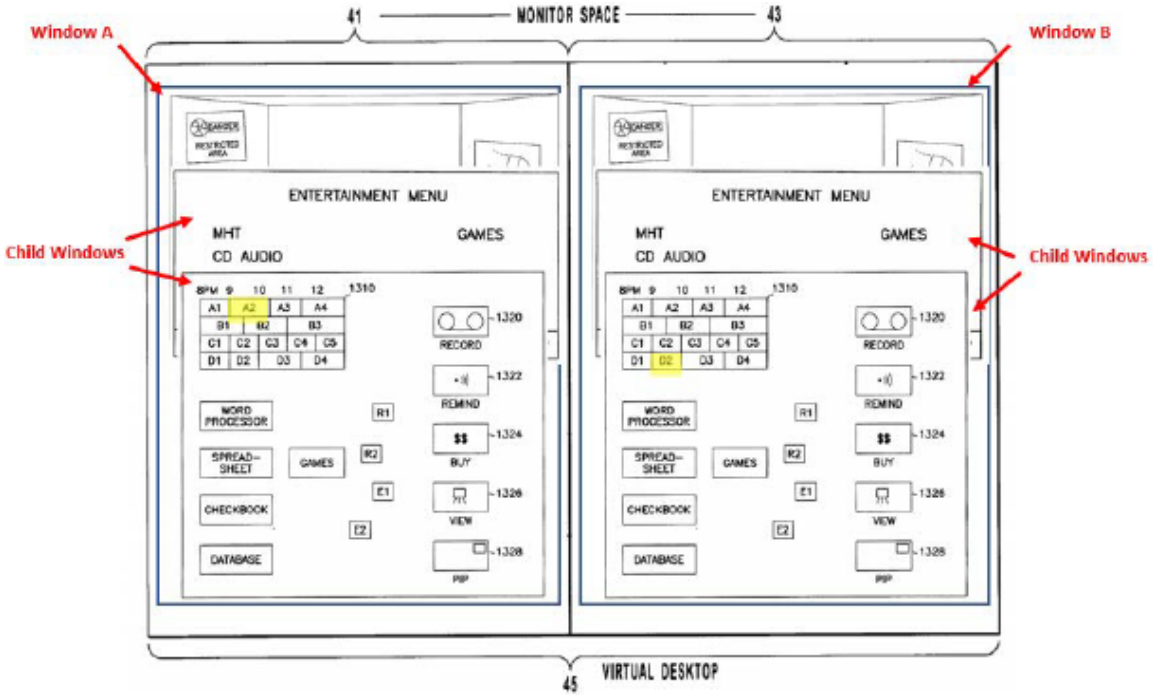
[6] Petitioner inadvertently omits the paragraph number from its citation to Exhibit 1003, but the context makes clear that Petitioner intended to cite paragraph 126.

Petitioner notes that Schindler's menus "include a list of input sources that is selectable by the user," such as the list of selections (including "digital video") in Schindler's entertainment menu. *Id.*; *see also id.* at 34 (citing Ex. 1005, 19:20–24) (citing Schindler's teaching that selectable items in Schindler's entertainment menu "may be launched from this window"). As such, Petitioner contends "a viewer can select one input source for monitor 122 via a first display device window and a second input source for NTSC monitor 150 via a second display device window." *Id.* at 38 (citing Ex. 1003 ¶ 127).

Patent Owner does not dispute Petitioner's analysis of the "display device output window" limitations. Schindler teaches an entertainment menu window having selectable video inputs, including "digital video," that "may be launched from this window." *See* Ex. 1005, 19:20–24, Fig. 14c. Petitioner also establishes, via Mr. Wechselberger's uncontested testimony, that an ordinarily skilled artisan considering Schindler's teachings on customizing menus would have listed other supported video inputs (including satellite, cable, and broadcast) in the entertainment menu. Pet. 34; Ex. 1003 ¶ 119; Ex. 1005, 19:45–50. Considering the multiple menu windows in Petitioner's proposed virtual desktop (as implemented in the dual monitor system of Schindler and Hogle (*see, e.g.*, Pet. 40)), we are persuaded that the combination of Schindler and Hogle teaches first and second "display device output window[s] having a group of selectable inputs."

Claim 16 further recites "inputting an indication that a user wishes to select a first input for the first display device output window" and "inputting an indication that a user wishes to select a second input for the second

display device output window." Ex. 1001, 15:4–9. For these limitations, Petitioner provides the drawing figure reproduced below.



Id. at 40. This figure depicts Petitioner's example of a user selecting different television programs for display in the combined system of Schindler and Hogle. *Id.* at 39. Petitioner contends that Schindler's broadband video menu (Ex. 1005, Fig. 13) permits a user to control the video streams displayed on the associated monitor, such as by clicking or performing a drag-and-drop operation in the user interface. *Id.* at 40–41 (citing Ex. 1005, 17:57–18:5, 18:21–22). The depicted virtual desktop allegedly includes "a first display device window selecting program A2 for display in its window and a second display device window selection program D2 for display in its window." *Id.* at 39. Petitioner asserts that the user selects program A2 (highlighted) for display on first monitor space 41 and program D2 (highlighted) for display on second monitor space 43. *Id.* at 41 (citing Ex. 1003 ¶ 130). According to Petitioner, processor 310 executes

a channel-changing command by "send[ing] the command over the PCI bus 312 to the receiver 316, where tuner 410 tunes in a different channel." *Id.* (citing Ex. 1005, 10:41–44). Petitioner further cites Schindler's teaching that different remote controls may be associated with different windows, which allows each window to be controlled by a different user in the combined system. *Id.* (citing Ex. 1003 ¶¶ 131–132; Ex. 1005, 6:6–8).

Patent Owner does not dispute Petitioner's analysis of the "inputting" limitations. Petitioner posits two instances of Schindler's broadband menu in different windows of the Schindler–Hogle virtual desktop. Pet. 40. Schindler teaches the broadband menu is an exemplary user interface for controlling video streams. Ex. 1005, 17:57–63. In Petitioner's example, users select different programs (i.e., A2 and D2) in the broadband menus for display on each monitor, which is consistent with Schindler's teachings on multiple remote controls controlling different portions of Schindler's system. Pet. 40–41; Ex. 1003 ¶¶ 130–132; Ex. 1005, 6:6–8. Thus, we are persuaded that the combination of Schindler and Hogle teaches the two "inputting" limitations of claim 16.

Claim 16 further recites "causing the adapter to display, on the first display device, signals according to the first display device input indication" and "causing the adapter to display, on the second display device, signals according to the second display device input indication." Ex. 1001, 15:10–15. Petitioner cites Schindler's teaching that after tuning, tuner output video signals (digital MPEG signals) are processed and sent on to VGA card 318 for decoding and conversion to VGA signals for display on monitor 122 or to NTSC signals for display on NSTC monitor 150. *Id.* at 41–42 (citing Ex. 1005, 10:44–46, 11:19–37). Petitioner further asserts that "the adapter

can be used to simultaneously tune to and display different channels." *Id.* at 42 (citing Ex. 1005, 10:6–11). As such, Petitioner contends "the adapter can cause the display of A2 on the first display simultaneously with the display of D2 on the second display." *Id.* (citing Ex. 1003 ¶ 135).

Patent Owner does not dispute Petitioner's analysis of the "causing" limitations. Schindler teaches receiving, tuning, and converting for output multiple simultaneous video channels. *See* Ex. 1005, 10:6–11, 11:19–37. We are persuaded that an ordinarily skilled artisan would have applied this functionality to different displays of the Schindler–Hogle virtual desktop to "cause the display of A2 on the first display simultaneously with the display of D2 on the second display" in response to user input in Schindler's broadband menu windows. *See* Ex. 1003 ¶ 135. Thus, we find that the combination of Schindler and Hogle teaches the two "causing" limitations of claim 16.

Based on the entire trial record, we are satisfied that the combination of Schindler and Hogle teaches all of the limitations of claim 16.

b. Reasons for the Combination

Petitioner notes that Schindler does not provide details on how to display data on multiple monitors, so Petitioner contends an ordinarily skilled artisan would have been motivated to search for references, such as Hogle, that taught these details. Pet. 23 (citing Ex. 1003 ¶ 93; Ex. 1006, 1:5–6). Petitioner notes that both Hogle's display architecture and Schindler's graphical user interface are designed to operate in a Windows-based operating system environment. *Id.* (citing Ex. 1003 ¶¶ 93–94; Ex. 1005, 18:57–63; Ex. 1006, 5:45–50). Petitioner contends "Hogle's

architecture alleviates screen clutter present in systems with a large number of applications and inputs such as disclosed by Schindler." *Id.* (citing Ex. 1003 ¶ 95; Ex. 1006, 1:53–57). Petitioner also contends Hogle's display architecture approach results in increased screen real estate and efficiency improvements for the graphics engine. *Id.* at 23–24 (citing Ex. 1006, 3:40–45). Petitioner additionally contends that, "[b]ecause Schindler's system supports multiple monitors, it would have been straightforward to a[n ordinarily skilled artisan] to apply Hogle's software-based multi-monitor configuration technique into Schindler's GUI software and the results would have been predictable." *Id.* at 24 (citing Ex. 1003 ¶ 96).

In addition, Petitioner argues that "Schindler handles requests on a per-application, per-window basis" and that "Schindler arbitrates requests from multiple users for multiple windows." Pet. Reply 6 (citing Ex. 1005, 15:14–46, Fig. 11a; Ex. 1034 ¶¶ 12–18). Petitioner further argues that distributing these windows across two screens, as in the combination with Hogle, makes no difference to Schindler's request arbitration. *Id.* at 6–7 (citing Ex. 1006, 6:35–43; Ex. 1034 ¶¶ 19–20).

Patent Owner contends that "Petitioner's proposed combination is missing key technical components that would allow such a combination to function in the manner Petitioner suggests." PO Resp. 5. In particular, Patent Owner contends that Petitioner fails to address "how to arbitrate access requests from multiple users for access to multiple video sources across multiple display screens." PO Resp. 6. According to Patent Owner (PO Sur-reply 4), Petitioner inconsistently cites Schindler's "explicit teaching of multiple monitors" to show such arbitration (Pet. Reply 6), while at the same time conceding that "Schindler does not provide details

regarding how the system manages the display of data on multiple monitors" (Pet. 23). Patent Owner also cites Dr. Brogioli's testimony and an internet article for the proposition that "even years after the time of Schindler and Hogle, the technical questions of how to arbitrate . . . access requests remained quite difficult." PO Resp. 8 (citing Ex. 2001 ¶ 49; Ex. 2003). Furthermore, Patent Owner highlights certain testimony from Mr. Wechselberger regarding certain "new commands"—above and beyond the presentation commands discussed in Schindler—that would be necessary to implement the combination of Schindler and Hogle. PO Sur-reply 6–8 (quoting Ex. 2004, 63:10–15). Patent Owner argues that "Petitioner provides no evidence of what these 'new commands' might be or where in either Schindler or Hogle one of ordinary skill in the art would look to discern these new commands." *Id.* at 6.

Patent Owner also argues that one of ordinary skill in the art would have encountered a number of significant challenges in the combined Schindler–Hogle combination, including "handling of user input requests, handling of multiple user interfaces, maintaining synchronization between the multiple displays and multiple user inputs, management of the memory, dealing with varying resolutions between displays, and how callback functionality responds to one or more user events in such a system." PO Resp. 8–9; PO Sur-reply 11. In its Reply, Petitioner responds point-by-point to Patent Owner's arguments regarding these alleged challenges with support from a reply declaration from Mr. Wechselberger. Pet. Reply 7–13 (citing Ex. 1034 ¶¶ 21–30).

