

**IN THE UNITED STATES DISTRICT COURT
DISTRICT OF DELAWARE**

VISUAL EFFECT INNOVATIONS, LLC

Plaintiff,

v.

SONY ELECTRONICS, INC.

Defendant.

Civil Action No.

18-0675-LPS-CJB

JURY TRIAL DEMANDED

FIRST AMENDED COMPLAINT FOR PATENT INFRINGEMENT

1. This is an action for patent infringement arising under the Patent Laws of the United States of America, 35 U.S.C. § 1 et seq. in which Plaintiff Visual Effect Innovations, LLC (“VEI” or “Plaintiff”) files this patent infringement action against Defendant Sony Electronics Inc. (“Sony” or “Defendant”).

BACKGROUND

2. Plaintiff VEI is the assignee of all right, title, and interest in and to U.S. Patent No. 7,030,902, entitled “Eternalism, a method for creating an appearance of sustained three-dimensional motion-direction of unlimited duration, using a finite number of pictures” (“the ‘902 Patent,” attached as Exhibit A); U.S. Patent No. 9,781,408, entitled “Faster state transitioning for continuous adjustable 3Deeps filter spectacles using multi-layered variable tint materials” (“the ‘408 Patent,” attached as Exhibit B); and U.S. Patent No. 9,948,922, entitled “Faster State Transitioning For Continuous Adjustable 3deeps Filter Spectacles Using Multi-Layered Variable Tint Materials” (“the ‘922 Patent,” attached as Exhibit C) (collectively, the “Patents-in-Suit”). VEI has the exclusive right to assert all causes of action arising under the Patents-in-Suit and the right to remedies for infringement thereof.

3. The inventors of the Patents-in-Suit are Kenneth Martin Jacobs and Ronald Steven Karpf.

4. Mr. Jacobs is the Distinguished Professor Emeritus of Cinema at SUNY Binghamton. He is the recipient of the American Film Institute's Maya Deren Independent Film and Video Artists Award, and the winner of the Los Angeles Film Critic's Douglas Edwards Experimental/Independent Film/Video Award. He is also the recipient of the Guggenheim Award and a special Rockefeller Foundation grant, and his work has been featured in prominent museums including the New York Museum of Modern Art, The American House in Paris, the Arsenal Theater in Berlin, the Louvre in Paris, and at the Getty Center in Los Angeles.

5. Dr. Karpf is the Founding Partner of bioinformatics company ADDIS Informatics, and Founding Partner of technology security company Geo Codex LLC. Mr. Karpf has an M.A. and Ph.D. in Mathematical Sciences.

6. The inventions claimed in the Patents-in-Suit are directed to unconventional improvements in the technology for displaying moving pictures, which has application in films, television and other display technology. In particular, these inventions are directed to, among other things, improvements in how continuous movement is displayed on presentation devices. *See* '902 patent, col. 1, lns. 16-20; '408 patent, col. 2, lns. 16-32; '922 patent, col. 2, lns. 18-34.

7. As explained in the specifications, the claimed inventions originated as ways to solve problems arising in the technology used to portray continuous movement in the technology used to display films or movies in theaters. The specifications explain the traditional or conventional methods of displaying continuous movement in films or movies, which included:

The appearance of continuous movement, using only two substantially similar pictures, has been accomplished in live performance by simultaneous projection of both images onto a screen, wherein one picture may be slightly off-set from the other picture as they appear on the screen, and by rotating a two-bladed propeller, wherein the propeller blades are set off from one another by 180 degrees, in front of and between the two projectors such that the two images are made to both alternate and overlap in their appearances, with both images in turn alternating with an interval of complete darkness onscreen when both projections are blocked by the spinning propeller.

‘902 patent, col. 1, lns. 36-47, ‘408 patent, col. 4, lns. 42-53; ‘922 patent, col. 4, lns. 44-55. As further explained, this method produced “flicker,” an unintended and undesirable effect of the transitions between film frames. *See, e.g.*, ‘902 patent col. 11, lns. 41-50; ‘408 patent, col. 50, lns. 58-64; ‘922 patent, col. 51, lns. 17-23. As the specifications also noted, in conventional video and computer-display “image-continuity depends likewise on this rapid on-off display,” or “flicker,” which was similarly disfavored. ‘408 patent, col. 50, lns. 47-64; ‘922 patent, col. 51, lns. 5-23.

