

# Petitioner Luxottica of America Inc.'s Demonstratives For Oral Argument

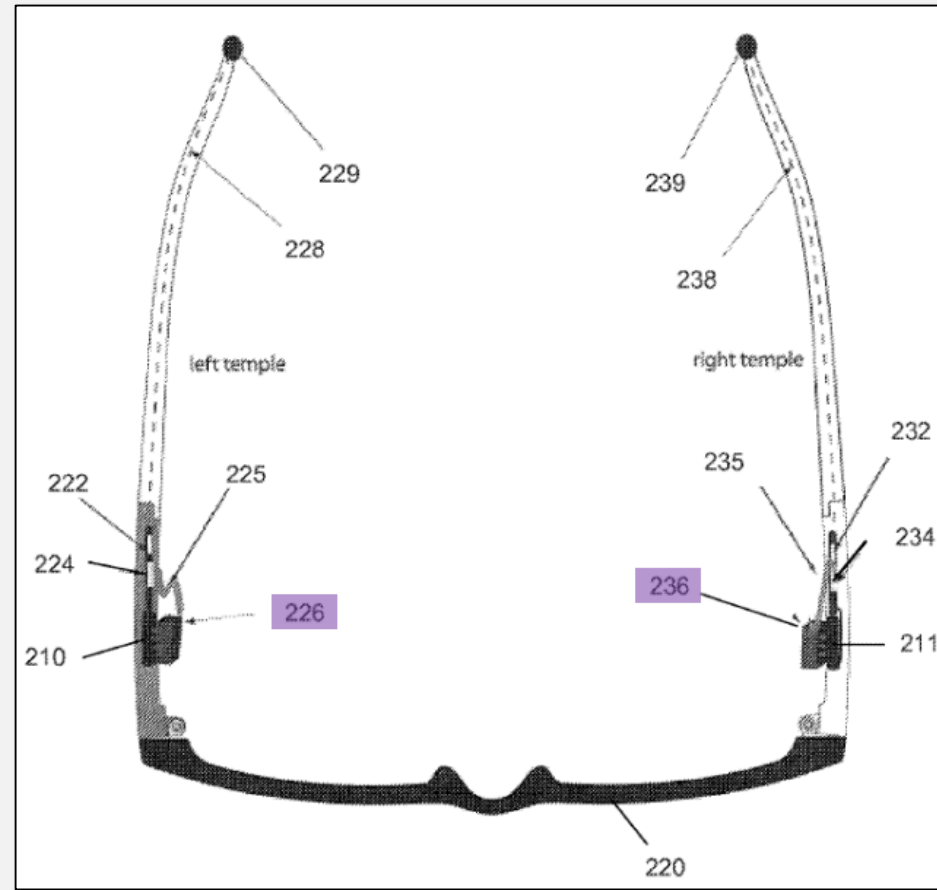
October 6, 2025

*Luxottica of America Inc. v. e-Vision Smart Optics, Inc.*

IPR2024-01072 (Patent 10,598,960)

*Luxottica v. e-Vision*  
IPR2024-01072  
**Luxottica Ex. 1027**

# The '960 Patent's Electronic Eyewear And Communication



(Ex. 1001, Fig. 3) (annotated)

# Undisputed: Independent Claim 1 And Its Dependents Unpatentable

1. Eyewear comprising:  
an eyewear frame having a first temple and a second temple;  
a speaker supported by the eyewear frame;  
an application module mechanically coupled to the eyewear frame and operably coupled to the speaker, the application module comprising:  
a microphone and a wireless chip to receive a verbal query from a wearer of the eyewear, wirelessly transmit the verbal query to an external device, receive a response to the verbal query, and provide the response to the wearer via the speaker.

(Ex. 1001, claim 1)

# Independent Claims 11 And 22 Are Also Unpatentable

**11.** Eyewear comprising:  
an eyewear frame having a first temple and a second temple; and  
an application module mechanically coupled to the eyewear frame, the application module including a wireless chip to communicate with a wireless enabled device,  
wherein the wireless enabled device is configured to recognize a presence of a wearer of the eyewear based at least in part on communication with the wireless chip.

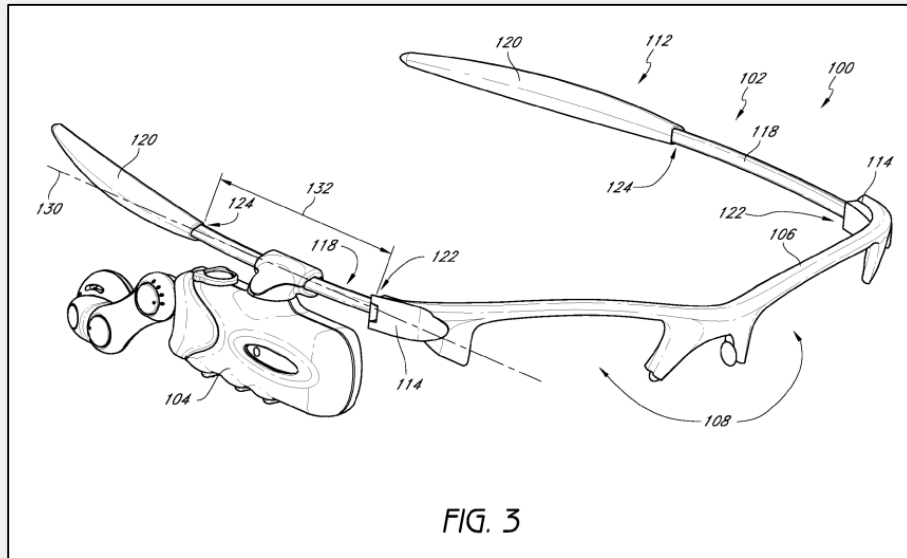
(Ex. 1001, claim 11) (annotated)

**22.** Eyewear comprising:  
an eyewear frame having a first temple and a second temple;  
an application module mechanically coupled to the eyewear the application module comprising a transmitter and a wireless chip to wirelessly transmit a password from the application module from a wearer of the eyewear to a computer to access the computer.