At the outset, we note that "'[a] person of ordinary skill is also a person of ordinary creativity, not an automaton,' so the fact that it would

take some creativity to carry out the combination does not defeat a finding of obviousness." *Facebook, Inc. v. Windy City Innovations, LLC*, 973 F.3d 1321, 1343 (Fed. Cir. 2020) (quoting *KSR*, 550 U.S. at 421). Indeed, an obviousness analysis "need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a [tribunal] can take account of the inferences and creative steps that a person of ordinary skill in the art would employ." *KSR*, 550 U.S. at 418. Moreover, "[t]he test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference, but rather whether a skilled artisan would have been motivated to combine the teachings of the prior art references to achieve the claimed invention." *Allied Erecting & Dismantling Co. v. Genesis Attachments, LLC*, 825 F.3d 1373, 1381 (Fed. Cir. 2016) (internal quotations omitted).

In addition, Patent Owner makes certain concessions that help to frame the issue of whether Petitioner has proven a rationale for combining Schindler and Hogle by a preponderance of the evidence. First, Patent Owner does not contest that an ordinarily skilled artisan would have had a motivation to combine Schindler and Hogle. *See* PO Resp. 7 (quoting Ex. 1003 ¶ 95[7]); PO Sur-reply 2–3. Second, Patent Owner does not contest that an ordinarily skilled artisan would have had the requisite knowledge to overcome the technical challenges (as mentioned by Patent Owner) in making the combination. *See* PO Sur-reply 2. Instead, Patent Owner states its argument this way: "Petitioner has not provided sufficient evidence to support its argument that Schindler and Hogle can be appropriately

[7] Patent Owner mistakenly cites paragraph 96, but the context makes clear that Patent Owner intended to cite paragraph 95.

combined to teach or suggest each and every limitation of the challenged claims under Petitioner's theory of [unpatentability]." *Id.* at 3. We now consider the sufficiency of Petitioner's rationale for the combination of Schindler and Hogle in light of Patent Owner's arguments regarding a failure of proof.

As Petitioner points out (Pet. 38, 41; Pet. Reply 4–5), Schindler already teaches arbitrating requests from multiple users using different remote controls. *See* Ex. 1005, 6:6–8 ("[E]ach remote control controls its own cursor to allow multiple users to control different portions of the system"), 15:4–9 ("[M]ultiple remotes are provided, each with its own identifying frequency or code" so that "each individual in the room can be controlling their application or program in a window, or be playing different parts in a game."), 15:44–46 ("[I]f someone else is watching a program in a different window, their channel selection controls will only affect their window."). Schindler also supports Petitioner's argument (Pet. Reply 6–7) that (1) each application is associated with a particular remote control and a particular window; and (2) incoming commands from a remote control are routed based on the remote control's associated window. *See* Ex. 1005, 15:14–36, Fig. 11a. Schindler additionally teaches the use of two different monitors, albeit not in a configuration where these monitors are combined in a single, continuous virtual desktop. *See id.* at 3:34–37, 5:47–62 (discussing a large monitor or television in a "home entertainment environment" versus a "display . . . located in a den, where it is displaying a financial application"), Fig. 1 (depicting VGA display 122 and NTSC TV 150). Thus, the only remaining question is whether Petitioner has shown that Schindler

and Hogle would have been "appropriately combined" such that the combination accounts for request arbitration.

Mr. Wechselberger testifies that spreading Schindler's windows across Hogle's two screens makes no difference to Schindler's request arbitration scheme. Ex. 1034 ¶ 20. He cites Hogle's example of an end-user moving a window back and forth between two monitor spaces and explains that "[s]uch end-user input would constitute a 'presentation command' as disclosed in Schindler's Figure 4 and would be handled separately from commands directed to the application itself." *Id.* ¶ 19 (citing Ex. 1005, 15:29–36; Ex. 1006, 1:62–67). He contends that Schindler's system would pass such a presentation command to Hogle's system, which in turn would handle the display of the windows across multiple screens. *Id.* And, as Petitioner points out (Pet. 20–22), Hogle teaches graphical device interface (GDI) subsystem 34 and forking display driver 201 to route display information to multiple monitors. Ex. 1006, 5:53–60, 9:50–54, Fig. 6; *see also* Ex. 1003 ¶¶ 89, 92, 125 (Mr. Wechselberger explaining the same). Thus, according to Mr. Wechselberger, Schindler's arbitration approach works the same in the combined system with Hogle "because the user input is not on a per-screen basis, but on a per-window basis." Ex. 1034 ¶ 22.

We are persuaded by Petitioner's arguments and evidence. In Schindler, each of multiple users utilizes a particular remote control to control an application in a particular window. *See* Ex. 1005, 15:4–9, 15:44–46. Schindler's Figure 11a flowchart shows how commands from a remote control are routed to an associated window. *See* Ex. 1005, 15:14–36, Fig. 11a. Thus, Schindler includes a native request arbitration scheme. Via testimony from Mr. Wechselberger, Petitioner persuasively shows how this

scheme would be applied to the combined Schindler–Hogle virtual desktop environment. *See* Ex. 1034 ¶ 19. In particular, he testifies persuasively that commands to move a window between Hogle's displays would be associated with a particular window and routed according to Schindler's Figure 11a flowchart as a "presentation command" for that window. *See id.* In turn, Hogle's system would handle display of the particular window across multiple screens. *See id.*; Ex. 1006, 1:24–28, 1:62–67, 5:53–60, 9:50–54, Fig. 6; *see also* Pet. 23 (describing "Hogle's display architecture" as "a natural extension to the display architecture used with Schindler's Windows-based operating environment"). As such, we credit Mr. Wechselberger's testimony because it is consistent with the record and requires no more than is already disclosed in the individual references themselves. Thus, we agree with Petitioner that implementing request arbitration in the combined system would have been a straightforward application of ordinary skill.

Against this showing, Dr. Brogioli testifies that "[a]rbitrating access requests (e.g., read requests for a video feed) for multiple users seeking access [to] multiple video sources across multiple sources is not a straightforward extension of doing so on a single monitor." Ex. 2001 ¶ 49; *see also* PO Resp. 8 (citing same). Dr. Brogioli's only support for this contention is an internet article regarding certain problems with dual-display screen sharing in the Apple Macintosh operating system. Ex. 2001 ¶ 49 (citing Ex. 2003). Yet Dr. Brogioli does not explain how the problems described in the article relate to the instant combination. We agree with Petitioner (Pet. Reply 13–14) that this article does not bear on the combinability of Schindler and Hogle at least because (1) it is not contemporaneous with the challenged patent; (2) it does not discuss

arbitrating requests from different users for multiple displays; and (3) it discusses single users, not multiple users, sharing multiple screens. *See* Ex. 2003, 1–2. Nor does Dr. Brogioli's testimony undermine Petitioner's persuasive showing of how Schindler's request arbitration scheme works with Hogle's multi-screen window display mechanism in the Schindler–Hogle virtual desktop environment. As stated above, Petitioner's proposed combination relies only on existing functionality within Schindler and Hogle.

We also note that Petitioner's rationale for the combination is at least as detailed about request arbitration as the disclosure of the '643 patent. Importantly, the '643 patent does not expressly address request arbitration for multiple users on multiple screens. During his deposition, Dr. Brogioli pointed only to the '643 patent's mention of a dynamic link library (DLL) and a peripheral component interconnect (PCI) bus as being related to the arbitration of requests. Ex. 1033, 14:1–15:17. Yet the '643 patent does not state that these items arbitrate requests. Ex. 1034 ¶ 11. And both of these items were well known in the art as of the time of the '643 patent. *Id.*; Ex. 1033, 15:18–21. In light of this, and given that the '643 patent is silent on request arbitration, we do not agree with Patent Owner (PO Resp. 8) that implementing request arbitration based on Schindler in a multi-user/multi-source/multi-screen environment was "a significant technical feat." To the contrary, the lack of disclosure in the '643 patent and the fact that DLLs and PCI buses were well known suggests that implementing request arbitration was within the knowledge of an ordinarily skilled artisan. This supports Petitioner's argument that an ordinarily skilled artisan would have implemented request arbitration from multiple users for multiple monitors

based on Schindler's "per-application, per-window" scheme. *See* Pet. Reply 4–7 (citing, *inter alia*, Ex. 1005, Fig. 11a).

For similar reasons, we do not agree with Patent Owner (PO Sur-reply 5) that Petitioner presents "a brand new theory" in its Reply simply because Petitioner responded to Patent Owner's arguments about request arbitration. We find that Petitioner merely elucidates how arbitration would have worked in its existing combination without any change in how the Petition described the combination of Hogle with Schindler. As stated above, the '643 patent does not discuss request arbitration, so it is unsurprising that Petitioner did not initially emphasize the combination's ability to arbitrate requests.

Regarding Mr. Wechselberger's deposition testimony about the need for "new commands" (Ex. 2004, 63:10–15), we do not share Patent Owner's interpretation of what he said. Having read Mr. Wechselberger's testimony in context (*see id.* at 61:16–63:21), we understand him to be saying that Hogle's existing functions, e.g., software-based commands governing Hogle's virtual desktop, would be implemented in Schindler's system. *See id.* at 63:17–21 ("[T]he Schindler commands are changed as much as I would say Hogle provides some richer features in terms of managing multiple[] monitors that might require commands that didn't exist in Schindler alone."). Petitioner describes Hogle's commands with respect to USER subsystem 33, which "provides functions relating to the GUI including functions to create, move, size, and remove screen objects such as display windows, selection menus appearing in the display windows, graphical icons, and the like" and "provid[es] the end-user with a continuous display space (e.g., virtual desktop) regardless of the number of monitors

(one or more) from which the display space is composed." Pet. 21 (quoting Ex. 1006, 7:64–8:2, 10:8–11). Correspondingly, Petitioner relies on Hogle's commands in its stated rationale for combining Schindler and Hogle. *See* Pet. 24 ("[I]t would have been straightforward to a[n ordinarily skilled artisan] to apply Hogle's software-based multi-monitor configuration technique into Schindler's GUI software"); Pet. Reply 7 ("Hogle handles allocating windows to screens"). In this way, the "new commands" from Hogle are new to Schindler's system, but not new in the sense that Petitioner has failed to account for them in its papers.

We also have considered Patent Owner's argument about Petitioner's allegedly inconsistent treatment of Schindler's multiple monitors in Petitioner's submissions. PO Sur-reply 4. We do not agree with Patent Owner that Petitioner's theory of unpatentability has changed or that Petitioner's arguments in the Petition are inconsistent with its arguments in the Reply. Specifically, Petitioner is correct to say that "Schindler does not provide details regarding how the system manages the display of data on multiple monitors." Pet. 23. Schindler does not detail display options like Hogle's virtual desktop with windows spread across monitors, for example. But that does not negate the fact that Schindler nonetheless discloses driving multiple monitors, as Petitioner alleges in the Reply. *See* Pet. Reply 6. Patent Owner admits as much in its Sur-reply. *See* PO Sur-reply 4–5. And Schindler's "per-application, per-window" arbitration across multiple monitors supports its rationale for the combination even if Schindler did not teach the *concurrent* use of multiple monitors (e.g., a single window spread across two monitors), as Patent Owner alleges. *See id*.

