

EXHIBIT 2003 (Cumulativeness of Goldstein873 and Goldstein9797)

Claim Element	Claim Feature	Petitioner's Reliance on Goldstein873	Goldstein797
39[pre]	"A system comprising:"	"Goldstein873 [alone] teaches this feature." Pet., 10. "Goldstein873 discloses an earpiece 100 that 'includes an Ambient Sound Microphone (ASM) 110 to capture ambient sound, an Ear Canal Receiver (ECR) 120 to deliver audio to an ear canal 140, and an ear canal microphone (ECM) 130 to assess a sound exposure level within the ear canal.' Goldstein873, [0024]." <i>See also</i> Goldstein873, FIGs. 1, 2. "Goldstein873 discloses that the earpiece 100 can represent 'a single operational device or a family of devices configured in a master-slave arrangement, for example, a mobile device and an earpiece,' and that 'the components of the earpiece 100 can be reused in different form factors for the master and slave devices.' Id., [0030]." Pet., 10.	"Audio input 11 (ambient microphone) is housed in assembly 13 and monitors sound pressure at the entrance to the occluded ear canal." Goldstein797, [0046] (similar to ASM) "An initial hearing test is performed in a step 561, which acquires data indicative of the users hearing sensitivity. The test may be an otoacoustic emission (OAE) test or audiogram administered utilizing the ear canal receiver or speaker 25." Goldstein797, [0078] (similar to ECR) "Located adjacent to speaker 25, is an ear canal microphone 23, which is also acoustically coupled to closed cavity 31." Goldstein797, [0046] (similar to ECM) Goldstein797 does not explicitly describe a primary-secondary arrangement like the Goldstein873 reference, but implicitly discusses this relationship. For example, "[h]owever, the test [to earpiece 100] can also be administered over the Internet, telephone or other communication device capable of outputting sounds sent across a distributed

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		"Goldstein873 further discloses that the earpiece 100 'can be connected via a wired connection to the media player, or via a wireless connection (e.g. Bluetooth),' including 'a portable music player, a cell phone, a radio, a laptop, or any other mobile communication device.' Id., [0054]." Pet., 11-12.	network and enabling responsive communication. The data is stored in a computer memory as an initial test value in a step 570 and is used in further processing to detect a change in the user hearing response." Goldstein797, [0078]. "System 100 includes an audio input device 113 for receiving sound at the ear. As will be discussed below, audio input 113 can include an analog audio input 11, 23 and a digital audio input 119. In at least one exemplary embodiment, audio input 113 receives audio input from at least one of three sources, namely; ambient noise around the ear, direct input noise such as a MP3 player or other device which can produce a digital audio input at digital audio input 119, and noise as detected within the ear canal 31 (FIG. 2)." Goldstein797, [0029].
39[a]	at least one cluster of at least one computing device,	"Goldstein873 discloses that earpiece 100 includes 'a processor 206 operatively coupled to the ASM 110, ECR 120, ECM 130, and ER 160 ...' Goldstein873, [0027]." Pet, 12.	"In at least one exemplary, but non-limiting, embodiment, as will be discussed below, system 100 includes an output acoustical transducer 25 to provide an audio signal to the ear. Output acoustical transducer 25 operates under the control of a digital signal processor 134. Digital

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		“Goldstein873 explains that ‘processor 206 can produce audio from at least in part the ambient sound captured by the ASM 110, and actively monitor the sound exposure level inside the ear canal 140.’ Id. Pet., 12. Petitioner also indicates that Goldstein873 contemplates conducting a listening test and an audio adjustment using sound pressure level. Pet., 13. “Goldstein873 teaches a pair of earpieces communicatively connected to a mobile communication device (‘at least one cluster’) including at least a first earpiece 100 having a processor 206 utilizing computing technologies such as a microprocessor, ASIC, and/or DSP (‘of at least one computing device’).” Pet., 13.	signal processor 134 receives a digital audio signal from input level detector 140, which acts as a pass through for the digitized signals from audio input 113. Digital signal processor 134 passes the sound signals through to a digital to analog converter 136 to drive acoustical transducers 25 to recreate the sound received at audio input 113 inside the ear canal in at least one exemplary embodiment of the invention as shown in FIG. 2. With such an exemplary embodiment, audio warning source 132 provides an output to digital sound processor 134 causing output acoustical transducer 25 to output a warning sound inside the ear of the user.” Goldstein797, [0039]. “In the above description the operation of system 100 is driven by sound pressure level, i.e. sound levels are monitored for time periods or epochs during which the sound pressure level does not equal the minimum threshold or is constant. However, as will be discussed in connection with the next exemplary embodiments of the invention, system 100 can also operate utilizing fixed or variable sampling epochs determined as a function of one or more of time and changes in

