IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF VIRGINIA
ALEXANDRIA DIVISION

SOUNDCLEAR TECHNOLOGIES LLC, Plaintiff, v. AMAZON.COM, INC.; AMAZON.COM LLC, AMAZON WEB SERVICES, INC., Defendants.	Case No. 1:24-cv-00728 Jury Trial Demanded

COMPLAINT FOR PATENT INFRINGEMENT

Plaintiff SoundClear Technologies LLC ("SoundClear") files this complaint against Amazon.com, Inc., Amazon.com LLC, and Amazon Web Services, Inc., (hereinafter collectively "Amazon" or "Defendants") for infringement of United States Patent Nos. 9,031,259; 9,070,374; and 9,804,819 (the "Patents-in-Suit"), attached here as Exhibits 1-3.

NATURE OF THE ACTION

1. This is an action for patent infringement arising under the patent laws of the United States, 35 U.S.C. §§1 *et seq*.

THE PARTIES

2. SoundClear is a limited liability company organized under laws of the Commonwealth of Virginia with its principal place of business at 1900 Reston Metro Plaza, Suite 600, Reston, VA 20190.

3. On information and belief, defendant Amazon.com, Inc. is a corporation organized and existing under the laws of the state of Delaware with a principal place of business at 410 Terry Ave N, Seattle, Washington 98109-5210.

4. On information and belief, Amazon.com, Inc. may be served with process through its registered agent, Corporation Service Company, 251 Little Falls Drive, Wilmington, Delaware 19808, or anywhere it may be found.

5. Amazon.com, Inc. does business across the United States, including in the Commonwealth of Virginia and, more specifically, in the Eastern District of Virginia.

6. On information and belief, defendant Amazon.com LLC is a limited liability corporation organized and existing under the laws of the state of Delaware and a wholly-owned subsidiary of Amazon.com, Inc, with a principal place of business at 410 Terry Ave N, Seattle, Washington 98109-5210.

7. On information and belief, Amazon.com LLC may be served with process through its registered agent, Corporation Service Company, 251 Little Falls Drive, Wilmington, Delaware 19808, or anywhere it may be found.

8. Amazon.com LLC does business across the United States, including in the Commonwealth of Virginia and, more specifically, in the Eastern District of Virginia.

9. On information and belief, defendant Amazon Web Services, Inc. ("AWS") is a corporation organized and existing under the laws of the state of Delaware with a principal place of business at 410 Terry Ave N, Seattle, Washington 98109-5210.

10. AWS is a subsidiary and controlled affiliate of defendant Amazon.com, Inc. and a so-called Amazon Group Company.

11. On information and belief, AWS may be served with process through its registered agent, Corporation Service Company, 100 Shockoe Slip Fl 2, Richmond, VA, 23219 - 4100 or anywhere it may be found.

12. AWS does business across the United States, including in the Commonwealth of Virginia and, more specifically, in the Eastern District of Virginia.

13. On information and belief, AWS has been authorized to transact business in the Commonwealth of Virginia and the Eastern District of Virginia since on or about January 25, 2013, under Virginia Entity ID F1918947.

14. On information and belief, Defendants sell and offer to sell products and services throughout Virginia, including in this judicial district, as well as throughout the United States, and introduces products and services that perform infringing processes into the stream of commerce knowing that they would be used, offered for sale, or sold in this judicial district and elsewhere in the United States.

15. On information and belief, Amazon has made, used, offered to sell, offered to sell access to, sold, and/or sold access to products and services, including the following specifically accused products and services: (1) Amazon Echo 1st Generation, Amazon Echo 2nd Generation, Amazon Echo 3rd Generation, Amazon Echo Dot 1st Generation, Amazon Echo Dot 2nd Generation, Amazon Echo Dot 3rd Generation, Amazon Echo Dot Kids Edition 1st Generation, Amazon Echo Dot Kids Edition 2nd Generation, Amazon Echo Look, Amazon Echo Show 2nd Generation, Amazon Echo Spot, Amazon Echo Plus 1st Generation, Amazon Echo Plus 2nd Generation, and Amazon Echo Studio, Amazon Echo (4th Generation), Amazon Echo Dot (4th Generation), Amazon Echo Dot With Clock (3rd Generation), Amazon Echo Dot With Clock (4th Generation), Amazon Echo Dot Kids (3rd Generation), Amazon Echo Dot Kids (4th

Generation), Amazon Echo Show 15 10 (3rd Generation), Amazon Fire TV Cube (2nd Generation), and Amazon Alexa (collectively "the Echo Products"); (2) current or legacy products or services, which use, or have used, one or more of the foregoing products and services as a component product or component service; (3) combinations of products and/or services comprising, in whole or in part, two or more of the foregoing products and services; and (4) all other current or legacy products and services imported, made, used, sold, or offered for sale by Amazon that operate, or have operated in a substantially similar manner as the above-listed products and services. (As used herein, one or more of the foregoing products and services are individually and collectively referred to as "the Amazon Products and Services").

16. On information and belief, Amazon, as well as the hardware and software components comprising the Amazon Products and Services and/or that enable the Amazon Products and Services to operate, including but not limited to servers, server software, webserver software, webserver hardware, email server hardware, email server software, website client software, mobile computing device client application software, networked communications hardware, network routers, network switches, network hubs, WIFI access point hardware, WIFI access point software, point-of-sale hardware, point-of-sale software, back-end hardware, back-end software, cloud-based software, cloud-based hardware, and other hardware and software computing systems and components infringes (literally and/or under the doctrine of equivalents) at least one claim of each of the Patents-in-Suit.