8. The claimed inventions turn a negative into a positive and deliberately use “flicker” and the resulting “effects of emphatic flicker on the human optical/nervous system” to produce better visual results. ‘902 patent col. 11, lns. 53-63; ‘408 patent, col. 50, lns. 58-64; ‘922 patent, col. 51, lns. 17-23. In particular, the results include enhanced continuous movement, various artistic visual effects and depth illusions to be experienced by persons without properly functioning binocular vision. *See, e.g.*, ‘902 patent col. 14, lns. 12-17; ‘408 patent, col. 50, ln. 65- col. 51, ln. 23; ‘922 patent, col. 51, lns. 24-49.

9. One core technique initially invented to harness the power of “flicker” for this purpose included the use of a different “bridge frame” between two picture frames. As explained in the specification:

The method of the present invention entails repetitive presentation to the viewer of at least two substantially similar image pictures alternating with a third visual interval or bridging picture that is substantially dissimilar to the other substantially similar pictures in order to create the appearance of continuous, seamless and sustained directional movement.

‘902 patent col. 2, lns.20-26; ‘408 patent, col. 8, lns. 50-56; ‘922 patent, col. 8, lns. 52-58.

10. As seen in the Patents-in-Suit and others in this family, this “bridge frame” could include a black frame or different solid color frame or a blended image (e.g., an image which is a partial picture and partial black or other solid color frame). Other nuances of and improvements to this unconventional technique are disclosed and claimed within this patent family, including in

the Patents-in-Suit. In this regard, this technique – of adding a black frame or blended image between image frames -- also can be accomplished in a variety of ways, including not only by “black frame insertion” but also by “backlight scanning” – where the lighting behind the screen is dimmed, in whole or in part, in planned intervals so as to achieve the same result, of inserting a black or partially blackened “frame” between two images. These unconventional inventive techniques are claimed in the accused claims of the Patents-in-Suit.

11. These unconventional inventive techniques claimed in the patents-in-suit have application in any device that displays moving pictures, including not only devices that display film or movies in theaters, but also televisions, projectors, computer screens, gaming consoles and a variety of other applications.

12. By making, using, selling, importing, and offering for sale products including but not limited to Sony televisions, Sony is infringing the claims of the Patents-in-Suit.

PARTIES

13. VEI is a Texas Limited Liability Company with a principal place of business at 1400 Preston Road, Suite 400, Plano, Texas 75093.

14. On information and belief, Sony Electronics Inc. is registered to do business in the State of Delaware and it may be served with process by delivering a summons and a true and correct copy of this complaint to its registered agent for receipt of service of process, Corporation Service Company, 251 Little Falls Drive, Wilmington, DE 19808.

JURISDICTION AND VENUE

15. This action arises under the patent laws of the United States, Title 35 of the United States Code. Accordingly, this Court has subject matter jurisdiction under 28 U.S.C. §§ 1331 and 1338(a).

16. This Court has personal jurisdiction over Sony because, among other reasons, Sony has established minimum contacts with the forum state of Delaware.

17. Venue is proper in this District under 28 U.S.C. § 1400(b) because Defendant is a resident of Delaware, has a regular and established place of business in this District, and has committed acts of infringement in this District.

COUNT I

INFRINGEMENT OF U.S. PATENT NO. 7,030,902

18. Plaintiff incorporates by reference the foregoing paragraphs and further alleges as follows:

19. On April 18, 2006, the United States Patent and Trademark Office issued the ‘902 Patent for inventions covering a method for producing an appearance of continuous movement using a finite number of pictures, which in one claimed embodiment comprises selecting at least two image pictures which are visually similar, a first image picture and a second image picture; selecting a bridging picture which is dissimilar to said image picture; arranging said pictures in a sequential order to create a first series of pictures, said sequential order being one or more first image pictures, one or more second image pictures, and one or more bridging pictures; placing said first series of pictures on a plurality of picture frames wherein each picture of said first series is placed on a single frame; and repeating the first series of pictures a plurality of times to create a continuous plurality of picture frames having said first series thereon, such that when said plurality of picture frames are viewed an appearance of continuous movement is perceived by a viewer. A true and correct copy of the ‘902 Patent is attached as Exhibit A.