(Ex. 1001, claim 22) (annotated)

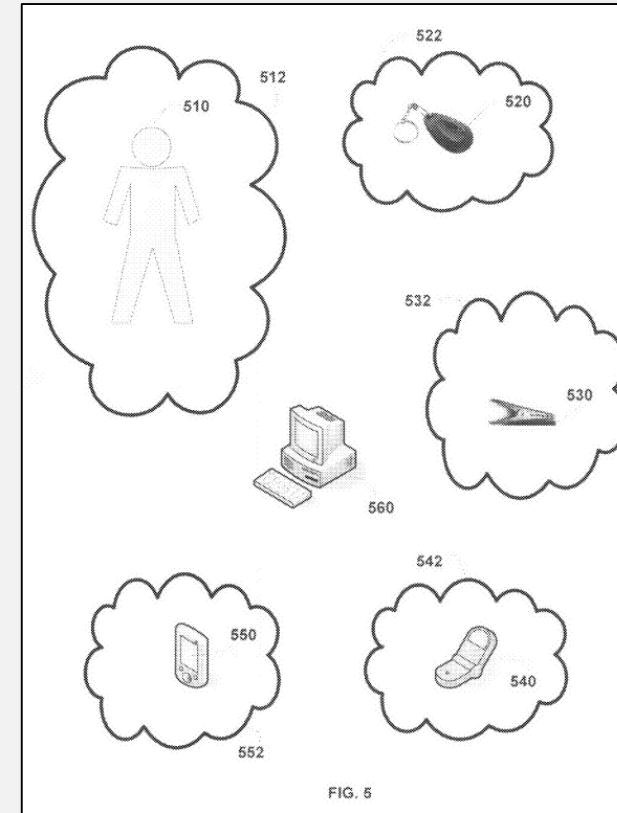
# Ground 4

# Claims 11 And 22 Unpatentable Over Jannard-740 And Rosenblatt



**Jannard-740**

+



**Rosenblatt**

# PO Does Not Dispute The Prior Art Teaches The Claim Limitations

- ⌚ Patent Owner does not dispute that Jannard-740 discloses the structural components of claims 11 and 22.
- ⌚ Nor does Patent Owner contest that Rosenblatt discloses the claimed functionality.

# PO Wrongly Claims Inoperability Defeats Motivation To Combine

Patent Owner's Response to  
Petition for Inter Partes Review  
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wherein the wireless enabled device is configured to recognize a presence of a wearer of the eyewear based at least in part on communication with the wireless chip.

Petitioner asserts that a POSITA would have been motivated to implement Rosenblatt's disclosure of a "key"—which allegedly embodies key limitations of claim 11—in the eyewear of either Jannard-740 (ground 4) or Chen (ground 7, (Petition, 46-51, 64-70).) But a POSITA would not have been motivated to combine Rosenblatt with either primary reference. And in the case of ground 7, even if a POSITA were to combine the references' teachings as suggested, the resulting combination still does not render obvious all limitations of claim 11.

**1. A POSITA would not have been motivated to implement the teachings of Rosenblatt in Jannard-740.**

A POSITA would not have been motivated to combine the eyewear teachings of Jannard-740 with Rosenblatt's "key" of to achieve eyewear "wherein the wireless enabled device is configured to recognize a presence of a wearer of the eyewear based at least in part on communication with the wireless chip," as required by claim 11. The excessive size and power requirements needed to implement Rosenblatt's key within the confines of the eyewear of Jannard-740 would render the combination inoperable. (EX-2014, ¶47.)

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A POSITA would not have been motivated to combine the eyewear teachings of Jannard-740 with Rosenblatt's "key" of to achieve eyewear "wherein the wireless enabled device is configured to recognize a presence of a wearer of the eyewear based at least in part on communication with the wireless chip," as required by claim 11. The excessive size and power requirements needed to implement Rosenblatt's key within the confines of the eyewear of Jannard-740 would render the combination inoperable. (EX-2014, ¶47.)

(POR, 18) (annotated)

devices, such as cell phones. A POSITA would have understood that the only Rosenblatt "keys" capable of the functionality recited in claim 11 were housed in electronic devices too large for adaptation to eyewear.

(Sur-Reply, 2) (annotated)

Patent Owner's Sur-Reply to  
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transceiver (or other components like a display and user interface), smaller key embodiments would include more rudimentary components, such as "radio-frequency identification (RFID) transponder tags." (EX-2014 at ¶49.) Petitioner does not challenge the physical reality of "very small device" keys necessarily having less physical space for components (and thus functionality) compared to relatively larger devices, such as cell phones. A POSITA would have understood that the only Rosenblatt "keys" capable of the functionality recited in claim 11 were housed in electronic devices too large for adaptation to eyewear.

Petitioner apparently recognizes the shortcomings of Rosenblatt's "keys," adding a new prior art reference (U.S. Patent App. Publ. No. 2006/0023158 to Howell et al. ("Howell-158")) in a belated attempt to bolster its original invalidity grounds. (Reply, 9.) But Petitioner may not use a reply to rehabilitate its petition grounds or chart a new course in search of a *prima facie* obviousness case. (*E.g.*, 35 U.S.C. § 312(a)(3); 37 C.F.R. § 42.33(b); Patent Trial and Appeal Board Consolidated Trial Practice Guide, November 2019 at pp. 73-74; *see, also, generally* Paper 30). And even if the Board were to consider this new reference, Howell-158's passing mention of "Bluetooth" and "the Internet" is not directed to the removable electronic device shown in FIGS. 8F-8H. (*Compare* Reply, 10-11 with Howell-158, ¶¶ 78-90, 112.)

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# PO's Flawed Understanding Of The Art And Arguments

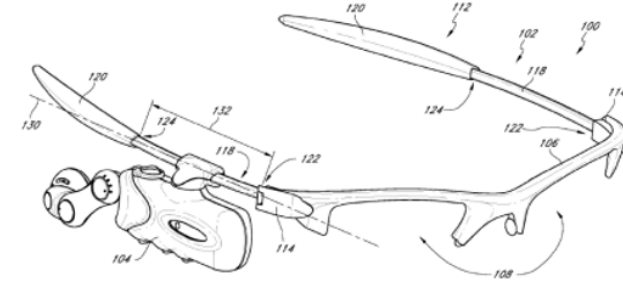
## Dr. Oliver's testimony:

49. Circuits such as radio-frequency identification (RFID) transponder tags and basic radio or infrared wireless remote controls, which generally form the basis for car key fobs, would have been suitable for inclusion in those devices. However, a POSITA would have known at the time that more advanced circuits, such as processors and memory needed to run programs, storage for data and programs (which can include memory, such as non-volatile memory, solid-state drives, etc.) and more advanced wireless transceiver (transmitter-receiver) chips (for instance, chips designed to use WiFi standards) would not fit in such rudimentary devices. In relation to wireless transceivers, I note that Rosenblatt describes a type of key that “creates personal area networks.” (*Id.*, [0057]). The ability to create personal area networks, such as “WiFi hotspots” and “ad hoc networks” is a feature of wireless transceivers, including WiFi and Bluetooth chipsets used in desktops, laptop computers, tablets and smartphones. Although Rosenblatt includes a “key fob” and

(Ex. 2014, ¶149) (annotated)

## Dr. Feland's testimony:

155. As I explained for claim 1 in Section V, Jannard-740 discloses eyewear comprising an eyewear frame and an application module that is mechanically coupled to the eyewear frame. *Supra* §§V.A.1-2, V.A.4.