JURISDICTION AND VENUE

17. This civil action arises under the Patent Laws of the United States, 35 U.S.C. § 1 *et seq*. Accordingly, this Court has subject matter jurisdiction under at least 28 U.S.C. §§ 1331 and 1338(a).

18. This Court has general and specific personal jurisdiction over the Defendants because it regularly conducts and solicits business, or otherwise engages in other persistent courses of conduct in this judicial district, and/or derives substantial revenue from the use, sale, and distribution of goods and services, including but not limited to the accused Amazon Products and Services provided to individuals and businesses in the Eastern District of Virginia.

19. On information and belief, Amazon infringes the patent-in-suit in the Eastern District of Virginia, at least, by making, using, offering to sell access to, and/or selling access to the accused Amazon Products and Services in this district.

20. Amazon is the world's largest online retailer and marketplace and provider of cloud computing services through AWS. Amazon distributes a variety of downloadable and streaming content through its Amazon Prime Video, Amazon Music, and Audible units. Amazon also produces retail consumer electronics including the Amazon Echo Products and the Kindle e-reader.

21. On information and belief, Amazon is the second largest private employer in the United States. According to the Virginia Economic Development Partnership, Amazon has since 2010 invested more than $109 billion in Virginia, including infrastructure and compensation to employees, and has created more than 36,000 jobs in the Commonwealth.[1]

22. Amazon officially opened its "HQ2"—i.e. its second headquarters—in Arlington, Virginia and plans to add more than 25,000 new jobs to the more than 30,000 employees it already has in the Virginia and DC metro area.[2] Amazon's new headquarters are within this

[1] *See* https://www.vedp.org/press-release/2023-09/amazon-virginiabeach.

[2] See https://www.aboutamazon.com/workplace/corporate-offices.

judicial district in the National Landing neighborhood of Arlington, Virginia. According to Amazon, the new Arlington campus will feature energy-efficient offices, neighborhood retail, and new public and green spaces including 1.1 acres of new public open space, designed for a variety of uses, including a dog park, recreation areas, farmers markets, and more to help realize the community's vision for a large, centrally-located park. *Id*.

23. On information and belief, certain features of the accused Amazon Products and Services (e.g., Amazon Alexa) are developed at Amazon's HQ2 in the Eastern District of Virginia. *See* https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/amazon-hiring-for-cloud-services-alexa-products-at-hq2-in-arlington-va-53798578; https://www.linkedin.com/posts/amazon_amazon-alexa-hq2-recruiting-short-1mov-activity-6862406229579456512-8Iu9; https://www.youtube.com/watch?v=vU2szgs2M7c.

24. On information and belief, the accused Amazon Products and Services are made, used, sold and offered for sale by Amazon throughout the Eastern District of Virginia.

25. On information and belief, Amazon customers located in the Eastern District of Virginia have obtained access to and used the accused Amazon Products and Services while located in the Eastern District of Virginia.

26. This Court has personal jurisdiction over Amazon because, inter alia, Amazon, on information and belief: (1) has committed acts of patent infringement in this Eastern District of Virginia; (2) maintains a regular and established place of business, namely its HQ2 in Arlington, within the Eastern District of Virginia; (3) has substantial, continuous, and systematic contacts with this Commonwealth and the Eastern District of Virginia; (4) owns, manages, and operates facilities in this Commonwealth and the Eastern District of Virginia; (5) enjoys substantial income from its operations and sales in this Commonwealth and the Eastern District of Virginia;

(6) employs Virginia residents in this Commonwealth and the Eastern District of Virginia, and (7) solicits business using the Amazon Products and Services in this Commonwealth and the Eastern District of Virginia.

27. On April 9, 2020, this Court held,

> It must be said that Amazon is nothing if not ubiquitous in the United States. Furthermore, after considering 238 cities, Amazon chose Arlington in the Eastern District of Virginia as the location for its HQ2 and will invest $2.5 billion and 25,000 jobs in the undertaking. As such, Amazon cannot in good faith represent to the Court that E.D. Va. is an undesirable or inconvenient location to operate and do business. Litigating should not be an additional significant strain.

Maglula, Ltd. v. Amazon.com, Inc., No. 1:19-cv-01570, ECF No. 52 at 32-33 (E.D. Va. Apr. 9, 2020).

28. Venue is proper pursuant to 28 U.S.C. §§ 1391 and/or 1400(b), at least because Amazon has committed acts of infringement in this judicial district, and has a regular and established places of business in this judicial district. Venue is also proper for the reasons set forth by the Court in its *Maglula* decision. *See* 1:2019-cv-01570 (E.D. Va. Apr. 9, 2020), D.I. 52.

29. In fact, Amazon has already admitted that venue is proper in this District. In *Amazon.com, Inc. v. WDC Holdings LLC*, No. 1:20-cv-484, ECF No. 1, ¶ 26 (E.D. Va. Apr. 27, 2020), Amazon argued that venue in this district was proper because "it is a district in which Plaintiff [Amazon] maintains headquarters and/or substantial business operations…"

THE ASSERTED PATENTS

U.S. Patent No. 9,031,259

30. 26. On May 12, 2015, the USPTO duly and legally issued United States Patent No. 9,031,259 ("the '259 patent") entitled "Noise Reduction Apparatus, Audio Input Apparatus, Wireless Communication Apparatus, and Noise Reduction Method" to inventor Takaaki Yamabe.

31. The ’259 patent is presumed valid under 35 U.S.C. § 282.

32. SoundClear owns all rights, title, and interest in the ’259 patent.

33. SoundClear has not granted Defendants an approval, an authorization, or a license to the rights under the ’259 patent.