Finally, we consider Patent Owner's list of alleged technical challenges associated with combining Schindler and Hogle. PO Resp. 8–9 (citing Ex. 2001 ¶ 50); PO Sur-reply 7–8. We have already discussed Patent Owner's arguments about "handling of user input requests" and "handling of multiple user interfaces" in our discussion of request arbitration above. Regarding "maintaining synchronization between the multiple displays and multiple user inputs," our discussion above touches on how Schindler's request arbitration would handle multiple inputs. For synchronizing displays, we agree with Petitioner (Pet. Reply 9–10) that Hogle teaches synchronizing a window across two screens. Ex. 1006, Fig. 4 (Window C), Ex. 1034 ¶ 24. We do not agree with Patent Owner's arguments about the alleged lack of evidence regarding "synchroniz[ing] displays ***when multiple users are seeking concurrent access to multiple displays***" (PO Sur-reply 8–9), because Petitioner sufficiently explains the request arbitration process in the combined system, as discussed above.

Regarding memory management, we agree with Petitioner that the combination of Schindler and Hogle requires nothing more than is taught by the individual references. Pet. Reply 10–11 (citing Ex. 1034 ¶ 27). And, as discussed above, Patent Owner's arguments (PO Sur-reply 7–8) regarding the alleged need for "new commands"—particularly with respect to memory management, in this instance—takes Mr. Wechselberger's cross-examination testimony out of context. We also do not agree with Patent Owner's argument that varying resolutions among displays would be a technical challenge, because Schindler itself describes a system with VGA display 122 and NTSC TV 150; these displays necessarily have different resolutions. Ex. 1005, Fig. 1. As noted by Petitioner, "Schindler's system is

already capable of handling the different resolutions through its separate VGA and NTSC decoders and NTSC conversion block." Pet. Reply 11 (citing Ex. 1005, Fig. 5; Ex. 1034 ¶ 28).

Patent Owner characterizes "callback functionality" as an additional technical challenge. Although Patent Owner does not explain what this means, Dr. Brogioli testified that callback functionality is "the kind of thing where the user is interacting with the system, changing various parameters or reconfiguring inputs and outputs, you know, how the system needs to be able to handle the desired behavior from the user, one or more user events." Ex. 1033, 11:23–12:17. We agree with Petitioner (Pet. Reply 12) that Schindler's "per-application, per-window" request arbitration would successfully route commands to applications, as discussed above. *See* Ex. 1034 ¶ 29.

We additionally note that Patent Owner expressly abandons any argument that its enumerated technical hurdles are insurmountable or too complicated for an ordinarily skilled artisan. *See* PO Sur-reply 2. Patent Owner only disputes that Petitioner has provided sufficient evidence that Schindler and Hogle can be appropriately combined. *Id.* at 3. We are persuaded by Petitioner's arguments from its Reply (Pet. Reply 7–13) that an ordinarily skilled artisan would have known to overcome the enumerated challenges. And, similar to Petitioner's reply arguments about request arbitration, Petitioner's reply arguments regarding the alleged technical challenges do not purport to change its proposed combination set forth the Petition.

Based on the entire trial record, we are persuaded by Petitioner's showing that an ordinarily skilled artisan would have had reasons to

combine Hogle with Schindler. We also find that Petitioner's reasons are supported by a preponderance of the evidence.

c. Conclusion Regarding Claim 16

On the entire trial record, we are satisfied that the combination of Schindler and Hogle teaches all of the limitations of claim 16 and that an ordinarily skilled artisan would have had a reason to combine these references in the manner suggested by Petitioner. Thus, we determine Petitioner has shown by a preponderance of the evidence that the subject matter of claim 16 would have been obvious over the combination of Schindler and Hogle under 35 U.S.C. § 103(a).

4. Claim 17

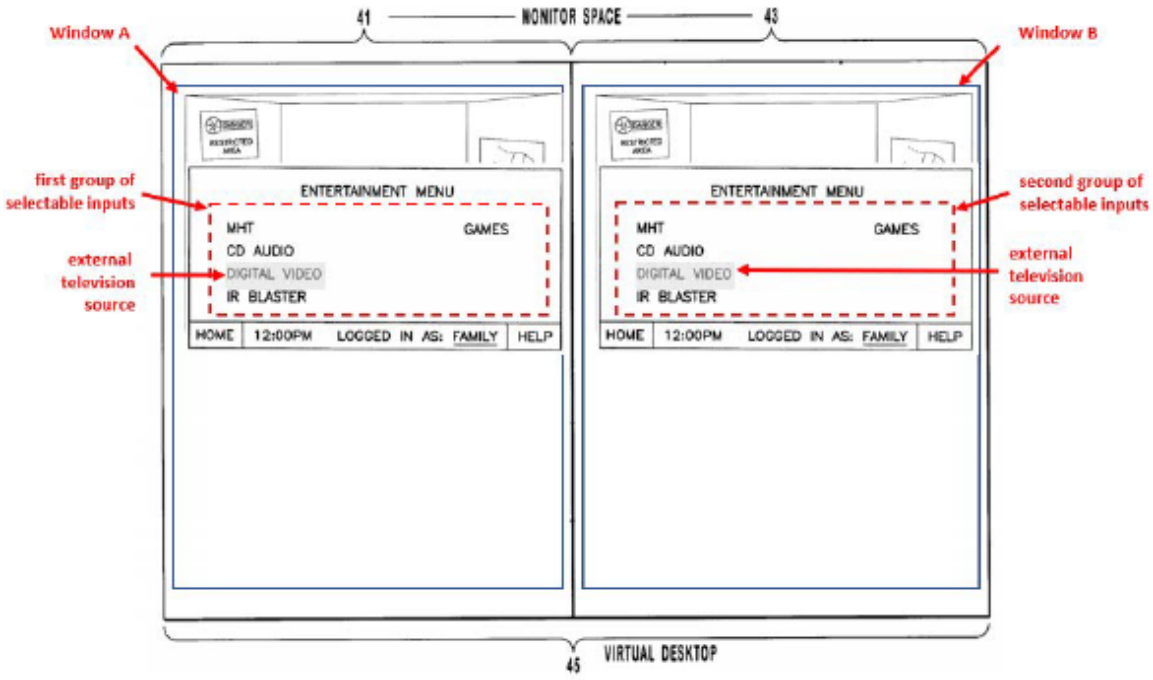
Claim 17 depends from claim 16 and recites that "if the first input is identical to the second input, the adapter displays, on the first display device and the second display device, signals according to the first display device input indication." Ex. 1001, 15:16–20. Petitioner contends that Schindler's VGA adapter 318 permits the same input (e.g., the output of tuner 526) to be displayed on both the NTSC monitor and the VGA monitor. Pet. 43–44 (citing Ex. 1003 ¶ 138; Ex. 1005, 11:40–45, Fig. 5). Thus, Petitioner contends that an ordinarily skilled artisan would have understood that Schindler's system is capable of displaying the same input on multiple displays when, for example, a popular event is being broadcasted live. *Id.* at 44 (citing Ex. 1003 ¶ 139).

Patent Owner relies on the same arguments discussed above with respect to claim 16. We are persuaded that Schinder's system is capable of

displaying identical inputs on both the NTSC monitor and the VGA monitor, in which case the adapter would be displaying signals "according to the first display device input indication." *See* Ex. 1003 ¶¶ 138–139. Thus, we determine Petitioner has shown by a preponderance of the evidence that the subject matter of claim 17 would have been obvious over the combination of Schindler and Hogle under 35 U.S.C. § 103(a).

5. Claims 18 and 19

Claims 18 and 19 each depend from claim 17 and recite that the first and second groups of selectable inputs include "an external television input." Ex. 1001, 15:21–28. Petitioner contends that, "for each display device (monitor) in Schindler's system, the users can select a video input source (*e.g.*, digital video) from the entertainment menu." Pet. 45. In support of its analysis, Petitioner provides an annotated depiction of its proposed Schindler–Hogle virtual desktop, which is reproduced below.



Id. at 46. In this annotated depiction, Petitioner has indicated with red arrows first and second groups of selectable inputs in separate instances of Schindler's entertainment menu in two different windows, Window A and Window B. *Id.* Petitioner also has indicated with red arrows the selection of "DIGITAL VIDEO" as an external television source within each instance of Schindler's entertainment menu. *Id.*

In further support of its analysis, Petitioner cites Schindler's teaching of external satellite 112 transmitting signals "comprising 150 channels of modulated digital video, audio and data signals." Pet. 45 (citing Ex. 1005, 7:44–50). Petitioner contends these satellite signals are received by antenna 114, downconverted, and then provided to PC 118. *Id.* at 45–46 (citing Ex. 1005, 7:62–64). Petitioner further notes that Schindler's VGA adapter 318 receives input from an external cable/antenna source over port 524. *Id.* at 46 (citing Ex. 1005, Fig. 5). As such, Petitioner contends that an ordinarily skilled artisan would have understood that, beyond simply the "DIGITAL VIDEO" selection shown above, "the other supported video inputs, including satellite, cable, and broadcast, would be listed on the entertainment menu." *Id.* at 46–47 (citing Ex. 1003 ¶ 143; Ex. 1005, 19:45–50 (teaching that a user can modify Schindler's menus)).

Patent Owner relies on the same arguments discussed above with respect to claim 16. We are persuaded that Schindler teaches various "external television input[s]," including "DIGITAL VIDEO" and satellite, cable, and broadcast television, which are displayed (or may be added) as selections in Schindler's entertainment menu. *See* Pet. 46; Ex. 1003 ¶ 143; Ex. 1005, 7:44–50, 7:62–64, 19:45–50, Fig. 5. And, as shown above in Petitioner's annotated depiction, the two different instances of entertainment

menus teaches the first and second groups of selectable inputs. *See* Pet. 46. Thus, we determine Petitioner has shown by a preponderance of the evidence that the subject matter of claims 18 and 19 would have been obvious over the combination of Schindler and Hogle under 35 U.S.C. § 103(a).