Ex. 1005 (Jannard-740), Fig. 3. Jannard-740 also discloses its application module includes a wireless chip and a transmitter. *Supra* §V.A.5; Ex. 1005 (Jannard-740), [0011], Claim 10. As a result, Jannard-740 discloses every limitation of claims 11 and 22 other than perhaps that [i] another device recognizes a presence of a wearer from communication with the wireless chip (claim 11) and [ii] the application module transmits a password for accessing a computer (claim 22). However, as described in Rosenblatt, it would have been well known to a POSITA to use a wireless chip and transmitter for those functions. Ex. 1007 (Rosenblatt), [0058]-

(Ex. 1003, ¶1155) (annotated)

# The '960 Patent's Own Disclosure



A patent demonstrates that an alleged invention was within the scope of the ordinary skill in the art, "not by what [the patent] discloses but by what it does not disclose."

*Abbott Labs. v. Andrx Pharms., Inc.*, 452 F.3d 1331, 1341 (Fed. Cir. 2006)

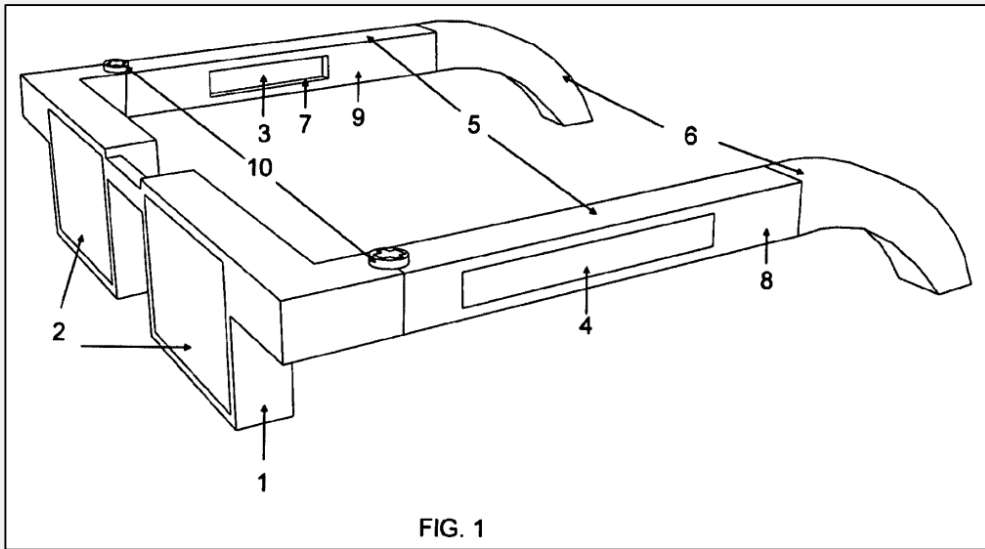


"[T]he Board's observation that appellant did not provide the type of detail in his specification that he now argues is necessary in prior art references supports the Board's finding that one skilled in the art would have known how to implement the features of the references and would have concluded that the reference disclosures would have been enabling."

*In re Epstein*, 32 F.3d 1559, 1568 (Fed. Cir. 1994)

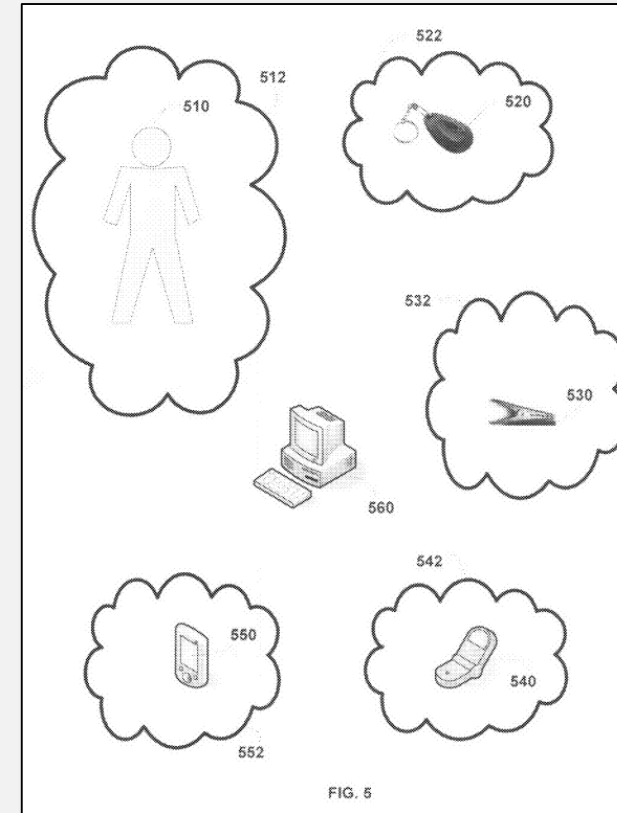
# Ground 7

# Claims 11 And 22 Unpatentable Over Chen And Rosenblatt



**Chen**

+



**Rosenblatt**

## PO's Repeated Ground 4 Arguments Fail

- ⌚ Patent Owner's reliance on its Ground 4 arguments does not overcome the Petition's showing of unpatentability with respect to Ground 7

# PO Wrongly Argues Chen Is Non-Analogous Art

Patent Owner's Sur-Reply to  
Petitioner's Reply for *Inter Partes* Review  
U.S. Patent No. 10,598,960

## 1. Chen Is Non-Analogous Art

Petitioner argues in its reply that Chen is “analogous art.” (Reply, 12.) However, Chen fails both prongs of the analogous art test. Chen is neither from the same field of endeavor as the claimed invention nor “reasonably pertinent to the particular problem with which the inventor is involved.” *Sanofi-Aventis Deutschland GmbH v. Mylan Pharm. Inc.*, 66 F.4th 1373, 1377 (Fed. Cir. 2023) (citing *In re Bigio*, 381 F.3d 1320, 1325 (Fed. Cir. 2004) with approval).