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			sound pressure level, sound pressure dosage level, a weighted sound pressure level, and restorative properties of the ear.” Goldstein797, [0046]. “System 100 includes an audio input device 113 for receiving sound at the ear. As will be discussed below, audio input 113 can include an analog audio input 11, 23 and a digital audio input 119. In at least one exemplary embodiment, audio input 113 receives audio input from at least one of three sources, namely; ambient noise around the ear, direct input noise such as a MP3 player or other device which can produce a digital audio input at digital audio input 119, and noise as detected within the ear canal 31 (FIG. 2).” Goldstein797, [0029]. Goldstein797 does not explicitly contemplate a pair of earpieces

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39[b]	the at least one computing device including:	Points to a first earpiece 100 having a processor 206 utilizing computing technologies such as a microprocessor, ASIC, and/or DSP ('of at least one computing device')." Pet., 13.	Same as above
39[b][i]	a sound sensing mechanism, configured to: detect a sensed energy, wherein the sensed energy comprises one or more sounds; and monitor one or more parameters selected from the group of (i) an amplitude of the one or more sounds and (ii) a frequency of the one or more sounds; and	"Goldstein873 also teaches earpiece 100 including an ECM 130 ('a sound sensing mechanism') to detect sound exposure levels within the ear canal 140 ('configured to detect a sensed energy') corresponding to pass-through ambient sound and filtered audio ('wherein the sensed energy comprises one or more sounds')." Pet., 15. "A POSITA would also have understood ASM 110 and ECM 130 monitoring sound pressure levels to comprise monitoring an amplitude of the ambient sounds and the sounds within the ear canal, respectively." Pet., 16. Petitioner brings in a third Goldstein reference (Goldstein864) that is not a part of the Ground. Petitioner uses Goldstein864 to indicate Sound Pressure Levels (SPL) is a well-understood term in the art and is	"Audio input 11 (ambient microphone) is housed in assembly 13 and monitors sound pressure at the entrance to the occluded ear canal." Goldstein797, [0046] (similar to ASM). "Located adjacent to speaker 25, is an ear canal microphone 23, which is also acoustically coupled to closed cavity 31." Goldstein797, [0046] (similar to ECM). "The processor 206 can also measure an ambient sound level outside the ear canal for selected frequencies, compare the ambient sound with the SPL for the selected frequencies of the ambient sound, and determine that the earpiece is inserted if predetermined portions of the ECTF are below a threshold (this test can be conducted when the test signal is not audibly present)." Goldstein797, [0038]. "The processor 206 can produce audio from at least in part the ambient sound captured by the ASM 110, and actively

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		based on the amplitude of the sound wave. $SPL = \beta(\text{dB}) = 10 \log \frac{I}{I_0} = 10 \log \frac{\Delta P^2}{\Delta P_0^2}$ “A POSITA would thus have understood SPL to be a function of amplitude (i.e., the root mean squared pressure amplitude in a measured pressure wave) [as taught in Goldstein864] captured using a transducer (such as ASM 110 or ECM 130).” Pet., 17.	monitor the sound exposure level inside the ear canal 140.” Goldstein797, [0027]. “If microphone 11 was utilized, then the frequency-dependent earplug noise reduction rating of earpiece 13 must be accounted for to determine the sound level within the ear. Therefore, the noise reduction rating, as stored in step 310, is utilized with the sound pressure level to determine a true sound pressure level as follows: SPLACT=SPL–NRR: where sound pressure SPLACT is the actual sound pressure level perceived at the ear, SPL is the sound pressure level determined in step 436 and NRR is the noise rate reduction value stored in step 410.” Goldstein797, [0062].
39[b][ii]	a wireless transceiver; and	“Goldstein873 discloses earpiece 100 including “a transceiver 204 that can support singly or in combination any number of wireless access technologies’ Goldstein873, [0028].” Pet., 18.	“All transducers receive or transmit audio signals to an ASIC 21 that undertakes at least a portion of the audio signal processing described above and provides a transceiver for audio via the wired or