34. The ’259 relates to, among other things, “a noise reduction method that can reduce a noise component varied by a voice signal in a variety of environments.” ’259 patent, Col. 1, lines 41-42.

35. The method determines “whether or not a sound … is a speech segment.” *Id*. at Col. 2, lines 18-20. When determining that the sound is the speech segment, “a voice incoming direction indicating from which direction a voice sound travels” is detected. *Id*. at 20-22, 25-27. A noise reduction process is then performed based on “speech segment information” and “voice incoming-direction information.” *Id*. at 27-32.

36. This manner of reducing noise also allows for transmission of high quality voice sound even in “an environment of high noise level.” *Id*., Col. 1, lines 29-24; see also, e.g., Col. 52, lines 60-62.

U.S. Patent No. 9,070,374

37. On June 30, 2015, the USPTO duly and legally issued United States Patent No. 9,070,374 (“the ’374 patent”) entitled “Communication Apparatus and Condition Notification Method for Notifying a Used Condition of Communication Apparatus by Using a Light-Emitting Device Attached to Communication Apparatus” to inventors Masaya Konishi and Tatsuya Onoda.

38. The ’374 patent is presumed valid under 35 U.S.C. § 282.

39. SoundClear owns all rights, title, and interest in the ’374 patent.

40. SoundClear has not granted Defendants an approval, an authorization, or a license to the rights under the '374 patent.

41. The '374 relates to, among other things, "a condition notification method that achieve[s] transmission of clear voice sounds with an effective noise-cancellation function." '374 patent, Col. 1, lines 56-58.

42. The method switches a "communication mode between a standby mode … and a transmission mode." *Id.* at Col. 2, lines 11-15.

43. The method "determine[s] a pick-up state of the voice sound." *Id.*, lines 16-17.

44. The method "control[s] the light-emitting device … based on the communication mode … and the pick-up state of the voice sound." *Id.*, lines 19-24.

45. The method also "evaluate[s] speech quality of a speech signal." *Id.*, lines 31-32.

46. This manner of reducing noise also allows for communication with clear voice sounds even in "noisy environments." *Id.*, Col. 1, lines 25-28.

U.S. Patent No. 9,804,819

47. On October 31, 2017, the USPTO duly and legally issued United States Patent No. 9,804,819 ("the '819 patent") entitled "Receiving Apparatus and Control Method" to inventors Kazuomi Tachigi, Kanji Kuroiwa, and Hiroshi Nakamura.

48. The '819 patent is presumed valid under 35 U.S.C. § 282.

49. SoundClear owns all rights, title, and interest in the '819 patent.

50. SoundClear has not granted Defendants an approval, an authorization, or a license to the rights under the '819 patent.

51. The '819 relates to, among other things, "a volume controller configured to cause" the output of audio "having a volume level corresponding to the operating value in a non-

locked state … and … corresponding to a lock value in a locked state." '819 patent, Col. 2, lines 9-16.

52. This manner of overcoming noise also prevents the output of "an unintentional volume level … as soon as the locked state is canceled" when "the volume is reset after the volume has been locked." *Id*., Col. 1, lines 30-40.

BACKGROUND OF THE INVENTIONS

53. These patents have been generated by the R&D engineers of a major audio processing product powerhouse, namely JVC, now known as JVC Kenwood ("JVCK").

54. JVCK is well known for producing quality, leading-edge audio and associated products and has a long and esteemed history in doing so.

55. The Patents-in-Suit were developed within the R&D department of JVCK, which consisted of many thousands of professional engineers spread over a number of R&D facilities.

56. Over the years, JVCK employed the host of audio technologies that it developed to bring forward an array of leading-edge products to market.

57. JVCK typically invested $260m in R&D per year to develop commercially viable technologies capable of generating substantial revenues.

58. JVCK has, for various reasons, realigned its technology focus over recent years, which has led the company to divest a number of patents it developed.

59. SoundClear has acquired these patents and has worked to identify companies that it believes are utilizing the technologies and profiting from the claimed inventions.

CLAIMS FOR RELIEF

COUNT I - Infringement of the ’259 patent

60. SoundClear repeats, realleges, and incorporates by reference, as if fully set forth here, the allegations of the preceding paragraphs above.

61. On information and belief, Defendants (or those acting on their behalf) make, use, sell, sell access to, import, offer to sell and/or offer to sell access to the Amazon Products and Services in the United States that infringe (literally and/or under the doctrine of equivalents) at least claim 1 of the ‘259 patent.

62. On information and belief, one or more components of the Amazon Products and Services is, employs, or provides a noise reduction apparatus (*e.g.*, one or more of the Echo Products is capable of processing sound and performing noise reduction.)

63. On information and belief, one or more components of the Amazon Products and Services is, employs, or provides a speech segment determiner (*e.g.*, computer hardware/software for performing signal processing (e.g., “keyword spotting” algorithm, ASR algorithm, Audio Signal Processor (“ASP”), Audio Input Processor (“AIP”), Wake Word Detection (“WWD”))) configured to determine whether or not a sound (*e.g.*, any sound in the area of the Echo device) picked up by at least either a first microphone or a second microphone (*e.g.*, MEMS microphones) is a speech segment (*e.g.*, a “wake word,” “wakeup word,” voice speech that follows the wake/wakeup word) and to output speech segment information (*e.g.*, details/parameters of the speech segment itself) when it is determined that the sound picked up by the first or the second microphone is the speech segment.