Petitioner attempts to draw together the concepts of “wearable embedded electronics” (of the ‘960 patent) and “thermally regulated clothing” (of Chen). (See Reply, 12-13.) But even to the extent these concepts overlap, a POSITA would not find the field of wearable embedded electronics to be the same field as thermally regulated clothing, because of the distinct focus of each pursuit.

For example, a POSITA would understand the ‘960 patent to concern wearable embedded electronics because the background, claims, figures, and detailed description concern exactly that: electronics, embedded, in a wearable. For example, each claim of the ‘960 patent recites, *inter alia*, an “application module.” Each figure of the ‘960 depicts an application module and/or its wearable implementation or functionality, while the detailed description describes it. Even the background of the ‘960 patent recognizes the need for “different application devices while the wearer is wearing the eyewear.” (EX-1001, 1:61-62.)

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(Sur-Reply, 12) (annotated)

# PO's Same-Field Arguments Improperly Limit Chen To One Example

Patent Owner's Sur-Reply to  
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U.S. Patent No. 10,598,960

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12

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(Sur-Reply, 12) (annotated)

structures that facilitate their use. (*Id.*, FIGS. 1-6.) By any objective measure, Chen concerns the field of thermally regulated clothing. This is a different field than embedded electronics, and so Petitioner's argument fails.

(Sur-Reply, 13) (annotated)

Patent Owner's Sur-Reply to  
Petitioner's Reply for *Inter Partes* Review  
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Petitioner's baseless attempt to rope in all wearable products into an amorphous field of endeavor does not change the fact that Chen concerns thermally regulated clothing. Taking a holistic, reality-of-the-circumstances view, each section of Chen would guide a POSITA to the field of thermal regulation. For example, Chen's claim 1 requires "at least one removable modular cartridge *for thermal regulation*." (EX-1010, cl. 1 (emphasis added).) Further, Chen's field of invention states that its invention relates to "thermal regulation of the head." (*Id.*, 1:20-22.) And each Chen figure (and accompanying description) shows thermal regulating cartridges and/or structures that facilitate their use. (*Id.*, FIGS. 1-6.) By any objective measure, Chen concerns the field of thermally regulated clothing. This is a different field than embedded electronics, and so Petitioner's argument fails.

Chen is also not reasonably pertinent to the problem faced by the inventor. Here, Petitioner relies on a single sentence in Chen noting that its cartridge 3 "is not limited to just this functionality but can also include any other function(s) that are only restricted by the component(s) & material(s) in the cartridge as well as the physical dimensions of the compartment & the cartridge." (Reply, 14 (citing EX-1010, 5:61-6:4).) However, a POSITA would read this statement in the context of Chen's thermal regulation teachings. Presented in context, Chen contemplates that while in some instances, "cartridge 3 . . . regulate[s] his/her head temperature in a convenient and

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# Chen Is From The Same Field As The '960 Patent

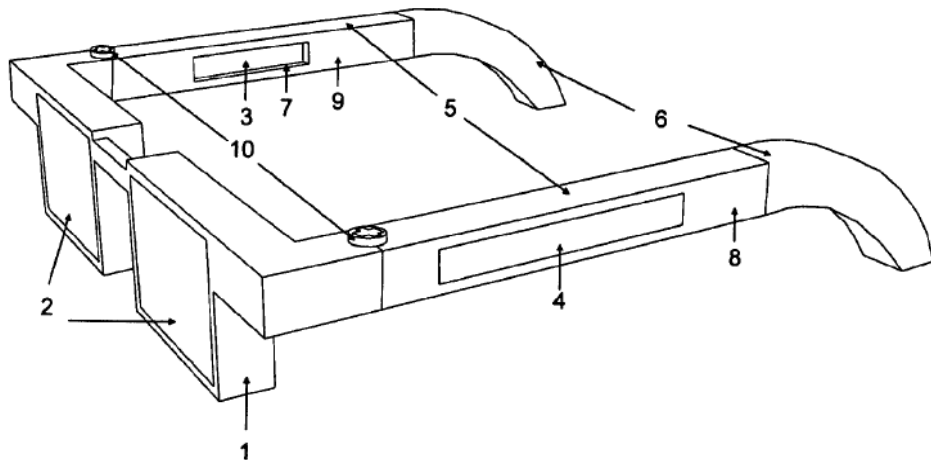
(12) **United States Patent**  
**Chen et al.**

(10) **Patent No.:** US 7,306,332 B2  
(45) **Date of Patent:** Dec. 11, 2007

(54) **EYEWEAR TEMPLE ASSEMBLY**

4,806,008 A 2/1989 Tarloff

(Ex. 1010, Cover Page) (annotated)



(Ex. 1010, Fig. 1)

## FIELD OF THE INVENTION

In one aspect, the present invention relates to eyewear with temple assemblies that contain storage recesses and detachable temples, temple tips, or other temple attachments. In another aspect, the present invention is related to eyewear with temple components that provide additional functions. In yet another aspect, the present invention relates

(Ex. 1010, 1:13-20) (annotated)

securely placed into cartridge compartment 7. Cartridge 3 is comprised of materials and components, including electronic or non-electronic or any combination thereof, which will provide useful functions. For instance, cartridge 3 can

(Ex. 1010, 5:61-64) (annotated)

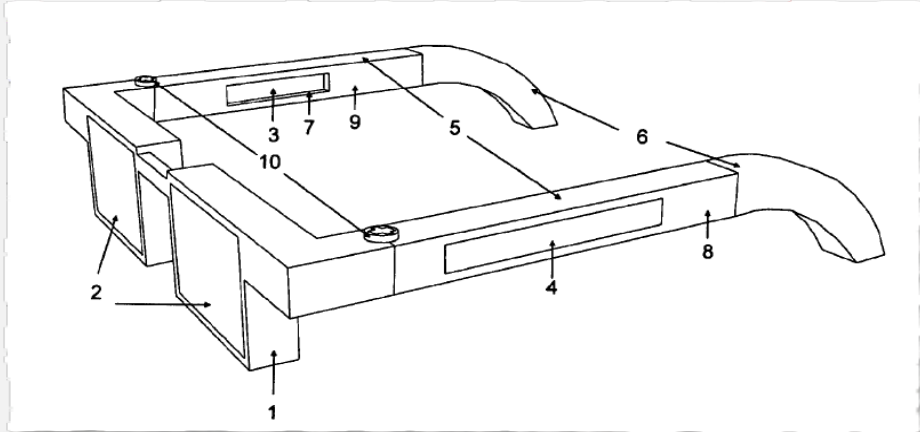
# Like The '960 Patent, Chen Addresses Wearable Electronics