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			wireless communication path 119. " Goldstein797, [0046]
39[c]	at least one output device, including:	"Goldstein873, however, does not focus on the implementation details relating to how the pair of earpieces contemplated by Goldstein873 would operate in a master-slave arrangement.... Newham is generally directed to 'intelligently and dynamically swapping] master/slave roles among wireless nodes (e.g., wireless earpieces) coupled to a wireless source device to optimize battery life in both wireless nodes." Newham, Abstract." Pet., 19. "[I]t would have been obvious to a POSITA to implement Goldstein873's earpieces sufficiently similarly—e.g., each at least having a processor, a transceiver, a microphone, a speaker, and a power supply (e.g., a battery)—to enable the earpieces to be configured in a master-slave arrangement as taught by Newham so as to enable each earpiece to interchangeably operate as either a master device or a slave device." Pet., 23-24.	Goldstien797 does not explicitly contemplate the primary-secondary relationship stated in the petition. Rather the output device would merely be the earpiece and the input would be "direct inputs such as MP3 players, phones, radios and other acoustic electronic devices, as well as exposure to environmental or background noise, also referred to as ambient noise." Goldstein797, [0070].

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39[c][i]	a power source for operating the output device;	“Goldstein873 discloses that earpiece 100 includes ‘power supply 210’ that ‘utilize[s] common power management technologies such as replaceable batteries ... for supplying energy to the components of the earpiece 100 and to facilitate portable applications.’ Goldstein873, [0029].” Pet., 25.	“FIG. 2 depicts the electro acoustical assembly 13 as an in-the-ear acoustic assembly or earpiece, as it would typically be placed in the ear canal 31 of a users 35 ear 17.” Goldstein797, [0045]. No explicit power supply is mentioned but it would be obvious to one skilled in the art that an electro acoustical system includes a power source to generate an output.
39[c][ii]	a speaker for outputting sound; and	“Goldstein873 discloses that the earpiece 100 includes an ‘ Ear Canal Receiver (ECR) 120 to deliver audio to an ear canal 140. ’ Goldstein873, [0024].” Pet., 26-27.	“An initial hearing test is performed in a step 561, which acquires data indicative of the users hearing sensitivity. The test may be an otoacoustic emission (OAE) test or audiogram administered utilizing the ear canal receiver or speaker 25.” Goldstein797, [0078] (similar to ECR)
39[c][iii]	a communication mechanism,	“[T]he Goldstein873-Newham combination teaches a pair of earpieces 100 including a second earpiece 100 having a transceiver supporting wireless access technologies (“a communication mechanism”).” Pet., 27.	“All transducers receive or transmit audio signals to an ASIC 21 that undertakes at least a portion of the audio signal processing described above and provides a transceiver for audio via the wired or wireless communication path 119.” Goldstein797, [0046]

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39[d]	wherein the at least one computing device further comprises: a memory, containing computer-executable instructions for connecting to the at least one cluster and varying an output of the at least one output device; and	Relies on both Goldstein873 and Newham Indicates Goldstein has a processor 206 that can utilize computing technologies such as a DSP associated with storage memory.	“In at least one exemplary, but non-limiting, embodiment, as will be discussed below, system 100 includes an output acoustical transducer 25 to provide an audio signal to the ear. Output acoustical transducer 25 operates under the control of a digital signal processor 134. Digital signal processor 134 receives a digital audio signal from input level detector 140, which acts as a pass through for the digitized signals from audio input 113. Digital signal processor 134 passes the sound signals through to a digital to analog converter 136 to drive acoustical transducers 25 to recreate the sound received at audio input 113 inside the ear canal in at least one exemplary embodiment of the invention as shown in FIG. 2. With such an exemplary embodiment, audio warning source 132 provides an output to digital sound processor 134 causing output acoustical transducer 25 to output a warning sound inside the ear of the user.” Goldstein797, [0039]. “In an exemplary embodiment of the invention, the control programs are stored in a program memory 148 for