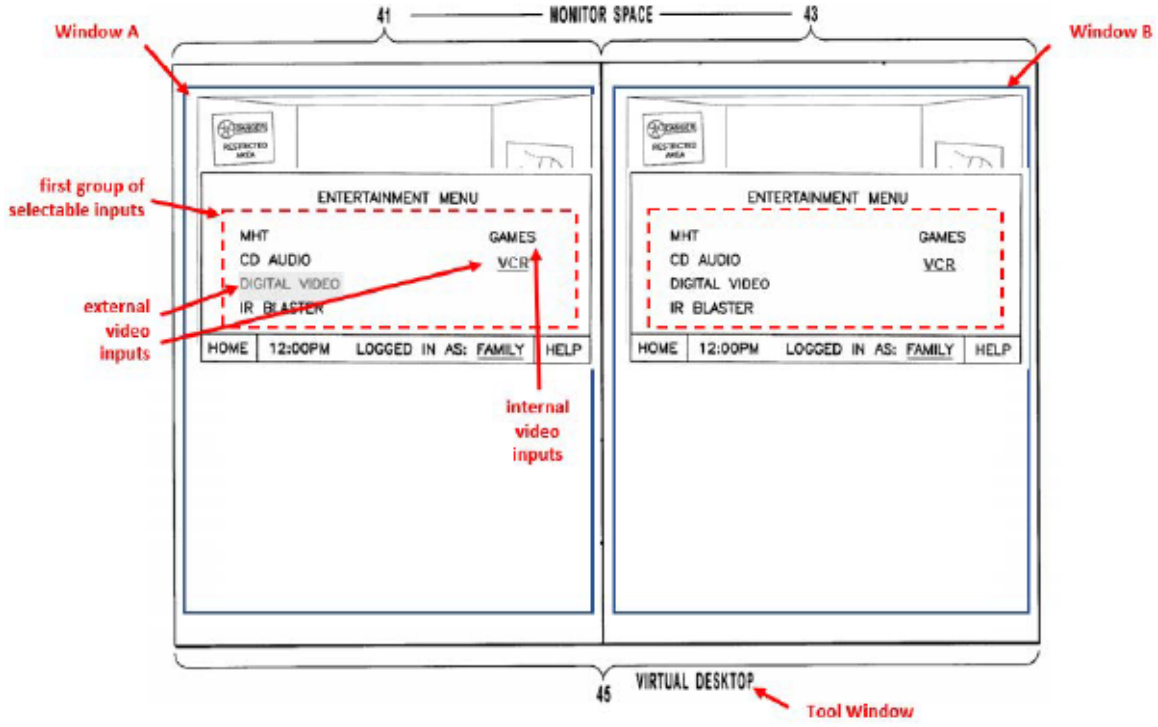
6. Claim 24

Claim 24 depends from claim 16 and further recites:

> displaying an input window within the tool window, the input window including a plurality of selectable internal video inputs and a plurality of external video inputs;
>
> inputting an indication that the user wishes to select a particular internal video input; and
>
> inputting an indication that the user wishes to select a particular external video input.

Ex. 1001, 16:23–33.

For "displaying an input window," Petitioner cites Schindler's teachings of a front-end menu (i.e., a "first screen display" as depicted in Figure 14a) with selectable areas that lead to further menus. Pet. 47–48 (citing Ex. 1005, 18:65–19:1, Fig. 14a). As noted by Petitioner, one of those selectable areas leads to Schindler's entertainment menu, which "includes a set of external video sources (*e.g.,* Microsoft Home Theater (MHT) and digital video) and a set of internal video sources (*e.g.*, games)." *Id.* at 48; *see also* Ex. 1005, Fig. 14c. In support of its analysis, Petitioner provides an annotated depiction of its proposed Schindler–Hogle virtual desktop, which is reproduced below.



Pet. 49. In this annotated depiction, Petitioner has indicated with red arrows external video inputs ("DIGITAL VIDEO" and "VCR") and an internal video input ("GAMES") in one instance of Schindler's entertainment menu in Window A. *Id.* Petitioner added the "VCR" selection based on its reasoning that Schindler supports a VCR as an external input and that Schindler teaches customizing the entertainment menu. *Id.* at 48–49 (citing Ex. 1003 ¶ 148; Ex. 1005, 12:22–27, 19:45–50, Figs. 1, 7).

Patent Owner relies on the same arguments discussed above with respect to claim 16 and does not dispute Petitioner's analysis for the "displaying an input window" limitation. We are persuaded that Schindler's front-end menu and entertainment menu teach the recited "input window" which appears in the Schindler–Hogle virtual desktop (i.e., the "tool window"). *See* Pet. 49; Ex. 1005, 18:65–19:1, Figs. 14a, 14c. We also are persuaded by that Schindler teaches "external video inputs" and "internal video inputs" in its entertainment menu. *See* Ex. 1005, Fig. 14c. Thus, we

find that the combination of Schindler and Hogle teaches the "displaying an input window" limitation of claim 24.

For the two "inputting an indication" limitations, Petitioner cites Schindler's teaching of using a remote control to control a cursor to select items in Schindler's menus. Pet. 49–50 (citing Ex. 1005, 5:63–65). Accordingly, Petitioner contends the user can select one of the listed internal or external input sources on Schindler's menus. *Id.* at 50 (citing Ex. 1003 ¶ 150). Patent Owner relies on the same arguments discussed above with respect to claim 16 and does not dispute Petitioner's analysis for the two "inputting an indication" limitations. We are persuaded that Schindler teaches the use of a remote control to input indications that select the internal and external video inputs discussed above. *See* Ex. 1005, 5:63–65. Thus, we find that the combination of Schindler and Hogle teaches the "inputting an indication" limitations of claim 24.

Based on the entire trial record, we determine Petitioner has shown by a preponderance of the evidence that the subject matter of claim 24 would have been obvious over the combination of Schindler and Hogle under 35 U.S.C. § 103(a).

7. Claim 25

Claim 25 depends from claim 24 and recites that "the plurality of selectable external video inputs includes a plurality of S-Video inputs." Ex. 1001, 16:34–37. Petitioner cites Schindler's teaching that VGA adapter 318 includes S-video pin 546. Pet. 50 (citing Ex. 1005, Fig. 5). Petitioner contends an ordinarily skilled artisan would have found it obvious "to provide additional S-video inputs to Schindler's adapter" in order to

"allow[] Schindler's system to support multiple video sources using S-video (*e.g.*, VCR, cameras, etc.) and allow[] multiple monitors to display different S-video sources simultaneously." *Id.* (citing Ex. 1003 ¶ 152). Petitioner further contends an ordinarily skilled artisan would have "include[d] S-video input sources such as VCR, camera, and laserdisc, on Schindler's entertainment menu." *Id.* at 51 (citing Ex. 1003 ¶ 153; Ex. 1005, 19:45–50).

Patent Owner relies on the same arguments discussed above with respect to claim 16. We are persuaded that Schindler's S-video pin 546 teaches the recited inputs. *See* Ex. 1005, 11:45–48, Fig. 5. We are also persuaded that an ordinarily skilled artisan would have known to implement multiple such S-video inputs and to modify Schindler's entertainment menu accordingly. *See* Ex. 1003 ¶¶ 152–153. Thus, we determine Petitioner has shown by a preponderance of the evidence that the subject matter of claim 25 would have been obvious over the combination of Schindler and Hogle under 35 U.S.C. § 103(a).

E. Obviousness Ground Based on Schindler, Hogle, and Baker

Petitioner contends the subject matter of claims 20–23 would have been obvious over Schindler, Hogle, and Baker. Pet. 51–60. Patent Owner relies on the same arguments discussed above in the Schindler–Hogle ground. *See* PO Resp. 5, 10.

1. Baker

Baker is a U.S. patent directed to a "multimedia system having a software mechanism that provides standardized interfaces and controls for

the operation of multimedia devices." Ex. 1007, 1:8–12. Figure 2 of Baker is reproduced below.

FIG. 2

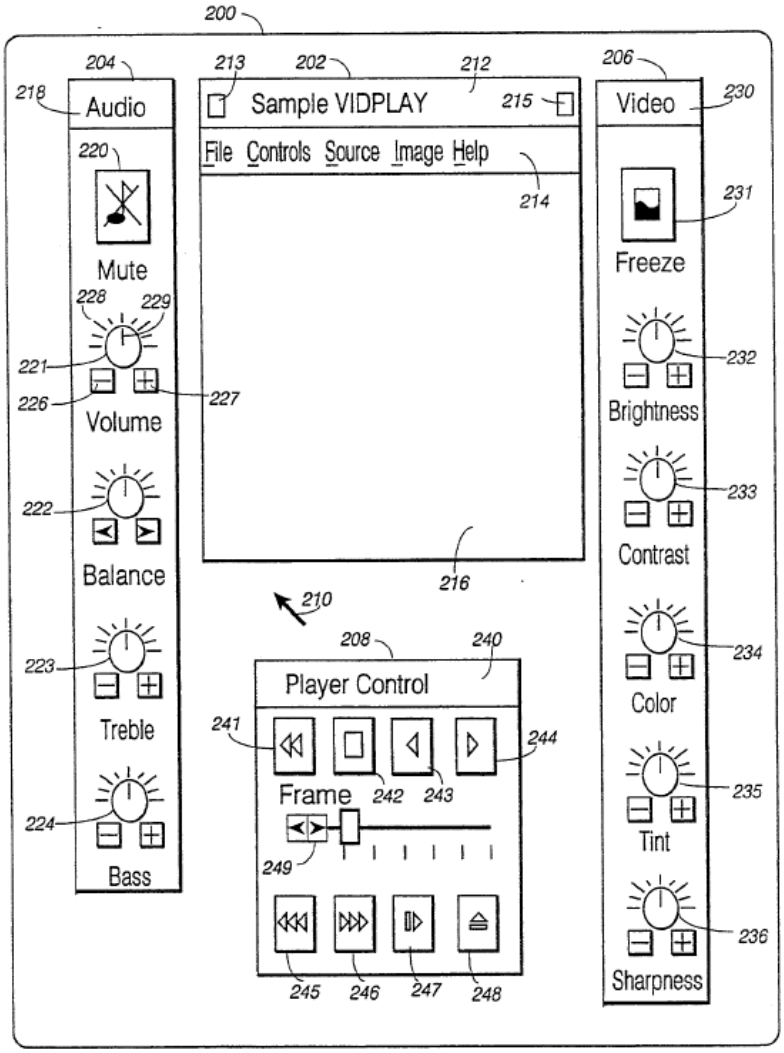


Figure 2 illustrates exemplary control screen 200 for a multimedia data processing system in which a plurality of windows or panels are displayed on a monitor. *Id.* at 3:40–42. Control screen 200 includes video window 202, audio control panel 204, video control panel 206, and player control panel 208. *Id.* at 4:9–12. Audio control panel 204 includes mute button 220, volume control 221, balance control 222, treble control 223, and bass control 224. *Id.* at 4:20–25. Video control panel 206 includes freeze

button 231, brightness control 232, contrast control 233, color control 234, tint control 235, and sharpness control 236. *Id.* at 4:42–46. A user manipulates the controls and buttons with a mouse. *Id.* at 4:33–38.

Petitioner contends Baker qualifies as prior art under 35 U.S.C. § 102(b) based on its issue date. Pet. 3. Patent Owner does not dispute the prior art status of Baker. We determine that Baker qualifies as prior art under 35 U.S.C. § 102(b) because Baker's issue date of June 27, 1995, is more than one year before the earliest possible effective filing date of the challenged claims, which is September 3, 1997. Ex. 1001, code (22); Ex. 1007, code (45).

2. Claim 20

Claim 20 depends from claim 16 and further recites:

> displaying a video window within the tool window, the video window including a plurality of selectable video characteristics;
>
> inputting an indication that the user wishes to select a particular video characteristic for an active window; and
>
> adjusting the selected video characteristic for the active the active window.

Ex. 1001, 15:29–39.

For "displaying a video window," Petitioner cites Baker's video control panel 206 in Figure 2. Pet. 55–56 (citing Ex. 1007, 4:42–46, Fig. 2). For the "selectable video characteristics," Petitioner cites dial controls 232–236 for controlling the brightness, contrast, color, tint, and sharpness of a video device. *Id.* Regarding "inputting an indication," Petitioner cites Baker's teaching of moving a cursor on a button or dial. *Id.* at 56–57 (citing Ex. 1003 ¶ 165; Ex. 1007, 4:35–38). Petitioner notes that such cursor

movement is "accompanied by signals being sent to the physical device whose controls are being simulated to cause the corresponding action to occur." *Id.* at 56 (quoting Ex. 1007, 4:35–38). According to Petitioner, this teaches the "adjusting the selected video characteristic" limitation. *Id.*

We are persuaded that Baker's video control panel 206 teaches the "video window" that allows a user to select and adjust various video characteristics. *See* Ex. 1007, Fig. 2. Patent Owner does not dispute Petitioner's analysis of the additional limitations in claim 20. Thus, we find that Baker teaches the additional limitations of claim 20.