64. On information and belief and as an example, one or more components of the Amazon Products and Services use microphones, such as Knowles MEMS microphones, to pick up sounds. *See* https://www.ifixit.com/Teardown/Amazon+Echo+Teardown/33953.

65. On information and belief, one or more components of the Amazon Products and Services determines whether sounds that are picked up are speech segments. *See* https://www.amazon.com/all-new-amazon-echo-plus-speaker-with-smart-home-hub-black/dp/B015S1SWLO ("With seven microphones, beamforming technology, and noise cancellation, Echo hears you from any direction—even while music is playing."); *see also* https://press.aboutamazon.com/2015/6/amazon-echo-now-available-to-all-customers. ("Echo uses far-field voice recognition with an array of seven microphones to clearly hear you around the room. Advanced beam-forming technology combines the signals from the individual microphones to suppress noise, reverberation, and even competing speech.").

66. On information and belief, one or more components of the Amazon Products and Services also uses a "keyword spotting" feature to detect particular speech segments (e.g., "Hi Alexa."). *See* https://assets.amazon.science/ba/c5/bd48ce11445ba0368d2d9191600d/building-a-robust-word-level-wakeword-verification-network.pdf.

67. On information and belief, one or more components of the Amazon Products and Services outputs speech segment information (*e.g.*, details/parameters of the speech segment itself) when it is determined that the sound picked up by the first or the second microphone is the speech segment. *See* https://developer.amazon.com/ja-JP/docs/alexa/avs-device-sdk/overview.html; https://developer.amazon.com/ja-JP/docs/alexa/avs-device-sdk-1-2x/overview.html; https://developer.amazon.com/en-US/docs/alexa/alexa-voice-service/interaction-model.html;

https://assets.amazon.science/9f/0e/ba97603b4b81bb5046e336343cef/vadoi-voice-activity-detection-overlapping-inference-for-end-to-end-long-form-speech-recognition.pdf; https://developer.amazon.com/en-US/docs/alexa/alexa-voice-service/speechrecognizer.html.

68. On information and belief, one or more components of the Amazon Products and Services is, employs, or provides a voice direction detector (*e.g.*, computer hardware/software performing an algorithm for learning/predicting audio source locations (*e.g.*, an SIR Beam Selector algorithm)) configured, when receiving the speech segment information, to detect a voice incoming direction (*e.g.*, direction from voice audio source location) indicating from which direction a voice sound (*e.g.*, audio sound of a voice) travels, based on a first sound pick-up signal (*e.g.*, a first Preliminary Beam Output) obtained based on a sound picked up by the first microphone (*e.g.*, a sound on a first Mic Input signal) and a second sound pick-up signal (*e.g.*, a second Preliminary Beam Output) obtained based on a sound picked up by the second microphone (*e.g.*, a sound on a second Mic Input signal) and to output voice incoming-direction information (*e.g.*, beam SIR ratio) when the voice incoming direction is detected.

69. On information and belief and as an example, one or more components of the Amazon Products and Services determines that a sound picked up by one of its microphones is a speech segment.

70. On information and belief, one or more components of the Amazon Products and Services also detects a voice incoming direction. *See* https://developer.amazon.com/en-US/docs/alexa/alexa-voice-service/ux-design-attention.html#core (a "[s]ingle LED segment should point in the direction of the customer's voice while the microphone is active.").

71. On information and belief, when the one or more components of the Amazon Products and Services determines that a sound picked up by one of its microphones is a speech

segment, Amazon Echo Products use algorithms of a voice direction detector to detect a voice incoming direction indicating from which direction a voice sound travels. *See* https://assets.amazon.science/da/c2/71f5f9fa49f585a4616e49d52749/sir-beam-selector-for-amazon-echo-devices-audio-front-end.pdf at 2. (For example, the Echo Products use a "signal-to-interference ratio beam selector" ("SIR Beam Selector") algorithm to "learn" and "predict" the "locations of audio sources."); *see also* https://www.amazon.com/b?ie=UTF8&node=23608571011 (("Echo devices are designed by default to detect only the sound waves of your chosen wake word, and everything else is ignored." "[A]ll other audio…passes through the device until the wake word is 'caught.'")

72. On information and belief, the detecting of a voice incoming direction performed by the voice direction detector of the one or more components of the Amazon Products and Services is based on a first sound pick-up signal obtained from a sound picked up by the first microphone and a second sound pick-up signal obtained from a sound picked up by the second microphone. For example, the SIR Beam Selector algorithm uses "Preliminary Beam Outputs" to "learn" and "predict" the "locations of audio sources." The Preliminary Beam Outputs are based on microphone inputs ("Mic inputs"). *See* https://assets.amazon.science/da/c2/71f5f9fa49f585a4616e49d52749/sir-beam-selector-for-amazon-echo-devices-audio-front-end.pdf at 2-3.

73. On information and belief, one or more components of the Amazon Products and Services is, employs, or provides a noise reduction apparatus comprising an adaptive filter (*e.g.*, adaptive filter) configured to perform a noise reduction process (*e.g.*, adaptive noise cancellation ("ANC") or sub-band based adaptive noise cancellation ("S-ANC")) using the first and second

sound pick-up signals based on the speech segment information (*e.g.*, details/parameters of the speech segment itself) and the voice incoming-direction information (*e.g.*, beam SIR ratio).

74. On information and belief, one or more components of the Amazon Products and Services performs adaptive noise cancellation (ANC/S-ANC), which is a noise reduction process, using modules that include an adaptive filter. The S-ANC process is performed only *after* the beam(s) of interest have been selected and other necessary parameters have been determined. *See* https://assets.amazon.science/da/c2/71f5f9fa49f585a4616e49d52749/sir-beam-selector-for-amazon-echo-devices-audio-front-end.pdf at 3 (The "selection process happens before S-ANC, so it is free of speech distortion that might be introduced by S-ANC").