## PATENT OWNER'S SUR-REPLY TO PETITIONER'S REPLY

Chen would not have logically commanded itself to the attention of a POSITA because the inventor addressed the problem of wearable embedded electronics. A POSITA would have understood that the types of cartridges (e.g., those housing phase-change materials; *see, e.g.*, EX-2023; EX-2024) and structures for regulating thermal flow therefrom, would not be relevant to wearable embedded electronics. The fact that Chen includes a single sentence describing its thermal regulating cartridges as “electric” does not change this result. (*See*, EX-1010, 5:61-6:4.) The mere presence of

(Sur-Reply, 14) (annotated)

# Chen Teaches An Application Module



(Ex. 1010, Fig. 1)

securely placed into cartridge compartment 7. Cartridge 3 is comprised of materials and components, including electronic or non-electronic or any combination thereof, which will provide useful functions. For instance, cartridge 3 can be a simple, miniature, thermal regulating cartridge that an eyewear user utilizes to regulate his/her head temperature in a convenient and unobtrusive manner. However, a cartridge is not limited to just this functionality but can also include any other function(s) that are only restricted by the component(s) & material(s) in the cartridge as well as the physical dimensions of the compartment & the cartridge.

(Ex. 1010, 5:61-6:4) (annotated)

# PO Misstates Petitioner's Arguments Regarding Chen's Cartridge

Patent Owner's Sur-Reply to  
Petitioner's Reply for Inter Partes Review  
U.S. Patent No. 10,598,960

such, Chen would not have been at the logical command of the inventor who attacked a wholly different problem.

In sum, Chen is non-analogous art because it is not in the same field of endeavor as the '960 patent, nor is it reasonably pertinent to the problem faced by the inventor, as demonstrated herein.

## 2. Chen Does Not Teach Or Suggest The Claimed "Application Module"

Petitioner asserts that Chen's background description of a *prior art* document discussing use of Bluetooth in an eyeglass temple discloses that *Chen's thermal cartridges* communicate wirelessly. (See, Reply, 15-16 (citing EX-1010, 1:63-2:2).) But the relevant question is whether a POSITA would have understood Chen to disclose or suggest incorporating Bluetooth or other wireless functionality into its thermally regulated cartridges. It does not.

In its reply, Petitioner cites the testimony of its expert, Dr. Feland, who opined that POSITA would have been motivated to include a Bluetooth component in Chen's glasses based on the following passage of Chen: "incorporate detachable parts and concealable compartments, which can store or hold additional functional components." (See, Reply, 16 (citing EX-1010, 1:32-34; EX-1003, ¶234).) But the ability to store and conceal additional functional components does not teach or suggest incorporating Bluetooth in Chen's thermally regulated cartridges. To the contrary, a

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Petitioner asserts that Chen's background description of a *prior art* document

discussing use of Bluetooth in an eyeglass temple discloses that *Chen's thermal cartridges* communicate wirelessly. (See, Reply, 15-16 (citing EX-1010, 1:63-2:2).)

But the relevant question is whether a POSITA would have understood Chen to disclose or suggest incorporating Bluetooth or other wireless functionality into its thermally regulated cartridges. It does not.

(Sur-Reply, 15) (annotated)

wireless enabled device." POR, 27-28. But PO ignores Chen's disclosure about embedding a Bluetooth component in the temple of eyewear. Ex. 1010, 1:63-2:2.

Indeed, PO fails to address the Petition's clear showing that Chen suggests using application modules with a wireless chip, including, for example:

To the extent PO argues that Chen does not expressly disclose a cartridge having a wireless chip, a POSITA would have been motivated to incorporate a wireless chip in a cartridge in view of Chen's highlighting of the Bluetooth component and cell phone capabilities and Chen's recommendation to "incorporate detachable parts and concealable compartments, which can store or hold additional functional components." [Ex. 1010], 1:32-34; Ex. 1003, ¶234.

Pet., 69. Similarly, PO does not rebut that "Rosenblatt suggests incorporating a

(Reply, 15-16) (annotated)

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*Luxottica v. e-Fision*

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Pet., 69. Similarly, PO does not rebut that "Rosenblatt suggests incorporating a wireless chip in a device like Chen's cartridge" and "[a] POSITA would have been motivated to incorporate Rosenblatt's key with its wireless chip or a wireless chip like Rosenblatt's in one of Chen's cartridges." *Id.*, 69-70.

## V. INDEPENDENT CLAIM 22 IS UNPATENTABLE

PO repeats its arguments from Ground 4 and 7 concerning claim 11, now in relation to claim 22. POR, 28-29. Specifically, PO argues the combinations would have been "inoperable" due to excessive size, weight, and power requirements. *Id.* PO also challenges the combination of Chen and Rosenblatt, asserting it fails to disclose or suggest the claimed application module. POR, 29. These arguments fail for the reasons above discussed with respect to claim 11. *Supra* §IV.

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# **Grounds 4 and 7: Dependent Claims**

# Claim 24: PO Is Wrong On Brightness Adjustment

24. The eyewear of claim 22, wherein the wireless enabled device is configured to adjust a brightness and/or a volume of the computer.

(Ex. 1001, claim 24)

## PO's arguments:

<sup>1</sup> Petitioner asserts that “wireless enabled device” must be construed as “computer” to avoid indefiniteness. The distinction between the two is irrelevant to Patent Owner's arguments in this proceeding, as the prior art also fails to disclose or render obvious a computer.

(POR, 36 n.1) (annotated)

In the reply, Petitioner doubles down on its use of Rosenblatt's mere mention of a display—“may include a display”—as evidence that it would have been obvious to adjust brightness using a wireless enabled device. (Reply, 20-21.) But mere mention of a display does not disclose or suggest brightness control, much less doing so with a wireless enabled device. For example, Petitioner's reply points to an unrelated portion

(Sur-Reply, 21) (annotated)

# PO's Admission Contradicts Its Arguments For Claim 24

Furthermore, the resulting combinations of Rosenblatt with Jannard-740 and Rosenblatt with Chen fail to disclose the limitations of claim 24. The petition and its accompanying expert declaration incorrectly cite to Rosenblatt as evidence of “adjusting a brightness or volume of the computer” but Rosenblatt merely indicates that a computer “may include a display” (EX-1007, [0051]-[0053]), without discussion of brightness or volume control in a computer. (See petition, 59, 73; EX-1003, ¶¶ 207-209, 253.)