20. Sony has been and is now directly and indirectly infringing one or more claims of the ‘902 Patent, in this judicial District and elsewhere in the United States.

21. For example, Sony directly infringes the ‘902 Patent, including but not limited to claim 1, by making, using, selling, importing, and offering for sale Sony televisions. The Sony KDL-55W802A (“Sony W802A”) is representative of the products accused, which encompass other Sony products having similar features, such as Motionflow XR 480 technology, *e.g.*:


Figure 1 (Source: https://docs.sony.com/release//SPECS/KDL55W802A_mksp.pdf) (red line added)

SONY

KDL-55W802A

55" Class (54.6" diag) W802A Series LED Internet TV

Quartz-cut design brings a new edge to TV with a hint of translucent color that emphasizes the hidden gem within. Each scene in everything you watch—HD movies, 3D, sports, even YouTube™ clips—is presented with unprecedented detail and color from Sony's exclusive X-Reality™ PRO picture engine. And lifelike motion comes via Motionflow™ XR 480 technology for



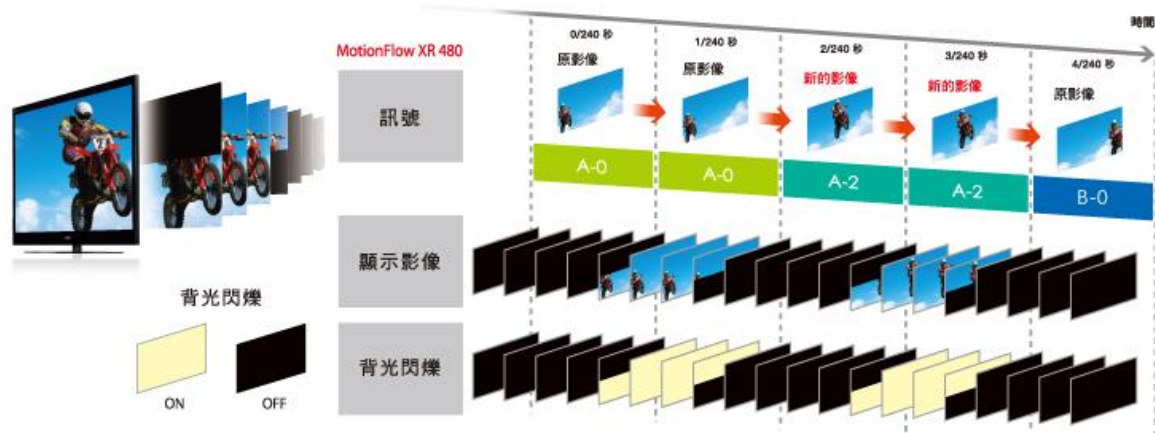
22. Sony televisions select at least two image pictures which are visually similar, a first image picture and a second image picture. For example, the Sony W802A selects two image pictures (shown below as 1 and 2) which are visually similar. In this case, similar red, green, and blue image pictures, *e.g.*:

Figure 2 (Source: <http://store.sony.com.tw/product/KDL-32HX750>)