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			operating the firmware/hardware identified above. " Goldstein797, [0042].
39[e]	a processor, for executing the computer-executable instructions, wherein the computer-executable instructions include:	Essentially the same citations as 39[d].	Essentially the same citations as 39[d].
39[e][i]	determining if at least one of the monitored one or more parameters falls outside of a predetermined threshold;	"Goldstein873 explains that [d]uring intense Environmental Noise (above an Effective Quiet level), the SPL Dose will increase. During time periods of negligible environmental noise, the SPL Dose will decrease according to an Ear Recovery Function.' Goldstein873, [0045]." Pet., 31-32. "Goldstein873 discloses processor 206 determining whether 'the filtered audio is less than the Effective Quiet Level,' and, if so, 'the processor 206 can decrease the SPL dose in accordance with a decay rate (e.g. exponential).' Id., [0047]." "Goldstein873 explains that the Effective Quiet level 'can be defined as 74 dB	"A sound pressure level is estimated in step 795. It is then determined whether or not the ear canal sound pressure level is less than effective quiet in a step 732. If the sound pressure level is less than the effective quiet as determined in step 732, then the update epoch is set at the maximum update epoch in a step 730. If the sound pressure level is louder than the effective quite, then in step 716, the update epoch is set to the minimum update epoch." Goldstein797, [0057]. "As will be discussed below, the minimum level threshold can be the effective quiet level of the individual, or some predetermined level substantially corresponding to a level which is ear damage neutral over time or a level of

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		SPL for the octave band centered at 4000 Hz, 78 dB SPL for the octave band centered at 2000 Hz, and 82 dB SPL for the octave bands centered at 500 Hz and 1000 Hz.” id., [0046].” Pet., 33-34.	interest, such as 80 dB, because of its effect on the ear.” E.g., Goldstein797, [0030].
39[e][ii]	if at least one of the monitored one or more parameters falls outside of the predetermined threshold, altering one or more of the one or more sounds so that at least one of the monitored one or more parameters does not fall outside of the predetermined threshold; and	“Goldstein873 discloses that ‘the processor 206 can calculate a sound pressure level dose (SPL Dose) to quantify the sound exposure over time as it relates to sound exposure and sensorineural hearing loss.’ Goldstein873, [0044]. Goldstein873 further discloses determining whether an SPL Dose threshold is exceeded. See id., [0049], FIG. 6 (step 630). Goldstein873 discloses that ‘[i]f the filtered sound exceeds the Effective Quiet level and the SPL Dose is not exceeded at step 630, the earpiece 100 can continue to monitor sound exposure level within the ear canal 140 at step 612 and update the SPL Dose.’ Id., [0049]. If, however, both are exceeded, Goldstein873 discloses that ‘the processor 206 can adjust (e.g. decrease/increase) a level of the filtered sound’ based on the user’s personalized hearing level. Id.” Pet., 35.	“If in step 322 it is determined that the differential is not greater than the level change threshold, including negative values for A (which are restorative values), then in step 326 it is determined whether or not the differential, as determined in step 316, is less than the level change threshold in a step 322. If it is determined that the differential is not less than the level change threshold, then the received noise was the effective quiet level, i.e., the level change threshold equals zero and in a step 330, the current SPL Dose is maintained at the same level. There is no change to the dose level. However, if the differential A is less than the level change threshold then this is a restorative quiet as determined in step 326, so the SPL dose is determined in a Step 328 as follows: $SPL\ Dose = SPL\ Dose(n-1) * e^{(-Update_epoch/\tau)}$ Where: τ (referred to as “tau” in the following diagrams) is equal to approximately 7 hours. In some