(POR, 37) (annotated)

Patent Owner's Response to  
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Furthermore, the resulting combinations of Rosenblatt with Jannard-740 and Rosenblatt with Chen fail to disclose the limitations of claim 24. The petition and its accompanying expert declaration incorrectly cite to Rosenblatt as evidence of “adjusting a brightness or volume of the computer” but Rosenblatt merely indicates that a computer “may include a display” (EX-1007, [0051]-[0053]), without discussion of brightness or volume control in a computer. (See petition, 59, 73; EX-1003, ¶¶ 207-209, 253.)

## 12. Dependent Claim 26 Is Patentable

Claim 26 recites: the “eyewear of claim 22, wherein the wireless enabled device is configured to access an email via the computer.” Petitioner asserts only grounds 4 and 7 against this dependent claim. A POSITA would not have been motivated to combine the key in Rosenblatt with the eyewear of Jannard-740 or Chen for the reasons discussed above in respect of claim 22.

## V. Dependent Claim 19 Is Patentable

Claim 19 recites: the “eyewear of claim 16, wherein the wireless enabled device is configured to control a functionality of the automobile to awake the wearer should the wearer fall asleep.” Petitioner asserts grounds 5 and 8 against this dependent claim, which add Gunaratne to the combination of Jannard-740 or Chen (respectively) and Rosenblatt.

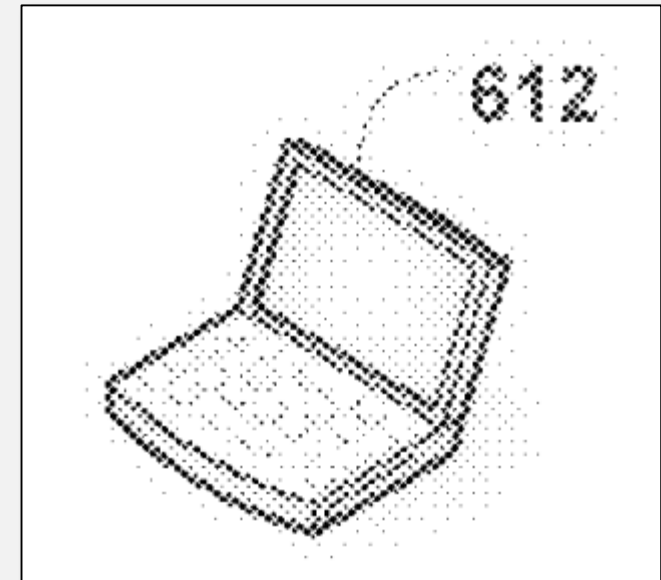
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# A Computer Varies The Brightness Of Its Display

## Dr. Feland's testimony:

208. Rosenblatt provides that a host device like a computer “may include a display....” Ex. 1007 (Rosenblatt), [0051]-[0053]. The display of the computer varies its brightness to visually present information to a user of the computer. Ex. 1011 (Microsoft Computer Dictionary), 5 (display being “[t]he visual output device of a computer ...”).

(Ex. 1003, ¶208)



(Ex. 1007, Fig. 6 (excerpt))

# Grounds 5 and 8

# Claim 19: Rosenblatt Discloses Many Of The Claimed Features

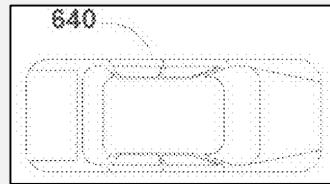
16. The eyewear of claim 11, wherein the wireless enabled device is located in an automobile.

19. The eyewear of claim 16, wherein the wireless enabled device is configured to control a functionality of the automobile to awake the wearer should the wearer fall asleep.

## Rosenblatt:

[0061] FIG. 6 shows computer 610, laptop 612, television system 620, multimedia system 630, automobile 640, door 650, lamp 660, heating and/or air conditioning system 670, elevator 680, and motor 690. The devices and systems of FIG. 6 may be configured to perform various operations when a key is placed in proximity of the device or system such that the device or system is within the network created by the key. For example, computer 610 and laptop 612 may be configured to automatically log the user associated with the key into the computer system. *As another example, computer 610 and*

(Ex. 1008, [0061]) (annotated)



(Ex. 1008, Fig. 6 (excerpt))

[0063] Automobile 640 may be configured to perform any of a number of operations when a key is brought in proximity of the automobile. For example, automobile 640 may unlock one or more of its doors when the key is brought in proximity of the automobile. As another example, automobile 640 may automatically start its engine. As still another example, automobile 640 may automatically turn on the heating or air conditioning system of the automobile. *As another example,*

(Ex. 1008, [0063]) (annotated)

# Gunaratne discloses Automobile Functionality To Wake Drivers

US 2010/0238034 A1

Sep. 23, 2010

## SYSTEM FOR RAPID DETECTION OF DROWSINESS IN A MACHINE OPERATOR

### FIELD OF THE INVENTION

[0001] The present invention relates to a system for detecting drowsiness in a machine operator, and in particular, to a system having a facial action database with a plurality of stored high priority sleepiness facial actions that are used for rapidly detecting drowsiness in a machine operator.

### BACKGROUND OF THE INVENTION

[0002] Accidents involving machines such as motor vehicles, heavy equipment machinery, metal stamping equipment and the like are known to occur when an operator of the machine becomes drowsy, distracted, etc. It is an attempt to anticipate motor vehicle driver drowsiness, video monitoring systems that focus on the driver and capture images of the driver's facial characteristics are known. For example, U.S. Patent Application Publication No. 2007/015944 discloses a system that processes three points of a driver's facial feature in order to calculate a head pose of the driver and determine their state during operation of a motor vehicle.

[0003] Other systems use facial imaging in order to determine behavior related to "road rage", "bitching", drowsiness during monitoring of computer displays and the like. However, heretofore systems and methods have required excessive computation time and/or complex modeling of facial features in order to attempt an evaluation as to whether or not an individual is becoming or has become drowsy. As such, an improved system and/or process for rapidly detecting the drowsiness of an individual while operating a machine would be desirable.