Regarding its rationale for combining Baker with Schindler and Hogle, Petitioner notes that Schindler teaches monitor controls for "brightness, contrast, vertical and horizontal sizing and positioning, [and] on/off (rest/resume)." Pet. 54 (citing Ex. 1005, 8:56–58). In light of these teachings, Petitioner contends an ordinarily skilled artisan "would have been motivated to search for references that permit a remote system to adjust these monitor controls" and "to include Baker's controls on Schindler's user interface to improve usability and convenience." *Id.* (citing Ex. 1003 ¶¶ 160–161). Petitioner further contends an ordinarily skilled artisan would have known "to launch a child window including Baker's audio controls and a child window including Baker's video controls from the broadband video menu of Schindler." *Id.* at 53 (citing Ex. 1003 ¶ 159).

Patent Owner relies on the same arguments discussed above with respect to claim 16. We are persuaded that an ordinarily skilled artisan would have known to implement Baker's selectable displayed audio and video controls in the system of Schindler and Hogle. *See* Ex. 1003 ¶¶ 159–

161. Thus, we are persuaded by Petitioner's rationale for combining Baker with Schindler and Hogle.

Based on the entire trial record, we determine Petitioner has shown by a preponderance of the evidence that the subject matter of claim 20 would have been obvious over the combination of Schindler, Hogle, and Baker under 35 U.S.C. § 103(a).

3. Claim 21

Claim 21 depends from claim 20 and recites that "the plurality of selectable video characteristics includes a color characteristic, a tint characteristic, a brightness characteristic, and a contrast characteristic." Ex. 1001, 16:1–5. Petitioner cites the same teachings from Baker discussed above regarding "dial controls 232–236 for controlling the brightness, contrast, color, tint, and sharpness of the video device." Pet. 57 (citing Ex. 1008, 4:42–46). Patent Owner does not dispute Petitioner's analysis for claim 21. We are persuaded that Baker teaches the recited selectable video characteristics. *See* Ex. 1008, 4:42–46, Fig. 2. Thus, we determine Petitioner has shown by a preponderance of the evidence that the subject matter of claim 21 would have been obvious over the combination of Schindler, Hogle, and Baker under 35 U.S.C. § 103(a).

4. Claim 22

Claim 22 depends from claim 16 and further recites:

> displaying an audio window within the tool window, the audio window including a plurality of selectable audio characteristics;

> inputting an indication that the user wishes to select a particular audio characteristic for an active window; and
>
> adjusting the selected audio characteristic for the active window.

Ex. 1001, 16:6–17.

For "displaying an audio window," Petitioner cites Baker's audio control panel 204 in Figure 2. Pet. 58–59 (citing Ex. 1007, 4:23–25, Fig. 2). For the "selectable audio characteristics," Petitioner cites dial controls 221–224 for controlling volume, balance, treble and bass. *Id.* Regarding "inputting an indication," Petitioner cites Baker's teaching of moving a cursor on a button or dial. *Id.* at 59–60 (citing Ex. 1003 ¶ 171–172; Ex. 1007, 4:35–38). Petitioner notes that such cursor movement is "accompanied by signals being sent to the physical device whose controls are being simulated to cause the corresponding action to occur." *Id.* at 59 (quoting Ex. 1007, 4:35–38). According to Petitioner, this teaches the "adjusting the selected audio characteristic" limitation. *Id.* at 59–60.

Patent Owner relies on the same arguments discussed above with respect to claim 16. We are persuaded that an ordinarily skilled artisan would have known to implement Baker's selectable displayed audio controls in the system of Schindler and Hogle. *See* Ex. 1003 ¶¶ 171–172. Thus, we determine Petitioner has shown by a preponderance of the evidence that the subject matter of claim 22 would have been obvious over the combination of Schindler, Hogle, and Baker under 35 U.S.C. § 103(a).

5. Claim 23

Claim 23 depends from claim 22[8] and recites that "the plurality of selectable audio characteristics includes a bass characteristic and a treble characteristic." Ex. 1001, 16:18–21. Petitioner cites the same teachings from Baker discussed above regarding dial controls 221–224 for controlling volume, balance, treble and bass. Pet. 60 (citing Ex. 1008, 4:23–25). Patent Owner does not dispute Petitioner's analysis for claim 23. We are persuaded that Baker teaches the recited selectable audio characteristics. *See* Ex. 1008, 4:23–25, Fig. 2. Thus, we determine Petitioner has shown by a preponderance of the evidence that the subject matter of claim 23 would have been obvious over the combination of Schindler, Hogle, and Baker under 35 U.S.C. § 103(a).

F. Obviousness Ground Based on Schindler and Kelleher

Petitioner contends the subject matter of claims 1–14 would have been obvious over Schindler and Kelleher. Pet. 61–99. Patent Owner does not dispute Petitioner's contentions.

[8] The '643 patent states that claim 23 depends from claim 16. Ex. 1001, 16:19. This appears to be a conspicuous error based on the prosecution history. *See* Ex. 1002, 34 (original claim with amendment annotations), 129 (Office Action addressing incorrect dependency), 135 (amendment correcting dependency). Accordingly, we follow the counsel of the court in *Fitbit, Inc. v. Valencell, Inc.*, 964 F.3d 1112, 1119–20 (Fed. Cir. 2020), to correct the error and to resolve the patentability of this claim based on the intended dependency from claim 22.

1. Kelleher

Kelleher is a U.S. patent directed to "a parallel-processor graphics architecture appropriate for multimedia graphics workstations that is scalable to the needs of a user." Ex. 1008, 1:7–9. Figure 2 of Kelleher is reproduced below.

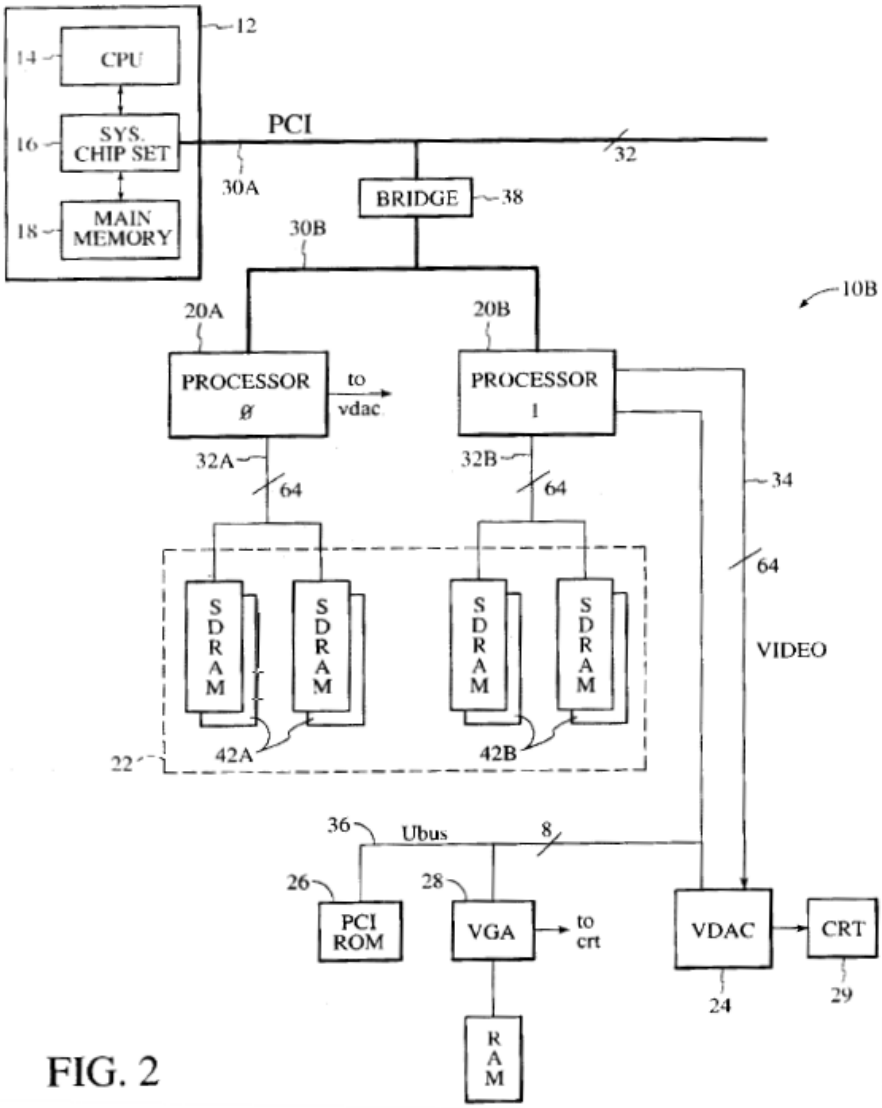


FIG. 2

Figure 2 is a block diagram depicting graphics system 10B with two rendering processors 20A and 20B. *Id.* at 2:45–46, 3:20–21. Rendering processors 20A and 20B are connected to general-purpose computer system 12 via PCI bus 30. Rendering processors 20A and 20B are the

primary components of graphics system 10B that implement graphics and multimedia algorithms. *Id.* at 3:64–4:1. In particular, rendering processors 20A and 20B integrate video technologies including 2D and 3D geometric graphics, photorealistic rendering, stereoscopic viewing, windowing operations, and live video. *Id.* at 4:1–4.

Petitioner contends Kelleher qualifies as prior art under 35 U.S.C. § 102(e) based on its filing date. Pet. 3. Patent Owner does not dispute the prior art status of Kelleher. We have no evidence of an invention date other than the earliest possible effective filing date of the challenged claims. Thus, we determine that Kelleher qualifies as prior art under 35 U.S.C. § 102(e) because Kelleher's filing date of December 11, 1995, is before the earliest possible effective filing date of the challenged claims, which is September 3, 1997. Ex. 1001, code (22); Ex. 1008, code (22).