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			embodiments, tau is adaptive for different users. In at least one exemplary embodiment, the level change threshold is set at substantially 0.9-1.0 dB.” Goldstein797, [0074]. “As the SPL Dose is calculated by system 100, it is also monitored. Once the SPL Dose reaches a certain level, as it is a cumulative calculation, ear fatigue calculator 130 determines whether or not the SPL Dose corresponds to a fatigued ear, and if so, it outputs warnings as discussed in connection with FIG. 1.” Goldstein797, [0075].
39[e][iii]	outputting the one or more sounds on the at least one output device.	Points to the “at least one cluster” and “of at least one computing device” mappings. Also points to the “output device” mappings. Pet., 37. “Goldstein873 also discloses that processor 206 ‘responsive to monitoring the sound exposure level can adjust the audio in the ear canal 140 to within a safe and subjectively optimized listening level range.’ Goldstein873, [0027]. For example, Goldstein873 discloses that ‘processor 206 can measure and monitor	“By providing a monitoring and protective system which, in at least one mode, continuously monitors sound pressure level at the ear until a potentially harmful exposure has occurred, rather than only monitoring for a predetermined time as with Nose Dose monitors which monitor for work shifts, a more accurate predictor of harm to the ear is provided.” Goldstein797, [0083]. “[T]he listening fatigue calculation may also be a function of a noise reduction rate

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		noise levels in the ambient sound,' 'selectively filter out the measured noise from the ambient sound,' and 'mix the audio content with the filtered sound to produce filtered audio.' Id., [0043]. Goldstein873 discloses that the ECR delivers 'the filtered audio to the user's ear canal.' Id. Goldstein873 also discloses that 'the processor 206 can adjust (e.g. decrease/increase) a level of the filtered sound' based on the user's personalized hearing level. Id., [0049].” Pet., 37.	of the earpiece embodying the system as it processes the input audio signal to produce the output audio signal.” Goldstein797, [0016]. (e.g., adjusts audio) “The system controls the level of noise produced in the ear as a function of the listening fatigue calculation. Additionally, ambient noise detection cancellation can be used to control the level of ambient noise. The warning of unsafe exposure to noise can include an audio warning at the ear, a visual warning in associated equipment, or one of attenuation or a complete noise cutoff at the output transducer.” Goldstein797, [0013]. “An initial hearing test is performed in a step 561, which acquires data indicative of the users hearing sensitivity. The test may be an otoacoustic emission (OAE) test or audiogram administered utilizing the ear canal receiver or speaker 25.” Goldstein797, [0078] (similar to ECR) “The process is started at a step 548. In a step 550, it is determined whether or not the user wishes to make use of a registration process, for example online,

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			for setting a personalized update epoch through communication with a remote registration system. If the user declines the registration, then the default tau is set at 7 hours in a step 552. In a step 554, this default value is transmitted to system 100 via a wired or wireless data communication network.” Goldstein797, [0076].

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32[pre]	A system comprising:	See 39[pre].	See 39[pre].
32[a]	at least one cluster of at least one computing device,	See 39[a].	See 39[a].
32[b]	the at least one computing device including:	See 39[b].	See 39[b].
32[b][i]	a sound sensing mechanism, configured to: detect a sensed	See 39[b][i].	See 39[b][i].

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	energy, wherein the sensed energy comprises one or more sounds; and monitor one or more parameters selected from the group of (i) an amplitude of the one or more sounds and (ii) a frequency of the one or more sounds, wherein at least one of the monitored one or more parameters is aggregated over time; and	“Goldstein873 further discloses that processor 206 calculates SPL Dose, which represents ‘sound exposure over time’ in order ‘to assess an acceptable level of sound exposure.’ Goldstein873, [0044].” Pet., 52. “Goldstein873 explains that SPL Dose ‘indicates an individual’s cumulative exposure to sound pressure levels over time,’ and that it ‘can be expressed as a percentage of a maximum time-weighted average for sound pressure level exposure’” Id., [0045].” Pet., 52-53.	“As the SPL Dose is calculated by system 100, it is also monitored. Once the SPL Dose reaches a certain level, as it is a cumulative calculation, ear fatigue calculator 130 determines whether or not the SPL Dose corresponds to a fatigued ear, and if so, it outputs warnings as discussed in connection with FIG. 1.” Goldstein, [0075]. “The SPL dose is expressed as a percentage of some maximum time-weighted average for sound pressure level exposure.” Goldstein797, [0070].
32[b][ii]	a wireless transceiver; and	See 39[b][ii].	See 39[b][ii].
32[c]	at least one output device, including:	See 39[c].	See 39[c].
32[c][i]	a power source for operating the output device;	See 39[c][i].	See 39[c][i].
32[c][ii]	a speaker for outputting sound;	See 39[c][ii].	See 39[c][ii].