### SUMMARY OF THE INVENTION

[0004] The present invention discloses a system and a process for detecting drowsiness in an individual operating a machine. The system includes an image acquisition module that can electronically capture a plurality of facial images of the individual. In addition, the system has a face localization module with a generic face mesh grid (GFMG), the face localization module able to create a neutral face mesh grid (NFMG) by fitting the GFMG to a desired first captured facial image and a subsequent face mesh grid (GFMG) by fitting the GFMG to a desired second captured facial image.

[0005] A facial orientation module can also be included; the facial orientation module able to determine a variation between a facial orientation parameter of the neutral face mesh grid and an equivalent facial orientation parameter of the subsequent face mesh grid. Such a variation can be known as a facial variation. The facial action database having a plurality of stored high priority sleepiness facial actions can also be included with each of the stored high priority sleepiness facial actions having an assigned sleepiness severity value.

[0006] An action estimation module can compare the facial variation with the plurality of stored high priority sleepiness facial actions in the facial action database. In addition, one of the stored high priority sleepiness facial actions that is within a predetermined range of likeness can be selected. Thereafter, a matching module can identify and select one or more additional stored high priority sleepiness facial actions that are within a predetermined range of likeness to the initially selected stored high priority sleepiness facial

action. A sleepiness level module can then compare the assigned sleepiness severity values of all the selected stored high priority sleepiness facial actions and generate a current level of sleepiness, the current level of sleepiness being the stored high priority sleepiness facial action corresponding to a sleepiness level that has the highest probability of being present in the individual. In addition, a warning module can activate an actuator that alerts the individual as a function of the current level of sleepiness.

### BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIG. 1 is a schematic flowchart illustrating an embodiment of the present invention;

[0008] FIG. 2 is a schematic representation of a facial image representing facial landmark points thereon;

[0009] FIG. 3 is a schematic representation of a generic face mesh grid being fit to a facial image of an individual;

[0010] FIG. 4 is a schematic illustration of a pose parameter for a stored face mesh grid;

[0011] FIG. 5 is a schematic illustration of an eye boundary region and a mouth boundary region;

[0012] FIG. 6 is a schematic illustration of a facial variation being submitted to and compared with a plurality of stored high priority sleepiness facial actions within a facial action database;

[0013] FIG. 7 is a schematic representation of the selection of additional stored high priority sleepiness facial actions that are within a predetermined range of likeness to a previously selected stored high priority sleepiness facial action;

[0014] FIG. 8 is a schematic representation of a trigger data packet;

[0015] FIG. 9 is a graphical representation of a sleepiness level as a function of time; and

[0016] FIG. 10 is a flowchart illustrating a process for an embodiment of the present invention.

### DETAILED DESCRIPTION OF THE INVENTION

[0017] The present invention discloses a system for detecting drowsiness of an individual operating a machine. In addition, a process for detecting drowsiness in the individual is disclosed. As such, the present invention has utility as a safety feature for a machine.

[0018] The system can rapidly detect the drowsiness of an individual operating a machine and thereby improve the performance and/or safety of the individual, other individuals in the vicinity of the machine and the like. The system can include an image acquisition module that can electronically capture a plurality of facial images of the individual. In some instances, the individual can be a driver of a motor vehicle, an operator of heavy equipment machinery, an operator of metal stamping equipment and the like.

[0019] A face localization module can have a generic face mesh grid (GFMG) and be operable to create a neutral face mesh grid (NFMG) by fitting the GFMG to a desired first captured facial image. In the alternative, the GFMG can be a neutral model of a face and the NFMG determined by comparing the face mesh grids that have been fit to captured facial images until one of the fitted face mesh grids is selected because it is within a predetermined range of likeness of the GFMG. In yet another alternative, the NFMG can be determined by fitting the GFMG to a specific number of initial facial images and selected the face mesh grid that has the minimum difference with the GFMG. The eye and/or mouth

[0018] The system can rapidly detect the drowsiness of an individual operating a machine and thereby improve the performance and/or safety of the individual, other individuals in the vicinity of the machine and the like. The system can include an image acquisition module that can electronically capture a plurality of facial images of the individual. In some instances, the individual can be a driver of a motor vehicle, an operator of heavy equipment machinery, an operator of metal stamping equipment and the like.

(Ex. 1008, [0018]) (annotated)

[0026] In some instances, the selected SHPSFAs with their assigned sleepiness severity values are compared with a previous current sleepiness level and used to estimate an updated or new current sleepiness level. In this manner, current facial variations can be compared and evaluated with previous facial actions and used to determine whether or not a particular captured facial image represents the individual becoming more drowsy or whether the captured image is simply a misleading indicator of drowsiness. After the current sleepiness level has been determined, an actuator can be actuated in order to alert the individual and/or surrounding individuals if required. In some instances, the actuator can be an audio actuator such as a beep, a radio in a motor vehicle, a bell, and the like. In other instances, a light actuator can be energized and/or a tactile actuator can be used to alert the individual that he or she is becoming drowsy and may fall asleep unless proper action is taken.

(Ex. 1008, [0026]) (annotated)

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regions of the NFMG can be segmented by tracing the boundaries of the eyes and/or mouth of the NFMG using a boundary tracing circuit. The boundaries of the eyes and/or mouth can be labeled and zero-motion parameters for the pose (P), eyes (E), and mouth (M) of the NFMG can be determined, stored as reference values and used in subsequent analyses.

[0020] The face localization module can create a subsequent face mesh grid (GFMG) by fitting the GFMG to a desired second captured facial image and a facial orientation module can be provided and used to determine a variation between a facial orientation parameter of the NFMG and an equivalent facial orientation parameter of the GFMG. Such a variation can be known as a facial variation. The facial variation can be a variation estimated from the zero-motion parameters of the NFMG and the pose, eyes and/or mouth parameters (P, [E], [E], [E]) and/or M, [m], [m]) of the GFMG. It is appreciated that the pose parameter of the face mesh grids can be determined with respect to three-dimensional space.

[0021] Once the facial variation has been determined, an action estimation module can compare the facial variation to a plurality of high priority sleepiness facial actions (SHPSFAs) stored within a facial action database, also known as a prioritized action database. In some instances, each of the SHPSFAs can have an assigned sleepiness severity value that provides a degree of sleepiness to a given facial action. It is appreciated that some facial actions represent a greater degree of drowsiness than other facial actions. As such, the plurality of SHPSFAs with their assigned sleepiness severity values can provide a ranking of facial actions that are observed when the individual goes through various stages of drowsiness ranging from being fully awake to being fully asleep.