MotionFlow XR 480 Extreme Streamline Imaging Technology 480

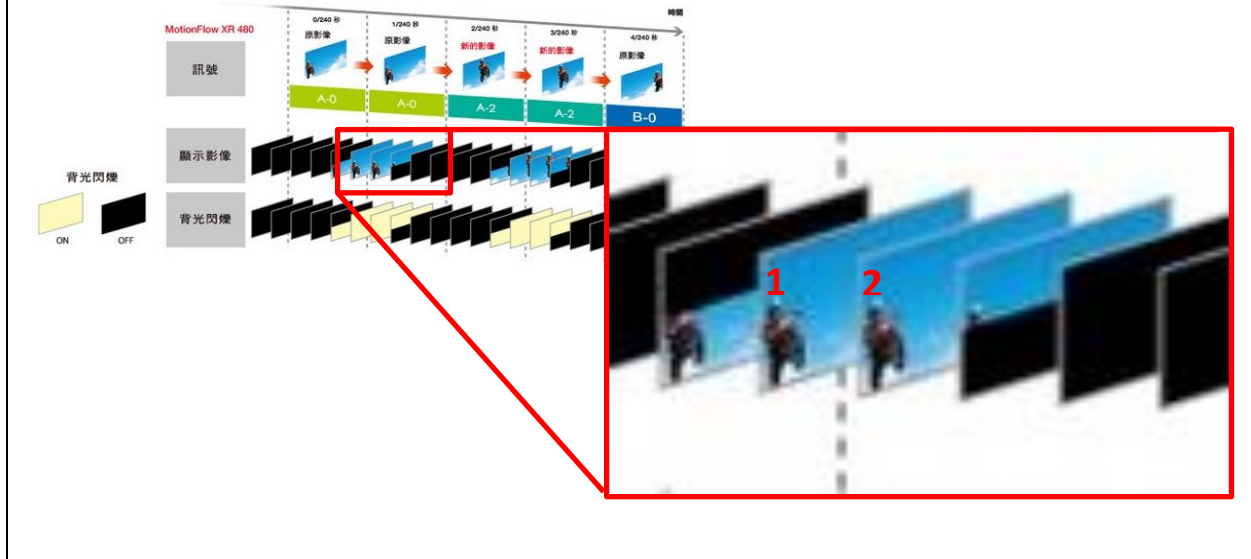
Image Leap Motion Faster

FX Streaming Video Technology uses a 240Hz panel that combines "Image Blur Reduction", "Frame Interpolation", and "Picture Backlight Frame Blinking" and Backlight Scanning "technology make the dynamic image performance as perfect as the scene, clear sense of speed and precise sense of detail, so that the image fluency and evolution!



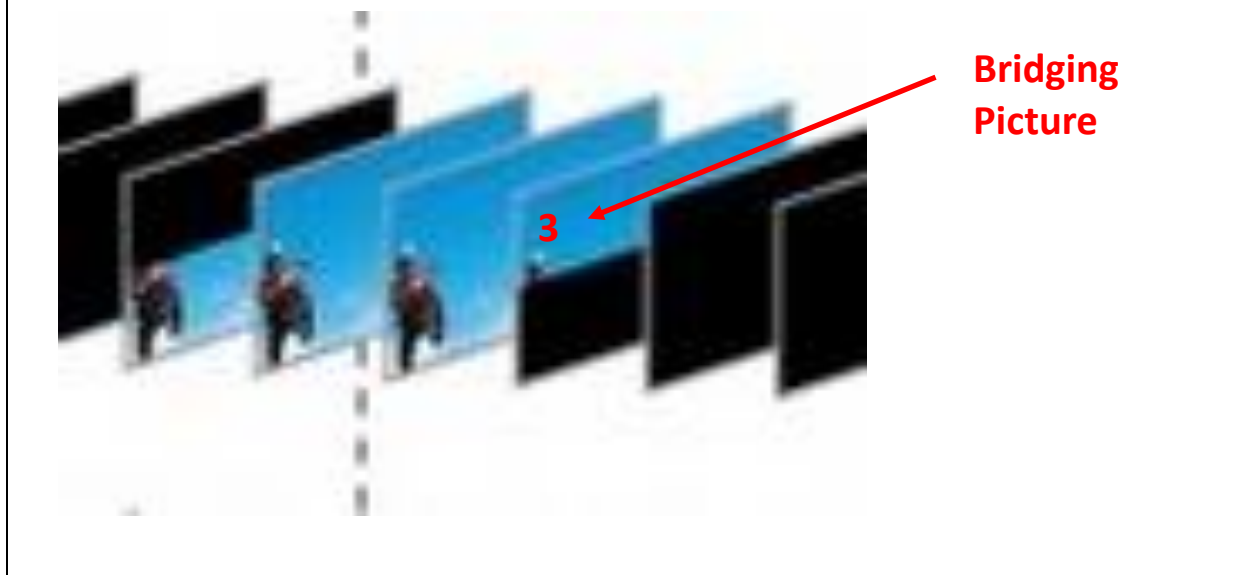
Motionflow XR 480

Figure 3 (Source: <http://store.sony.com.tw/product/KDL-32HX750>) (red lines, red boxes, and red text added)