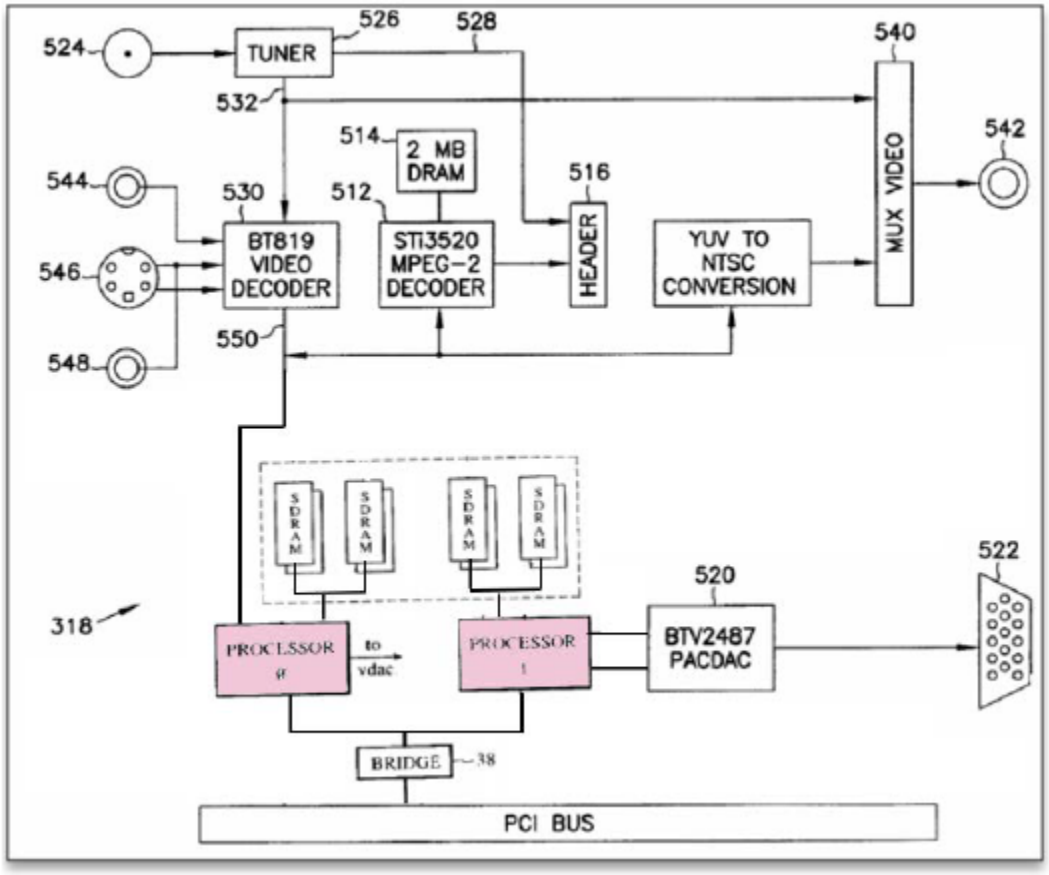
2. Claim 1

The preamble of claim 1 recites "[a] video adapter for use in a computer having an internal bus." Ex. 1001, 13:53–54. Petitioner cites Schindler's personal computer 118, which includes PCI bus 312 coupled to processor 310, receiver 316, and VGA adapter 318. Pet. 67 (citing Ex. 1005, 8:66–9:7). Petitioner likens PCI bus 312 to the recited "internal bus." *Id.* Petitioner contends that an ordinarily skilled artisan would have understood that circuitry including receiver 316, VGA adapter 318, and PCI bus 312 is the recited "adapter" because it enables Schindler's personal computer 118 to use NTSC and VGA displays. *Id.* at 67–68 (citing Ex. 1003 ¶¶ 189–191).

Patent Owner does not dispute Petitioner's analysis for the preamble. Neither party addresses whether the preamble is limiting. Because Petitioner

establishes that Schindler's processor 310, PCI bus 312, receiver 316, and VGA adapter 318 function as an adapter (*see* Ex. 1003 ¶ 191), we need not determine whether the preamble is limiting. *See Nidec*, 868 F.3d at 1017.

Claim 1 further recites first and second graphic accelerators. Ex. 1001, 13:55–56. For these limitations, Petitioner notes that Schindler's VGA adapter 318 includes Mediastream controller 510. *Id.* at 68–69 (citing Ex. 1005, Fig. 5). Petitioner further notes that controller 510 processes video signals and places "video information into a dynamic random access memory or video random access memory, VRAM 518." *Id.* (quoting Ex. 1005, 11:31–34). Petitioner then posits the replacement of "Schindler's Mediastream controller 510 and VRAM 518 with components of Kelleher's parallel-processor graphics architecture (*e.g.*, processors 20A and 20B, memory 22, and PCI bridge 38)." *Id.* at 69 (citing Ex. 1003 ¶ 193). The Petition includes a diagram of this combination, which is reproduced below.



Id. at 70. In this diagram from the Petition, Petitioner depicts its conception of a VGA adapter combining the teachings of Schindler and Kelleher. *Id.* The diagram shows that rendering processors 0 and 1 (shaded in pink) from Kelleher's Figure 2 have replaced Schindler's Mediastream controller 510 and VRAM 518 in Figure 5 from Schindler. *Id.* at 69–70. Petitioner notes that these rendering processors "implement[] graphics and multimedia algorithms" and integrate various video technologies, which makes them "special-purpose hardware that handle graphics processing." *Id.* (citing Ex. 1008, 3:36–38, 3:65–4:4). According to Petitioner, Kelleher's processors 0 and 1 in the combination are each commensurate with a "graphic accelerator" in claim 1 because they each "offload[] . . . processing from the main processor of the personal computer (CPU 310) and

accelerat[e] graphics applications." *Id.* at 70 (citing Ex. 1003 ¶ 194; Ex. 1008, 1:53–56).

Petitioner contends an ordinarily skilled artisan would have combined Kelleher with Schindler "to improve the performance of Schindler's system" based on Kelleher's teaching about "substantial gains in graphics system performance" from using parallel processors. Pet. 65 (citing Ex. 1003 ¶ 182; Ex. 1008, 1:26–28). Petitioner further contends that an ordinarily skilled artisan would have been motivated to use Kelleher's graphics architecture because it is scalable, and this would have allowed lower- and higher-performance configurability. *Id.* at 66 (citing Ex. 1003 ¶ 183; Ex. 1008, Abstract, 2:19–24).

Patent Owner does not dispute Petitioner's analysis for the first and second graphic accelerator limitations. We are persuaded that an ordinarily skilled artisan would have replaced Schindler's Mediastream controller 510 and VRAM 518 with Kelleher's parallel processors 20A and 20B and associated memory 22. *See* Pet. 70; Ex. 1003 ¶ 181. We find that the parallel processors in this combination teach the first and second graphic accelerator limitations of claim 1. We also find that an ordinarily skilled artisan would have been motivated to use multiple processors to obtain the gains in graphic system performance touted by Kelleher. *See id.* ¶ 182; Ex. 1008, 1:26–28.

Claim 1 further recites "at least one video decoder coupled to at least one of the first and second graphic accelerators." Ex. 1001, 13:58–59. Petitioner cites Schindler's MPEG-2 decoder 512 for decoding MPEG data and video decoder 530, which "receives the output of tuner 526 and inputs from RCA jacks 544, 548 and S-video pin 546" and "decodes the received

signals into YUV video output on line 550." *Id.* at 71 (citing Ex. 1005, 11:22–23, 11:42–51). Petitioner further contends decoders 512 and 530 are coupled to Kelleher's processors 0 and 1 in the combined system of Schindler and Kelleher. *Id.* at 71–72.

Patent Owner does not dispute Petitioner's analysis for the "video decoder" limitation. We find that Schindler's decoders 512 and 530 in Petitioner's combined Schindler–Kelleher system teach the "video decoder" limitation of claim 1. *See* Pet. 70; Ex. 1005, 11:22–23, 11:42–48.

Claim 1 further recites first and second television tuners for receiving first and second television signals, respectively. Ex. 1001, 13:60–62. For the first television tuner, Petitioner cites Schindler's tuner 410 within receiver 318, which receives a direct broadcast signal from an antenna. *Id.* at 72 (citing Ex. 1005, 10:13–15). For the second television tuner, Petitioner cites Schindler's tuner 526 within VGA card 318, which receives cable television input. *Id.* at 72–73 (citing Ex. 1005, Fig. 5); *see also* Ex. 1005, 11:38–40 (describing video input from standard cable connector 524).

Patent Owner does not dispute Petitioner's analysis for the television tuner limitations. We find that Schindler's tuner 410 for broadcast signals and tuner 526 for cable television signals teach the recited first and second television tuners of claim 1. *See* Ex. 1005, 10:13–15, 11:38–40.

Claim 1 further recites "circuitry for coupling the first and second television tuners to the at least one video decoder." Ex. 1001, 13:64–65. Petitioner contends Schindler's tuner 410 within receiver 316 is coupled via PCI bus 312 to decoder 512 within VGA card 318. Pet. 74 (citing Ex. 1003 ¶ 199; Ex. 1005, 10:43–47, 11:19–22). Petitioner further contends tuner 526 is coupled to decoder 530 via line 532. *Id.* (citing Ex. 1003 ¶ 200; Ex. 1005,

11:40–42). Patent Owner does not dispute Petitioner's analysis for the "circuitry" limitation. We find that Schindler's PCI bus 312 and line 523 (i.e., "circuitry") couples the first and second television tuners to decoders 512 and 530, respectively. *See* Ex. 1003 ¶ 199; Ex. 1005, 10:43–47, 11:19–22, 11:40–42.

Claim 1 further recites "a plurality of video monitor outputs." Ex. 1001, 13:65. Petitioner contends Schindler's personal computer 118 is set up to drive multiple monitors, including VGA monitor 122 and NTSC monitor 150. Pet. 75 (citing Ex. 1005, 5:58–59, Fig. 1). Petitioner further notes that Schindler's Figures 5 and 7 depict VGA output 522 and NTSC output 542 as output connectors to these monitors. *Id.* at 76–77 (citing Ex. 1005, 4:23–26, 6:53–55, 11:34–37, Figs. 5, 7). Patent Owner does not dispute Petitioner's analysis for the "video monitor outputs" limitation. We find that Schindler teaches VGA output 522 and NTSC output 542 for VGA monitor 122 and NTSC monitor 150, respectively. *See* Ex. 1005, 11:34–37, 12:34–35, Figs. 1, 5, 7.

Based on the entire trial record, we are satisfied that the combination of Schindler and Kelleher teaches all of the limitations of claim 1 and that an ordinarily skilled artisan would have had a reason to combine these references in the manner suggested by Petitioner. Thus, we determine Petitioner has shown by a preponderance of the evidence that the subject matter of claim 1 would have been obvious over the combination of Schindler and Kelleher under 35 U.S.C. § 103(a).

3. Claim 2

Claim 2 depends from claim 1 and recites that the video adapter further comprises "a plurality of CVBS outputs." Ex. 1001, 13:66–67. According to Petitioner, CVBS refers to composite video. Pet. 78 (citing Ex. 1003 ¶ 204[9]). Building on its analysis for claim 1, Petitioner contends that Schindler suggests composite video outputs insofar as "Figure 1 shows separate wired connections 151 and 173 to NTSC TV 150 and VCR 171" and Figure 7 depicts RCA connectors for such composite signals. *Id.* (citing Ex. 1003 ¶¶ 204–205). Mr. Wechselberger also cites a contemporaneous reference to show that RCA connectors were associated with composite video signals. Ex. 1003 ¶ 204 (citing Ex. 1030, 247).

Patent Owner does not dispute Petitioner's analysis for claim 2. We are persuaded by Petitioner's analysis that Schindler's depiction of separate wired connections for an NTSC TV and a VCR (Fig. 1) and Schindler's depiction of RCA connectors (Fig. 7) would have suggested a plurality of composite video outputs to an ordinarily skilled artisan. Ex. 1003 ¶¶ 204–205; Ex. 1005, Figs. 1, 7; Ex. 1030, 247. Thus, we determine Petitioner has shown by a preponderance of the evidence that the subject matter of claim 2 would have been obvious over the combination of Schindler and Kelleher under 35 U.S.C. § 103(a).

4. Claim 3

Claim 3 depends from claim 1 and recites that the video adapter further comprises "a bus interface communicating with the internal bus" and

[9] Petitioner mistakenly refers to paragraph 201, but the context makes clear that Petitioner intended to cite paragraph 204.