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32[c][iii]	and a communication mechanism,	See 39[c][iii].	See 39[c][iii].
32[d]	wherein the at least one computing device further comprises: a memory, containing computer-executable instructions for connecting to the at least one cluster and varying an output of the at least one output device; and	See 39[d].	See 39[d].
32[e]	a processor, for executing the computer-executable instructions and being capable of receiving an input from a user for manually adjusting a volume , wherein the computer-executable instructions include:	“Goldstein873 also discloses that its earpiece 100 operates to receive ‘audio content from a media player,’ and that ‘earpiece 100 can be connected via a wired connection to the media player, or via a wireless connection (e.g. Bluetooth) using the transceiver 204.’ Goldstein873, [0054].” Pet., 54. <i>See also</i> Pet., 55 (“In the Background section, Goldstein873 explains that it is well known to use earpieces and headphones to play audio content from a media player. See id., [0004]”). “Goldstein873, however, does not focus on the implementation details relating to how to enable a user to manually control	“System 100 includes an audio input device 113 for receiving sound at the ear. As will be discussed below, audio input 113 can include an analog audio input 11, 23 and a digital audio input 119. In at least one exemplary embodiment, audio input 113 receives audio input from at least one of three sources, namely; ambient noise around the ear, direct input noise such as a MP3 player or other device which can produce a digital audio input at digital audio input 119, and noise as detected within the ear canal 31 (FIG. 2).” Goldstein797, [0029]. “All transducers receive or transmit audio signals to an ASIC 21 that undertakes at

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		the volume of audio content.” Pet., 55. Thus, Petitioner introduces a third reference (Chaudhuri) as teaching adjusting audio (via a user interface on a mobile phone). Pet., 55-58. For the rest of this claim, Pet primarily relies on Newham and Chaudhuri.	least a portion of the audio signal processing described above and provides a transceiver for audio via the wired or wireless communication path 119. ” Goldstein797, [0046]
32[e][i]	determining if at least one of the monitored one or more parameters falls outside of a predetermined threshold;	See 39[e][i].	See 39[e][i].
32[e][ii]	if at least one of the monitored one or more parameters falls outside of the predetermined threshold, transmitting, to the at least one output device, an alert ;	Relies on the Goldstein's teachings from 39[e][ii], but also indicates: “A POSITA would have recognized that it would have been obvious to provide an audible warning via the speakers of earpieces 100, such as ECR 120 ... [because] the earpiece 100 ‘can partially or fully occlude the ear canal 140 to provide various degrees of acoustic isolation,’ and thus an audio warning delivered to devices outside of the ear-canal risks being blocked or attenuated by the earpiece 100 itself. Goldstein873, [0024].” Pet, 59-60.	Goldstein797 already contemplates this warning. “When the listening fatigue factor corresponds to a state predictive of a damage level, the listening fatigue calculator outputs a warning to the system user of potential harm. ” Goldstein797, [0013]. “ The warning of unsafe exposure to noise can include an audio warning at the ear, a visual warning in associated equipment, or one of attenuation or a complete noise

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			cutoff at the output transducer.” Goldstein797, [0013]. “In another non-limiting example, the listening fatigue signal is output to an audio warning source 132, which outputs an output audio warning to the user notifying the user that exposure to the sound source has reached critical levels.” Goldstein797, [0038]. “By providing a monitoring and protective system which, in at least one mode, continuously monitors sound pressure level at the ear until a potentially harmful exposure has occurred, rather than only monitoring for a predetermined time as with Nose Dose monitors which monitor for work shifts, a more accurate predictor of harm to the ear is provided. By utilizing a method, which determines exposure in part as a function of effective quiet exposure as well as loud noise exposure, an enhanced model of potential risk is achieved. By providing a series of warning mechanisms and preventive measures as a function of the determined potentially harmful dosage levels ear damage is more likely to be prevented. By providing the system in an earpiece which substantially occludes the ear and making use of audio

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			inputs at the external and internal ear, a more accurate reading of noise level is provided and more control through a real time warning system is achievable.” Goldstein797, [0083].
32[e][iii]	altering one or more of the one or more sounds so that at least one of the monitored one or more parameters does not fall outside of the predetermined threshold; and	See 39[e][ii].	See 39[e][ii].
32[e][iv]	outputting the one or more sounds on the at least one output device.	See 39[e][iii].	See 39[e][iii].