[0022] If the action estimation module identifies a SHPSFA that matches the facial variation within a predetermined range of likeness, a mouth trigger can be generated and the SHPSFA selected. In addition, a matching module can be used to identify and select one of the other SHPSFAs in the facial action database that are within a predetermined range of likeness to the initially selected SHPSFA. Thereafter, a sleepiness level module can evaluate all of the selected SHPSFAs with their assigned sleepiness values and estimate probabilities of current sleepiness levels. The sleepiness level module can also evaluate all of the selected SHPSFAs with prior probability estimates of current sleepiness levels and further estimate which SHPSFA has the highest probability and thus which sleepiness level has the highest probability of being present in the individual. Thereafter, a drowsiness trigger can be generated for the current sleepiness level having the highest probability and a warning module can activate an actuator that can alert the individual and/or other individuals that may be in the near vicinity.

[0023] In some instances, the face localization module can have a facial landmark point circuit to select a set of facial landmark points on each of the plurality of captured images of the machine operator. It is appreciated that a facial landmark point can be a point on a facial image that can be easily and uniquely identified by the face localization module. In addition, the face localization module can use the set of facial landmark points to fit the GFMG to the desired first captured facial image and any subsequent captured facial images.

[0024] Regarding the eye parameter and the mouth parameter, a facial parts segmentation module having a boundary tracing circuit can be provided. The boundary tracing circuit can trace an eye region and/or a mouth region of the NFMG and the NFMG with the eye parameter being a boundary of

the eye region and the mouth parameter being a boundary of the mouth region. The facial parts segmentation module can calculate an eye region variation between the eye region boundaries of the SHPSFA and the NFMG (E-E), and a mouth region variation between the mouth region boundaries of the SHPSFA and the NFMG (M-M).

[0025] After a SHPSFA that matches the facial variation of the individual within a predetermined range of likeness has been selected, along with all SHPSFAs that are within a predetermined range of likeness to the initially selected SHPSFA, a trigger data packet module can generate a trigger data packet that contains data on all of the selected SHPSFAs. Thereafter, a drowsiness trigger module can evaluate all of the selected SHPSFAs with their assigned sleepiness severity values and determine a probability for each candidate high priority sleepiness action. It is appreciated that the high priority sleepiness action with the highest probability can be associated with a level of drowsiness for the individual currently being experienced and can be known as the current level of sleepiness of current sleepiness level.

[0026] In some instances, the selected SHPSFAs with their assigned sleepiness severity values are compared with a previous current sleepiness level and used to estimate an updated or new current sleepiness level. In this manner, current facial variations can be compared and evaluated with previous facial actions and used to determine whether or not a particular captured facial image represents the individual becoming more drowsy or whether the captured image is simply a misleading indicator of drowsiness. After the current sleepiness level has been determined, an actuator can be actuated in order to alert the individual and/or surrounding individuals if required. In some instances, the actuator can be an audio actuator such as a beep, a radio in a motor vehicle, a bell, and the like. In other instances, a light actuator can be energized and/or a tactile actuator can be used to alert the individual that he or she is becoming drowsy and may fall asleep unless proper action is taken.

[0027] A process for rapidly detecting drowsiness in the individual can include capturing a plurality of facial images as a function of time an individual is operating a machine. For example and for illustrative purposes only, facial images of a driver for a motor vehicle can be taken at predetermined time intervals and may or may not be taken during short trips in the vehicle, for example short commuting trips to work, to run errands and the like. Stated differently, the system and the process has flexibility such that the manufacturer and/or the individual operating the machine can determine whether or not the system should be operated during short trips taken by a driver of a motor vehicle, small jobs performed by an operator of heavy equipment machinery and the like.

[0028] The process also includes selecting a set of facial landmark points on a desired first captured facial image and another set of facial landmark points on a desired second captured facial image. Thereafter, a NFMG can be created by fitting a GFMG to the set of facial landmark points on the desired first captured facial image and a SHPSFA can be created by fitting the GFMG to the set of facial landmark points on the desired second captured facial image. In the alternative, the GFMG can be a neutral model of a face and the NFMG created by comparing the face mesh grids that have been fit to captured facial images until one of the fitted face mesh grids is within a predetermined range of likeness of the GFMG and is thus selected. In yet another alternative, the NFMG can be created by fitting the GFMG to a specific number of initial

## PO's Grounds 5 And 8 Arguments Fail

- ④ **Non-analogous art:** Patent Owner's arguments do not address Petitioner's same-field and same-problem analysis
- ④ **Inoperability:** Patent Owner claims inoperability of Gunaratne, but denies it presents a non-enablement theory
- ④ **Mischaracterizes Petition:** Patent Owner mischaracterizes Petitioner's arguments as "incorporat[ing] Gunaratne's system into eyewear"
- ④ **Mischaracterizes claim:** Patent Owner mischaracterizes the claim, suggesting that Petitioner must show "a wearable, 'wireless enabled device'"

# Grounds 6 and 9

# Claim 25: Nielsen Discloses The Dependent Claim Functionality

**25.** The eyewear of claim 22, wherein the wireless enabled device is configured to adjust a font size of an application in the computer.

## Nielson:

### 1. Field of the Invention

The invention relates to information retrieval, and more particularly to adaptively changing the font size with which information retrieved over a network is displayed.

(Ex. 1009, 1:9-11) (annotated)

Thus the prior art does not provide a way for adapting font size in a browser or other User Interface based on user font-size preferences for retrieved documents.

The prior art also fails to accommodate the needs of a variety of network users who have different individual preferences for viewing documents, the source copy of which must be shared with other users. The prior art also fails to account for display differences which may cause the same document to appear differently on different displays.

(Ex. 1009, 1:55-63) (annotated)

## PO's Grounds 6 And 9 Arguments Fail

- ④ **Non-analogous art:** Patent Owner's arguments do not address Petitioner's same-field and same-problem analysis
- ④ **Inoperability:** Patent Owner wrongly claims inoperability of the combination, arguing "there would be no basis for the preference detection techniques to occur"
- ④ **Mischaracterizes Petition:** Patent Owner mischaracterizes Petitioner's arguments as "substitut[ing] the Nielsen database analysis system into eyewear"