75. On information and belief, the S-ANC noise reduction process uses the preliminary beam outputs, which are first and second sound pick-up signals.

76. On information and belief, Defendants directly infringe at least claim 1 of the '259 patent in violation of 35 U.S.C. § 271(a) by making, using, selling, selling access to, importing, offering for sale, and/or offering to sell access to the Amazon Products and Services.

77. Defendants' infringement has damaged SoundClear and caused / continues to cause it to suffer irreparable harm and damages.

COUNT II - Infringement of the '374 patent

78. SoundClear repeats, realleges, and incorporates by reference, as if fully set forth here, the allegations of the preceding paragraphs above.

79. On information and belief, Defendants (or those acting on their behalf) make, use, sell, sell access to, import, offer to sell and/or offer to sell access to the Amazon Products and Services in the United States that infringes (literally and/or under the doctrine of equivalents) at least claim 9 of the '374 patent.

80. On information and belief, one or more components of the Amazon Products and Services is, employs, or provides a communication apparatus, such as the Echo Products.

81. On information and belief, one or more components of the Amazon Products and Services is, employs, or provides a first pick-up unit (*e.g.*, MEMS microphones) configured to pick up a voice sound (*e.g.*, a spoken sound originating from a person (*e.g.*, a voice request and/or wake word)). *See e.g.*, https://www.ifixit.com/Teardown/Amazon+Echo+Teardown/33953; *See* https://assets.amazon.science/ba/c5/bd48ce11445ba0368d2d9191600d/building-a-robust-word-level-wakeword-verification-network.pdf.

82. On information and belief, one or more components of the Amazon Products and Services is, employs, or provides a transmitter unit (e.g., unit in the Echo device that sends the wake word and/or voice request to Amazon's secure cloud) configured to transmit the voice sound picked up by the first pick-up unit to outside (e.g., Amazon's secure cloud) as a first speech signal (e.g., data signal representing the wake word and/or voice request).

83. On information and belief, one or more components of the Amazon Products and Services uses a client-server keyword spotting system ("KWS") (e.g., "Wakeword detection" algorithm/system) triggered by a keyword or key phrase such as "Hi Alexa." *See* https://assets.amazon.science/ba/c5/bd48ce11445ba0368d2d9191600d/building-a-robust-word-level-wakeword-verification-network.pdf.

84. On information and belief, one or more components of the Amazon Products and Services is, employs, or provides comprise a communication-mode switching unit (e.g., unit in the Echo device that causes the transmitter unit to send or not send the wake word and/or voice request to Amazon's secure cloud) configured to switch a communication mode (e.g., operation

mode of the transmitter unit) between a standby mode (e.g., when the wake word is not detected) in which the transmitter unit does not transmit the speech signal and a transmission mode (e.g., when the wake word is detected) in which the transmitter unit transmits the speech signal.

85. On information and belief, the processor in the one or more components of the Amazon Products and Services transmits the first speech signal when the keyword is detected using the "keyword spotting" feature. *See* https://www.amazon.com/b/?node=23608618011.

86. On information and belief, one or more components of the Amazon Products and Services includes the Alexa Voice Assistant software that switches between an idle-state (e.g., in which the microphone is off) to a listening-state (e.g., in which the microphone is on). In the listening state, the user initiates the communication via a wake word or tapping a button to begin streaming the voice input for processing. When the Wakeword detection system/algorithm detects "Alexa," it wakes the device and captures the speech to be sent to the processing service for further recognition/action – which constitutes the "transmission mode." However, when the microphone is turned off, the wake word cannot be detected; therefore no speech signals are transmitted. *See* https://developer.amazon.com/en-US/docs/alexa/alexa-voice-service/ux-design-attention.html#core.

87. On information and belief, one or more components of the Amazon Products and Services is, employs, or provides a sound pick-up state determination unit (e.g., (1) hardware/software for performing noise reduction, signal filtering, and enhanced beam selection (e.g., sound processing module including an "acoustic echo canceller (AEC)" component, "specialized adaptive noise canceller (S-ANC)" component, signal-to-interference ratio (SIR) beam selector component), and (2) computer hardware/software for performing a signal processing (e.g., "keyword spotting" algorithm, ASR algorithm, Audio Signal Processor

("ASP"), Audio Input Processor ("AIP"), Wake Word Detection ("WWD"))) configured to determine a pick-up state (e.g., signal characteristics) of the voice sound picked up by the first pick-up unit.

88. On information and belief, one or more components of the Amazon Products and Services includes (1) hardware/software for performing noise reduction, signal filtering, and enhanced beam selection (e.g., sound processing module including an "acoustic echo canceller (AEC)" component, "specialized adaptive noise canceller (S-ANC)" component, signal-to-interference ratio (SIR) beam selector component), and (2) computer hardware/software for performing a signal processing (e.g., "keyword spotting" algorithm, ASR algorithm, Audio Signal Processor ("ASP"), Audio Input Processor ("AIP"), Wake Word Detection ("WWD")). Together, these components determine a pick-up state of the voice sound picked up by the microphones on the device. *See e.g.,* https://assets.amazon.science/da/c2/71f5f9fa49f585a4616e49d52749/sir-beam-selector-for-amazon-echo-devices-audio-front-end.pdf at 2-3; https://www.amazon.com/b/?node=23608618011; https://developer.amazon.com/en-US/docs/alexa/alexa-voice-service/ux-design-attention.html#core; https://developer.amazon.com/en-US/docs/alexa/alexa-voice-service/audio-hardware-configurations.html; https://d1.awsstatic.com/product-marketing/A4B/White%20Paper%20-%20Alexa%20Privacy%20and%20Data%20Handling%20Overview.pdf; https://developer.amazon.com/ja-JP/docs/alexa/avs-device-sdk/overview.html.