"a bus bridge coupled to the first and second graphic accelerators and coupled to the bus interface." Ex. 1001, 14:1–5. For the recited "bus bridge," Petitioner refers to its conception of a combined Schindler–Kelleher system (as reproduced above) and contends "graphics processors 0 and 1 'are connected to a system PCI bus 30A through a PCI bridge 38.'" Pet. 79 (quoting Ex. 1008, 3:46–69). For the "bus interface," Petitioner notes that the combined Schindler–Kelleher system includes PCI bus 312 (i.e., the "internal bus"), which Schindler characterizes as an "industry standard." *Id.* at 80 (citing Ex. 1005, 8:67–9:1). Citing a contemporaneous reference, Petitioner contends "it was well-known that a CPU, such as Schindler's processor 310, coupled to a PCI bus has a PCI bus interface so that it can connect to the bus and communicate with other hardware components." *Id.* at 80–81 (citing Ex. 1003 ¶ 207; Ex. 1012, 496–503). As such, Petitioner contends the "bus interface" of processor 310 is coupled to the "bus bridge" via the PCI bus. *Id.* (citing Ex. 1003 ¶ 207).

Patent Owner does not dispute Petitioner's analysis for claim 3. We are persuaded that Kelleher's PCI bridge 38 in Petitioner's combined system teaches the recited "bus bridge." *See* Ex. 1008, 3:46–69, Fig. 2. We also are persuaded that an ordinarily skilled artisan would have known that a processor has an interface to connect to an "industry standard" PCI bus. *See* Ex. 1003 ¶ 207; Ex. 1005, 8:67–9:1; Ex. 1012, 496–503. Thus, we determine Petitioner has shown by a preponderance of the evidence that the subject matter of claim 3 would have been obvious over the combination of Schindler and Kelleher under 35 U.S.C. § 103(a).

5. Claim 4

Claim 4 depends from claim 1 and recites that "the coupling circuitry further comprises a video multiplexer." Ex. 1001, 14:6–7. Petitioner cites Schindler's video multiplexer 540 and contends it is a component of VGA adapter 318 and therefore part of the recited "circuitry." Pet. 81 (citing Ex. 1003 ¶ 201; Ex. 1005, 11:42–45). Patent Owner does not dispute Petitioner's analysis for claim 4. We are persuaded by Petitioner's analysis and find that it is consistent with Petitioner's analysis of the recited "circuitry" in claim 1. Thus, we determine Petitioner has shown by a preponderance of the evidence that the subject matter of claim 4 would have been obvious over the combination of Schindler and Kelleher under 35 U.S.C. § 103(a).

6. Claim 5

Claim 5 depends from claim 4 and recites that the video adapter further comprises "a second video multiplexer having an external input and coupled to at least one video decoder." Ex. 1001, 14:8–10. Petitioner cites Schindler's Figure 5 and contends that "Schindler's decoder 530 receives input video signals over S-video pin 546 and RCA jacks 546, 548." Pet. 82 (citing Ex. 1005, 11:40–48, Fig. 5). Petitioner contends an ordinarily skilled artisan would have known that "the three analog input signals depicted in Figure 5 are input to the decoding functions (i.e., the decoder) of the chip via a three-input multiplexer because the decoder processes one signal at a time, and not all three signals in parallel." *Id.* (citing Ex. 1003 ¶ 212). Petitioner additionally notes that Schindler's Figure 5 identifies decoder 530 as a Bt819 video decoder, a type of decoder that an ordinarily skilled artisan

would have known to include a multiplexer. *Id.* (citing Ex. 1003 ¶ 213; Ex. 1005, Fig. 5; Ex. 1013, 5 (Bt819A Functional Description)).

Patent Owner does not dispute Petitioner's analysis for claim 5. We are persuaded that the three video inputs to decoder 530 at least suggests the "second video multiplexer." *See* Ex. 1005, 11:40–48, Fig. 5. Petitioner also puts forth evidence that an ordinarily skilled artisan would have known the exemplary Bt819 video decoder to include a multiplexer. *See* Ex. 1003 ¶ 213; Ex. 1005, Fig. 5; Ex. 1013, 5. Thus, we determine Petitioner has shown by a preponderance of the evidence that the subject matter of claim 5 would have been obvious over the combination of Schindler and Kelleher under 35 U.S.C. § 103(a).

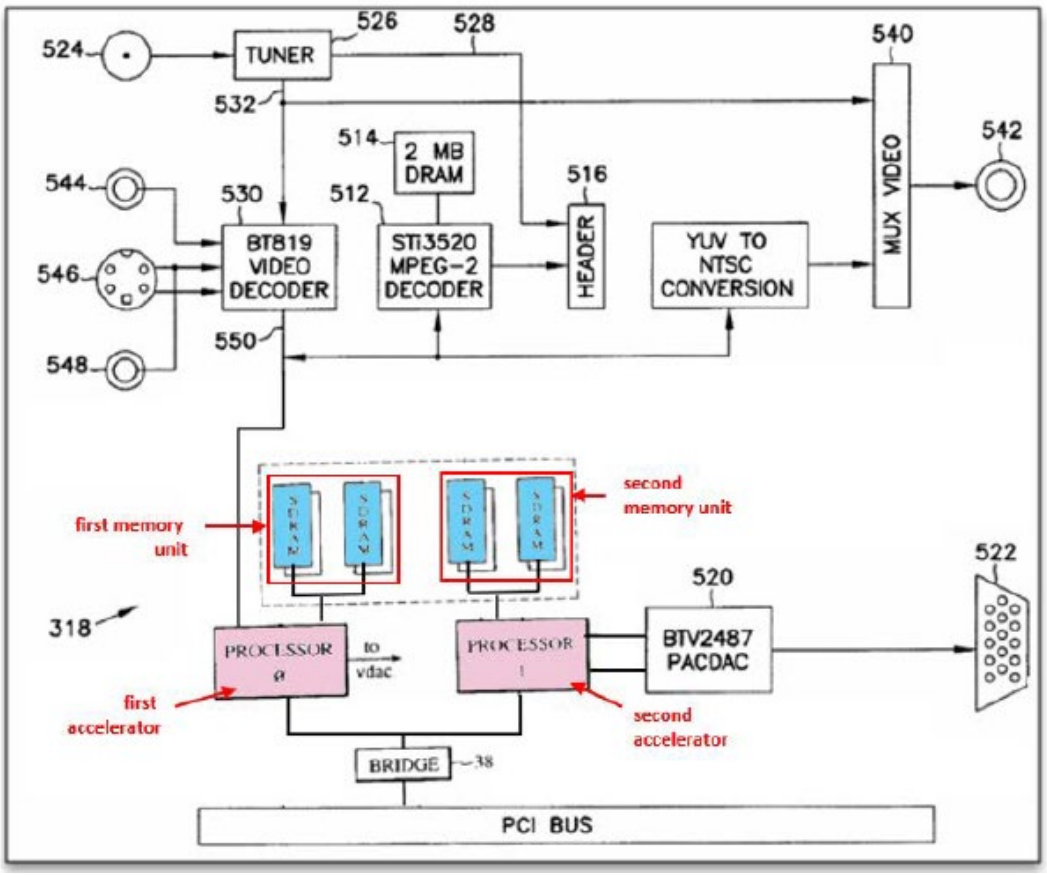
7. Claim 6

Claim 6 depends from claim 5 and recites that "the external video multiplexer input is an S-Video input." Ex. 1001, 14:11–12. Petitioner cites Schindler's input over S-video pin 546. Pet. 82 (citing Ex. 1005, 11:40–48, Fig. 5). Patent Owner does not dispute Petitioner's analysis for claim 6. We are persuaded that Schindler's S-video pin 546 teaches the recited input. *See* Ex. 1005, 11:40–48, Fig. 5. Thus, we determine Petitioner has shown by a preponderance of the evidence that the subject matter of claim 6 would have been obvious over the combination of Schindler and Kelleher under 35 U.S.C. § 103(a).

8. Claim 7

Claim 7 depends from claim 1 and recites that the video adapter further comprises "a first memory unit coupled to the first accelerator; and a

second memory unit coupled to the second accelerator." Ex. 1001, 14:13–17. Petitioner cites Kelleher's teaching of partitioned physical memory segments 42, wherein each memory segment 42 is coupled to a different rendering processor 20. Pet. 83 (citing Ex. 1008, 4:15–20). To explain its position, Petitioner provides an annotated diagram of the combined VGA adapter of Schindler and Kelleher, which is reproduced below.



Id. at 84. In this diagram from the Petition, Petitioner has indicated with red arrows its mapping of the recited "first memory unit" and "second memory unit" to Kelleher's memory segments (shaded blue) and of the recited "first accelerator" and "second accelerator" to Kelleher's processors 0 and 1. *Id.*

Patent Owner does not dispute Petitioner's analysis for claim 7. We are persuaded that Kelleher's memory segments 42—as grouped by

Petitioner in the diagram above—teach the recited memory units of claim 7. *See* Pet. 84; Ex. 1008, 4:15–20. We also note that Petitioner's mapping is consistent with its mapping of the first and second accelerators from claim 1. Thus, we determine Petitioner has shown by a preponderance of the evidence that the subject matter of claim 7 would have been obvious over the combination of Schindler and Kelleher under 35 U.S.C. § 103(a).

9. Claim 8

Claim 8 depends from claim 7 and recites that the video adapter further comprises "a main memory unit coupled to the first and second accelerators." Ex. 1001, 14:18–20. Petitioner cites Schindler's random access memory (RAM) 314, which is "coupled to both the processor 310 for direct access, and to the PCI bus 312 for direct access by other components also coupled to the PCI bus 312." Pet. 85 (quoting Ex. 1005, 9:1–4). Petitioner contends Schindler's RAM 31 is coupled to both graphic accelerators via PCI bus 312. *Id.* (citing Ex. 1005, Figs. 3, 5).

Patent Owner does not dispute Petitioner's analysis for claim 8. We are persuaded that Schindler's RAM 314 is a "main memory" coupled to the graphic accelerators via PCI bus 312. *See* Ex. 1005, 9:1–4, Fig. 5. Thus, we determine Petitioner has shown by a preponderance of the evidence that the subject matter of claim 8 would have been obvious over the combination of Schindler and Kelleher under 35 U.S.C. § 103(a).

10. Claim 9

Claim 9 depends from claim 1 and recites that the video adapter further comprises "a sound processor coupled to at least one of the first and

second television tuners." Ex. 1001, 14:21–23. Petitioner cites Schindler's sound cards 320 and 321. Pet. 86–87 (citing Ex. 1005, 9:5–7, Fig. 3). To show the recited coupling to a television tuner, Petitioner notes that when Schindler tuner 410 tunes to a channel, "the video signals are processed and sent on to VGA card 318 and sound card 320." *Id.* at 87 (quoting Ex. 1005, 10:41–45) (citing Ex. 1003 ¶ 222).

Patent Owner does not dispute Petitioner's analysis for claim 9. We are persuaded that Schindler's sound card 320 teaches the recited "sound processor" and that it is coupled to tuner 410, which Petitioner likens to the recited "first television tuner" in claim 1. *See* Ex. 1005, 9:5–7, 10:41–45, Fig. 3. Thus, we determine Petitioner has shown by a preponderance of the evidence that the subject matter of claim 9 would have been obvious over the combination of Schindler and Kelleher under 35 U.S.C. § 103(a).