89. On information and belief, the keyword spotting algorithm works with the AEC, S-ANC, and SIR beam selector components to determine the pick-up state of the voice. *See* https://assets.amazon.science/da/c2/71f5f9fa49f585a4616e49d52749/sir-beam-selector-for-

amazon-echo-devices-audio-front-end.pdf at 1. ("[W]e adopted a beam selector to analyze the beam signals and decide which beam will be used for…[the] Wakeup Word (WW) and ASR [(automatic speech recognition)] engines. The wakeup word (WW) used in Amazon Echo devices is 'Alexa', and it is required at the beginning of the voice command phrases in order to get the device's attention. A beam selection algorithm is critical for correct operation of the device and should be carefully designed to avoid missing the signal of interest.")

90. On information and belief, one or more components of the Amazon Products and Services is, employs, or provides a light emission device (e.g., an LED ring light) configured to emit light. *See* https://www.amazon.com/gp/help/customer/display.html?nodeId=GKLDRFT7FP4FZE56.

91. On information and belief, one or more components of the Amazon Products and Services is, employs, or provides a control unit (e.g., unit in the Echo device that controls the LED light to operate in a variety of modes) configured to control the light-emitting device so that the light-emitting device is turned off, turned on or repeatedly turned on and off (e.g., "animations," "glimmering," "solid") based on the communication mode switched by the communication-mode switching unit, and the pick-up state of the voice sound picked up by the first pick-up unit and determined by the sound pick-up state determination unit.

92. On information and belief, one or more components of the Amazon Products and Services controls the LED ring light to operate in a variety of modes based on the pick-up state of the voice sound. For example, a cyan spotlight on a blue ring indicates that Alexa is listening. *See* https://www.amazon.com/gp/help/customer/display.html?nodeId=GKLDRFT7FP4FZE56. The device uses a red light to indicate the microphone is turned off. *Id*.

93. On information and belief, one or more components of the Amazon Products and Services is, employs, or provides a speech-quality evaluation unit (e.g., hardware/software for performing noise reduction, signal filtering, and enhanced beam selection (e.g., sound processing module including an "acoustic echo canceller (AEC)" component, "specialized adaptive noise canceller (S-ANC)" component, signal-to-interference ratio (SIR) beam selector component)) configured to evaluate speech quality (e.g., filters noise from the speech signal) of the first speech signal to be transmitted by the transmitter unit, wherein the sound pick-up state determination unit determines the sound pick-up state of the voice sound picked up by the first sound pick-up unit based on the speech quality of the speech signal evaluated by the speech-quality evaluation unit.

94. On information and belief, one or more of the Amazon Products and Services includes hardware/software for performing noise reduction, signal filtering, and enhanced beam selection (e.g., sound processing module including an "acoustic echo canceller (AEC)" component, "specialized adaptive noise canceller (S-ANC)" component, signal-to-interference ratio (SIR) beam selector component). The hardware and software components associated with that module are configured to evaluate speech quality. *See* https://assets.amazon.science/da/c2/71f5f9fa49f585a4616e49d52749/sir-beam-selector-for-amazon-echo-devices-audio-front-end.pdf at 2-3 ("[t]he AEC is designed to remove the acoustic echoes of the sound played from the device," "the S-ANC is designed to remove the ambient noise and the interfering signals coming from directions other than the look direction," "the SIR beam selector is designed to utilize the Signal-to-Interference Ratios…to assist beam selection and locate all the audio sources in the surrounding of the device…[through] a selection process

[that] happens before S-ANC, so it is free of speech distortion that might be introduced by S-ANC.")

95. On information and belief, one or more components of the Amazon Products and Services is, employs, or provides a speech-segment determination unit (e.g., computer hardware/software for performing a signal processing (e.g., "keyword spotting" algorithm, ASR algorithm, Audio Signal Processor ("ASP"), Audio Input Processor ("AIP"), Wake Word Detection ("WWD"))) configured to determine whether or not the first speech signal to be transmitted by the transmitter unit is a speech segment (e.g., a "wake word," "wakeup word," voice speech that follows the wake/wakeup word), wherein, the sound pick-up state determination unit determines the sound pick-up state of the sound to be transmitted as the first speech signal based on a determination result (e.g., a "spotted" or "detected" keyword) at the speech-segment determination unit and an evaluation result (e.g., the filtered sound signal resulting from the processing performed by the AEC, S-ANC, and SIR beam selector components) at the speech-quality evaluation unit.

96. On information and belief, one or more components of the Amazon Products and Services includes computer hardware/software for performing a signal processing (e.g., "keyword spotting" algorithm, ASR algorithm, Audio Signal Processor ("ASP"), Audio Input Processor ("AIP"), Wake Word Detection ("WWD")). Those hardware and software components are configured to determine a speech segment. *See* https://www.amazon.com/b/?node=23608618011 (the "keyword spotting" ("KWS") algorithm runs on Amazon Echo Products "to detect…your chosen wake word" (e.g., "Alexa")). For example, when the customer begins speaking the "wake word," the device checks that the sound heard is potentially the matching wake words, thereby detecting that a voice sound has been

picked up from the microphone. *See* https://developer.amazon.com/en-US/docs/alexa/alexa-voice-service/ux-design-attention.html#core.

97. On information and belief, the keyword spotting algorithm works with at least the AEC, S-ANC, and SIR beam selector components to determine the pick-up state of the voice. *See* https://assets.amazon.science/da/c2/71f5f9fa49f585a4616e49d52749/sir-beam-selector-for-amazon-echo-devices-audio-front-end.pdf at 1 ("[W]e adopted a beam selector to analyze the beam signals and decide which beam will be used for…[the] Wakeup Word (WW) and ASR [(automatic speech recognition)] engines. The wakeup word (WW) used in Amazon Echo devices is 'Alexa', and it is required at the beginning of the voice command phrases in order to get the device's attention. A beam selection algorithm is critical for correct operation of the device and should be carefully designed to avoid missing the signal of interest.").

98. On information and belief, Defendants directly infringe at least claim 9 of the '374 patent in violation of 35 U.S.C. § 271(a) by making, using, selling, selling access to, importing, offering for sale, and/or offering to sell access to the Amazon Products and Services.

99. Defendants' infringement has damaged SoundClear and caused / continues to cause it to suffer irreparable harm and damages.

COUNT III - Infringement of the '819 patent

100. SoundClear repeats, realleges, and incorporates by reference, as if fully set forth here, the allegations of the preceding paragraphs above.

101. On information and belief, Defendants (or those acting on their behalf) make, use, sell, sell access to, import, offer to sell and/or offer to sell access to the Amazon Products and Services in the United States that infringes (literally and/or under the doctrine of equivalents) at least claim 8 of the '819 patent.

102. On information and belief, one or more components of the Amazon Products and Services is, employs, or provides a control method (e.g., a method for regulating and processing sound signals) for a receiving apparatus (e.g., an Echo device).

103. On information and belief, one or more components of the Amazon Products and Services is, employs, or provides a control method for a receiving apparatus comprising an audio output unit (e.g., a speaker) configured to output audio (e.g., the sound from a speaker of Alexa's spoken responses) corresponding to an audio signal (e.g., input signal to the speaker representing Alexa's spoken responses). *See* https://www.ifixit.com/Teardown/Amazon+Echo+Teardown/33953.

104. On information and belief, one or more components of the Amazon Products and Services is, employs, or provides a control method for a receiving apparatus comprising a volume operating unit (e.g., software in the Echo device that controls the volume of Alexa's spoken responses) configured to output an operating value (e.g., an electronic signal value representing the volume level for outputting Alexa's spoken responses) indicating a volume level (e.g., the volume level for outputting Alexa's spoken responses) of the audio according to a user operation (e.g., a user's interaction with the software that controls the volume of Alexa's spoken responses through, e.g., (1) physical operation of hardware components related to volume control (e.g., a volume control dial, gear, and encoder), (2) voice commands pertaining to volume control, or (3) the volume control user interface on the Alexa application).

105. On information and belief, the Echo Products include software that takes as one of its inputs the volume level set by the hardware components related to volume control. Amazon Echo devices include a volume dial that allows a user to adjust the output volume level by interacting with the dial. *See*

https://www.ifixit.com/Teardown/Amazon+Echo+Teardown/33953. The dial works in connection with a gear and encoder to adjust a signal (output from the encoder) indicating the desired level of volume. A user can generally control the volume of Alexa's voice responses by adjusting the hardware components related to volume control (e.g., a volume control dial, gear, and encoder).

106. On information and belief, one or more components of the Amazon Products and Services is, employs, or provides a control method for a receiving apparatus comprising a volume controller (e.g., "power and speaker driver board" and "motherboard") configured to cause the audio output unit to output the audio having a volume level corresponding to the operating value in a non-locked state (e.g., operating mode when the volume level is automatically adjusted by volume control bypass software (e.g., "Whisper Mode," "Adaptive Volume") independent of the volume level set by the user through a user operation (as defined for element 8b above)) in which the volume level of the audio can be varied based on the operating value (e.g., output the Alexa's spoken responses at, e.g., (1) a lower level than the set volume level (e.g., a whisper level through Whisper Mode), or (2) a higher level than the set volume level (e.g., an increased level through Adaptive Volume to overcome loud ambient noise)) and to cause the audio output unit to output the audio having a volume level corresponding to a lock value (e.g., the default volume level set by the user through a user operation) in a locked state when the volume control bypass software (e.g., "Whisper Mode," "Adaptive Volume") is not activated and/or is otherwise not independently adjusting the volume level set by the user) in which the volume level of the audio is fixed by a constant lock value (e.g., the value of the volume level set by the user through a user operation) for the operating value.

107. On information and belief, certain volume operation modes of the one or more components of the Amazon Products and Services permits the volume of Alexa's spoken responses to automatically deviate from the volume level that was set by the user. These modes include the Whisper Mode and the Adaptive Volume mode. In the Whisper Mode, Alexa's spoken responses are provided at the volume level of a whisper, regardless of the set value of the volume. In the Adaptive Volume mode, Alexa's spoken responses are provided at the volume level generally higher than the set value so that the responses may be heard over load ambient noise in the room. These modes correspond to a "non-locked' state because the volume is allowed to automatically deviate from the volume level set by the user. *See* https://www.amazon.science/blog/whisper-to-alexa-and-shell-whisper-back; See https://www.amazon.com/b?ie=UTF8&node=23595731011; https://www.lifewire.com/what-is-adaptive-volume-on-alexa-5205636.