11. Claim 10

Claim 10 depends from claim 1 and recites that "the first television signal is an external signal." Ex. 1001, 14:24–25. Petitioner notes that Schindler's satellite 112 transmits direct broadcast signals "comprising 150 channels of modulated digital video, audio and data signals." Pet. 88 (citing Ex. 1005, 7:44–50). Petitioner contends these satellite signals are received by antenna 114, downconverted, and then provided to PC 118. *Id.* (citing Ex. 1005, 7:62–64). Petitioner cites also Schindler's teaching of tuner 410 receiving a direct broadcast signal from antenna 114. *Id.* (citing Ex. 1005, 10:13–15).

Patent Owner does not dispute Petitioner's analysis for claim 10. We are persuaded that Schindler's satellite signals, which are ultimately received

at tuner 410, teach the recited "external signal." *See* Ex. 1005, 7:44–50, 7:62–64, 10:13–15. Thus, we determine Petitioner has shown by a preponderance of the evidence that the subject matter of claim 10 would have been obvious over the combination of Schindler and Kelleher under 35 U.S.C. § 103(a).

12. Claim 11

Claim 11 depends from claim 10 and recites that "the external signal is provided by video-producing equipment." Ex. 1001, 14:24–25. Building on its analysis for claim 10, Petitioner contends that it would have been obvious to an ordinarily skilled artisan "that content delivered via the external television signals (*e.g.*, satellite) in both the '643 patent and Schindler was produced by '*video-producing equipment*.'" Pet. 88 (citing Ex. 1003 ¶ 226). Petitioner also notes that the '643 patent does not describe or mention "video-producing equipment." *Id.*

Patent Owner does not dispute Petitioner's analysis for claim 10. We are persuaded that an ordinarily skilled artisan would have known Schindler's satellite signals (i.e., the "external signal") to be produced by "video-producing equipment." *See* Ex. 1003 ¶ 226. Thus, we determine Petitioner has shown by a preponderance of the evidence that the subject matter of claim 11 would have been obvious over the combination of Schindler and Kelleher under 35 U.S.C. § 103(a).

13. Claim 12

The preamble of claim 12 recites "[a] computer system." Ex. 1001, 14:28. Petitioner cites Schindler's personal computer 118. Pet. 89 (citing

Ex. 1005, 3:58–60). Patent Owner does not dispute Petitioner's analysis for the preamble. Neither party addresses whether the preamble is limiting. Because Petitioner establishes that Schindler's PC 118 is a computer system (*see* Ex. 1005, 3:58–60), we need not determine whether the preamble is limiting. *See Nidec*, 868 F.3d at 1017.

Claim 12 further recites "a central processing unit." Ex. 1001, 14:29. Petitioner cites Schindler's processor 310 within PC 118. Pet. 90 (citing Ex. 1005, 8:67–9:1, 9:61–62, Fig. 3). Patent Owner does not dispute Petitioner's analysis for this limitation. We find that Schindler's processor 310 teaches the recited "central processing unit." *See* Ex. 1005, 8:67–9:1, 9:61–62, Fig. 3.

Claim 12 further recites "a video adapter communicating with the central processing unit." Ex. 1001, 14:30–31. Petitioner cites Schindler's VGA adapter 318. Pet. 90 (citing Ex. 1005, 8:66–9:7). Patent Owner does not dispute Petitioner's analysis for this limitation. We find that Schindler's VGA adapter 318 teaches the recited "video adapter." *See* Ex. 1005, 8:66–9:7, Fig. 3.

Claim 12 further recites first and second video sources providing first and second video signals to the video adapter. Ex. 1001, 14:33–36. Petitioner cites Schindler's description of video signals coming "from cable source 174" and "from a VCR, camcorder or laserdisc." Pet. 91 (citing Ex. 1005, 12:28–30, 21:12–14). Petitioner also notes how VGA adapter 318 includes a standard cable connector, S-video pin, and RCA jack for receiving such signals. *Id.* at 91–92 (citing Ex. 1005, 11:38–40, 12:28–30, Fig. 5). Patent Owner does not dispute Petitioner's analysis for this limitation. We find that Schindler's cable source, VCR, camcorder, and

laserdisc are "video sources" that provide video signals to the video adapter. *See* Ex. 1005, 12:28–30, 21:12–14.

Claim 12 further recites first and second graphic accelerators. Ex. 1001, 14:37–38. Petitioner relies on the same analysis as for claim 1 (Pet. 92–93), which we find persuasive above. *See supra* § II.F.2.

Claim 12 further recites "a bus interface communicating with an internal bus of said computer system" and "a bus bridge coupled to the first and second graphic accelerators and coupled to the bus interface." Ex. 1001, 39–42. Petitioner relies on the same analysis as for claim 3 (Pet. 93–94), which we find persuasive above. *See supra* § II.F.4.

Claim 12 further recites first and second display devices coupled to the video adapter for displaying results of the first and second graphic accelerators, respectively. Ex. 1001, 14:43–49. Regarding displays being coupled to the video adapter, Petitioner cites Schindler's teaching of VGA adapter 318 having two output connectors: NTSC output 542 and VGA output 522. Pet. 94 (citing Ex. 1005, Fig. 5). According to Petitioner, NTSC output 542 is coupled to NTSC TV 150 and VGA output 522 is coupled to VGA monitor 122. *Id.* (citing Ex. 1005, 11:34–37, 11:52–55). Petitioner also contends NTSC TV 150 and VGA monitor 122 each display the output of Schindler's controller 410. *Id.* at 95 (citing Ex. 1005, 11:34–37; 11:48–55, 19:23–26).

Petitioner's proposed combination of Schindler and Kelleher employs Kelleher's graphic accelerators, and Petitioner notes Kelleher's teaching that blocks of data may be flexibly allocated to the accelerators for processing. Pet. 95–96 (citing Ex. 1008, 5:6–9, 5:44–51, 6:19–21, Fig. 6). In light of this, Petitioner contends an ordinarily skilled artisan "would have been

motivated to assign blocks associated with a first display device to a first processor and blocks associated with a second display device to a second processor." *Id.* at 96 (citing Ex. 1003 ¶ 245).

Patent Owner does not dispute Petitioner's analysis for the "display device" limitations. We find that Schindler's NTSC TV 150 and VGA monitor 122, which receive and display the output of controller 410, teach the first and second display devices. *See* Ex. 1005, 11:34–37, 11:48–55, 19:23–26, Fig. 5. We also are persuaded that, in light of Kelleher's teachings on allocating data to graphic accelerators (*see* Ex. 1008, 5:6–9, 5:44–51, 6:19–21, Fig. 6), an ordinarily skilled artisan would have allocated data to graphic accelerators in the Schindler–Kelleher combination as proposed by Petitioner. *See* Ex. 1003 ¶ 245. Thus, we find that the combination of Schindler and Kelleher teaches the "display device" limitations of claim 12.

Based on the entire trial record, we are satisfied that the combination of Schindler and Kelleher teaches all of the limitations of claim 12 and that an ordinarily skilled artisan would have had a reason to combine these references in the manner suggested by Petitioner. Thus, we determine Petitioner has shown by a preponderance of the evidence that the subject matter of claim 12 would have been obvious over the combination of Schindler and Kelleher under 35 U.S.C. § 103(a).

14. Claim 13

Claim 13 depends from claim 12 and recites "the first video signal is a television signal." Ex. 1001, 14:50–51. Petitioner cites Schindler's teachings of cable connector 524 being coupled to video tuner circuit 526

and of signal 175 being provided from cable source 174. Pet. 97 (citing Ex. 1005, 11:38–40, 21:12–14). Petitioner contends a cable source is a provider of television programming. *Id.* (citing Ex. 1003 ¶ 247). Patent Owner does not dispute Petitioner's analysis for claim 13. We find that Schindler's cable source is a television signal that is provided to the adapter. *See* Ex. 1005, 11:38–40, 21:12–14. Thus, we determine Petitioner has shown by a preponderance of the evidence that the subject matter of claim 13 would have been obvious over the combination of Schindler and Kelleher under 35 U.S.C. § 103(a).

15. Claim 14

Claim 14 depends from claim 12 and recites that "if the first video signal is identical to the second video signal, the results of the first video signal are displayed on the first and second display devices." Ex. 1001, 14:52–55. Petitioner notes that each monitor in Schindler has its own user interface through which a user can select an input to display. Pet. 98; *see also id.* at 32; Ex. 1003 ¶ 116; Ex. 1005, 18:57–58. As such, Petitioner contends an ordinarily skilled artisan would have understood that "users of Schindler's system could select the same input for multiple displays." Pet. 98 (citing Ex. 1003 ¶ 250). Patent Owner does not dispute Petitioner's analysis for claim 14. We are persuaded by Petitioner's reasoning, which is supported by Mr. Wechselberger's testimony. *See* Ex. 1003 ¶ 250. Thus, we determine Petitioner has shown by a preponderance of the evidence that the subject matter of claim 14 would have been obvious over the combination of Schindler and Kelleher under 35 U.S.C. § 103(a).

G. Obviousness Ground Based on Schindler, Kelleher, and Hogle

Petitioner contends the subject matter of claim 15 would have been obvious over Schindler, Kelleher, and Hogle. Pet. 99–100. Claim 15 depends from claim 14 and recites "the results of the first video signal are displayed as a single window across the first and second display devices." Ex. 1001, 14:56–58. Petitioner adds Hogle to the Schindler–Kelleher combination for teaching that a video signal can be displayed in a single window across the first and second display devices. Pet. 99–100 (citing Ex. 1006, 1:57–67, Fig. 4). Petitioner relies on the same reasons for combining Hogle with Schindler discussed above. *Id.* at 100; *see also supra* § II.D.3.

Patent Owner does not dispute Petitioner's analysis. Hogle teaches the use of a single window across display devices. *See* Ex. 1006, 1:57–67, Fig. 4. We also are persuaded that an ordinarily skilled artisan would have combined Hogle with Schindler and Kelleher for the same reasons discussed above in the Schindler–Hogle ground. *See supra* § II.D.3. Thus, we determine Petitioner has shown by a preponderance of the evidence that the subject matter of claim 15 would have been obvious over the combination of Schindler, Kelleher, and Hogle under 35 U.S.C. § 103(a).

III. CONCLUSION

Petitioner has shown, by a preponderance of the evidence, that (1) claims 16–19, 24, and 25 would have been obvious over the combination of Schindler and Hogle; (2) claims 20–23 would have been obvious over the combination of Schindler, Hogle, and Baker; (3) claims 1–14 would have been obvious over the combination of Schindler and Kelleher; and

(4) claim 15 would have been obvious over the combination of Schindler, Kelleher, and Hogle.[10]

IV. ORDER

Accordingly, it is:

ORDERED that claims 1–25 of the '643 patent are held to be unpatentable; and

FURTHER ORDERED that, because this is a Final Written Decision, parties to this proceeding seeking judicial review of our decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

[10] Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this Decision, we draw Patent Owner's attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. *See* 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. *See* 37 C.F.R. § 42.8(a)(3), (b)(2).

In summary:

Claims	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not shown Unpatentable
16–19, 24, 25	103(a)	Schindler, Hogle	16–19, 24, 25	
20–23	103(a)	Schindler, Hogle, Baker	20–23	
1–14	103(a)	Schindler, Kelleher	1–14	
15	103(a)	Schindler, Kelleher, Hogle	15	
Overall Outcome			1–25	

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