108. On information and belief, one or more components of the Amazon Products and Services is, employs, or provides a control method comprising when a predetermined operating part (e.g., volume control bypass software (e.g., "Whisper Mode," "Adaptive Volume")) is turned on (e.g., activates) in the locked state, switching the locked state to the non-locked state for a period of time (e.g., the duration of broadcasting Alexa's spoken responses) that starts when the operating value becomes a value that falls within a predetermined range (e.g., a value corresponding to a whisper volume level, or a value corresponding to a volume level based on the ambient noise that is higher than the volume level set by the user) based on the lock value and ends when the predetermined operating part is turned off (e.g., deactivates (e.g., when Alexa's broadcasted voice response is complete)).

109. On information and belief, certain volume operation modes of the one or more components of the Amazon Products and Services permits the volume of Alexa's spoken responses to automatically deviate from the volume level that was set by the user. These modes include the Whisper Mode and the Adaptive Volume mode. In the Whisper Mode, Alexa's spoken responses are provided at the volume level of a whisper, regardless of the set value of the volume. In the Adaptive Volume mode, Alexa's spoken responses are provided at the volume level generally higher than the set value so that the responses may be heard over loud ambient noise in the room. These modes correspond to a "non-locked' state because the volume is allowed to automatically deviate from the volume level set by the user. By contrast, when these volume control bypass software features are not enabled or active, the volume of the Echo device generally does not automatically deviate from the set volume level. *See* https://www.lifewire.com/what-is-adaptive-volume-on-alexa-5205636; https://www.amazon.science/blog/whisper-to-alexa-and-shell-whisper-back.

110. On information and belief, a non-locked state is an operating mode when the "Volume Limit" feature is not activated and/or is otherwise not restricting the volume level. In that scenario, the volume of Alexa's voice responses can be adjusted by adjusting the master volume of the device. However, when the Volume Limit feature is enabled/active, it prevents the master volume from being increased beyond a level designated by a user, e.g., a volume limit ("lock value"). In this scenario, when a predetermined operating part (e.g., volume control bypass software (e.g., "Adaptive Volume")) is turned on and the Volume Limit feature is activated (i.e. a "locked state"), the Alexa enabled device will temporarily override the Volume Limit in order to broadcast Alexa's voice responses at a higher volume to overcome ambient noise.

111. On information and belief, the Echo Products include an adaptive volume feature that "automatically overrides the default volume…but only for voice responses" from Alexa. *See* https://www.lifewire.com/what-is-adaptive-volume-on-alexa-5205636. When enabled, the adaptive volume feature "automatically adjusts the [v]olume of Alexa's responses to match the ambient noise level." *Id*. Normally, when a volume limit is being applied in an Amazon Echo Product (*e.g.*, as a result of the "Set Max Volume" feature of "Amazon Kids"), the output volume will not be allowed to exceed that limit (e.g., restricting the volume to, e.g., level 5). This corresponds to the claimed "locked state" because the volume level is not permitted to increase beyond the limit despite a user's interaction with the claimed volume operating unit.

112. On information and belief, when the adaptive volume feature is enabled at the same time when a volume limit is being applied, the one or more components of the Amazon Products and Services overrides the volume limit and output an Alexa response that exceeds the volume limit if the surrounding ambient noise justifies increasing the volume level for the response. *See* https://www.amazon.com/gp/help/customer/display.html?nodeId=TSHi9yZXIGnPT1hKXu.

113. On information and belief, one or more components of the Amazon Products and Services is, employs, or provides a control method comprising when the predetermined operating part is turned off after having switched to the non-locked state (e.g., when the volume control bypass software (e.g., "Whisper Mode," "Adaptive Volume") subsequently deactivates after being activated for the broadcast of Alexa's voice response), updating the lock value with the operating value (e.g., resetting the volume level to the volume level set by the user) and switching the non-locked state to the locked state.

114. On information and belief, after Alexa's spoken response is broadcasted at a whisper volume or at a high volume to account for ambient noise, the volume level returns to the level set by the user. *See* https://www.lifewire.com/what-is-adaptive-volume-on-alexa-5205636.

115. On information and belief, Defendants directly infringe at least claim 8 of the '819 patent in violation of 35 U.S.C. § 271(a) by making, using, selling, selling access to, importing, offering for sale, and/or offering to sell access to the Amazon Products and Services.

116. Defendants' infringement has damaged SoundClear and caused / continues to cause it to suffer irreparable harm and damages.

JURY DEMANDED

117. Pursuant to Federal Rule of Civil Procedure 38(b), SoundClear hereby requests a trial by jury on all issues so triable.

PRAYER FOR RELIEF

SoundClear respectfully requests this Court to enter judgment in SoundClear's favor and against Amazon as follows:

a. finding that Amazon has infringed one or more claims of the '259 patent under 35 U.S.C. § 271(a);

b. finding that Amazon has infringed one or more claims of the '374 patent under 35 U.S.C. § 271(a);

c. finding that Amazon has infringed one or more claims of the '819 patent under 35 U.S.C. § 271(a);

d. awarding SoundClear damages under 35 U.S.C. § 284, or otherwise permitted by law, including enhanced damages for willful infringement and/or supplemental damages for any continued post-verdict infringement;

e. awarding SoundClear pre-judgment and post-judgment interest on the damages award and costs;

f. awarding cost of this action (including all disbursements) and attorney fees pursuant to 35 U.S.C. § 285, or as otherwise permitted by the law; and

g. awarding such other costs and further relief that the Court determines to be just and equitable.

Dated: May 1, 2024

Respectfully submitted,

/s/ Chandran B. Iyer

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