23. Sony televisions select a bridging picture which is dissimilar to said image picture. For example, the Sony W802A selects a partially black bridging picture (shown below as 3), which is dissimilar to said image pictures, *e.g.*:

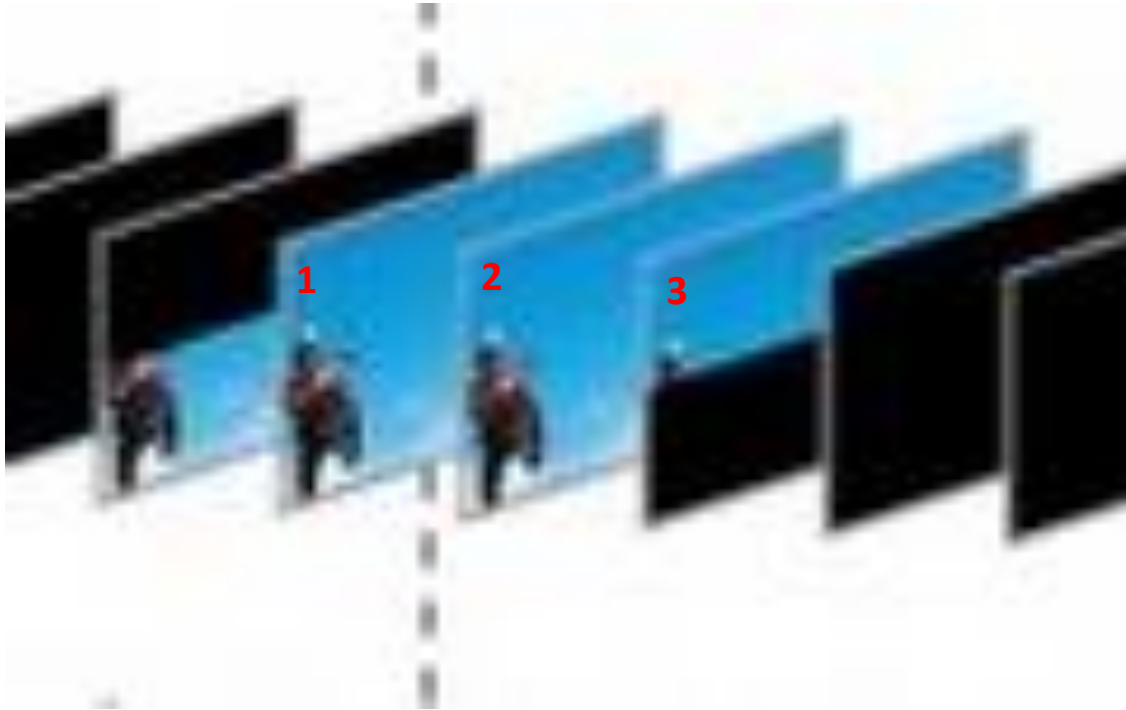
Figure 4 (Source: <https://attach.mobile01.com/attach/201212/mobile01-a9e8f30a891dbc038b08b6b8a72efa77.jpg>) (red text and red arrow added)



24. Sony televisions arrange said pictures in a sequential order to create a first series of pictures, said sequential order being one or more first image pictures, one or more second image

pictures, and one or more bridging pictures; and place said first series of pictures on a plurality of picture frames wherein each picture of said first series is placed on a single frame. For example, the Sony W802A arranges (and displays) said pictures in sequential order to create a first series of pictures and places the first series of pictures on a plurality of picture frames, each of the pictures having their own frames. As shown below, the order in which the pictures are arranged (and displayed) is 1, 2, 3 and each of the image pictures and the bridging picture are displayed on their own frames, *e.g.*:

Figure 5 (Source: <https://attach.mobile01.com/attach/201212/mobile01-a9e8f30a891dbc038b08b6b8a72efa77.jpg>) (red text added)



25. Sony televisions repeat the first series of pictures a plurality of times to create a continuous plurality of picture frames having said first series thereon, such that when said plurality of picture frames are viewed an appearance of continuous movement is perceived by a viewer. For example, the Sony W802A repeats the first series of pictures, frames 1-3, in frames 4-6, when the screen is paused or a static image is displayed on the screen, *e.g.*:

Figure 6 (Source: <https://attach.mobile01.com/attach/201212/mobile01-a9e8f30a891dbc038b08b6b8a72efa77.jpg>) (red lines, red boxes, and red text added)



26. The above Figure 6 intended to reflect the performance of the device when displaying a non-movingstatic image. The underlying image produced by Sony (Fig. 2, p. 6) appears to have been altered to exaggerate the motion of the motorcycle (or dirt-bike), as the amount of motion in Figure 2 would be consistent with a motor speed over 200 mph. (See Bohannon Decl. annexed as Ex. 4D, ¶V.3) Examining the underlying figure, the series of full blue-sky motor-cycle images and preceding black and blue-sky image have been placed in frames and could be repeated a plurality of times (e.g., when the screen is paused or when a static image is displayed on the screen). (Id. at ¶V.2)

27. By making, using, selling, importing, and offering for sale Sony televisions and other similar products, Sony is infringing the claims of the '902 Patent, including but not limited to claim 1. Sony has committed these acts of infringement without license or authorization.

28. Sony had actual knowledge of the '902 patent at least as early as January 2018, and likely before.

29. Specifically, Sony relied on the '902 patent in Sony Electronics Inc.'s Reply Brief to Plaintiff's Responsive Brief in Opposition to Partial Motion to Dismiss for Lack of Patentable Subject Matter, docket item 17, at p. 8, dated January 17, 2018.

30. Sony therefore had knowledge of the relevance of the '902 patent and of its products' infringement of that patent since that date.

31. Furthermore, at least as early as February 15, 2017, counsel for VEI advised counsel for Sony that VEI intended to seek redress from Sony for infringement of the '902 patent.

32. Nonetheless, Sony has continued to manufacture, sell and distributed the accused and similar products after becoming aware of the '902 patent and its infringement thereof. Sony's continued manufacture, sale and distribution, in the face of its knowledge of the '902 patent constitutes willful infringement.

33. Sony has injured VEI and is liable to VEI for direct and indirect infringement of the claims of the '902 Patent pursuant to 35 U.S.C. § 271(a), (b), and (c).

34. As a result of Defendant's infringement of the '902 Patent, VEI has suffered harm and seeks monetary damages in an amount adequate to compensate for infringement, but in no event less than a reasonable royalty for the use made of the invention by Sony, together with interest and costs as fixed by the Court.

35. Further, as a result of Sony's willful violation, VEI is entitled to recover treble damages, or such multiple damages as the Court finds just, for Sony's infringement of the '902 Patent.

COUNT II

INFRINGEMENT OF U.S. PATENT NO. 9,781,408

36. Plaintiff incorporates by reference each of the allegations in the foregoing paragraphs, and further alleges as follows:

37. On October 3, 2017, the United States Patent and Trademark Office issued the '408 Patent for inventions covering systems, which in one claimed embodiment comprise a storage adapted to store one or more image frames; and a processor adapted to obtain a first image frame

from a first video stream; expand the first image frame to generate a modified image frame, wherein the modified image frame is different from the first image frame; generate a first altered image frame that includes first and second non-overlapping portions, wherein the first non-overlapping portion comprises a first portion of the modified image frame, wherein the first image frame does not include the second non-overlapping portion, wherein the modified image frame does not include the second non-overlapping portion; and generate a second altered image frame that includes third and fourth non-overlapping portions wherein the third non-overlapping portion comprises a second portion of the modified image frame, the second portion of the modified image frame being different from the first portion of the modified image frame, wherein the first image frame does not include the fourth non-overlapping portion, wherein the modified image frame does not include the fourth non-overlapping portion. A true and correct copy of the '408 Patent is attached as Exhibit B.

38. Sony has been and is now directly and indirectly infringing one or more claims of the '408 Patent, in this judicial District and elsewhere in the United States.

39. For example, Sony directly infringes the '408 Patent, including but not limited to claim 1, by making, using, selling, importing, and offering for sale Sony televisions. The Sony 55X930E is representative of the products accused, which encompass other Sony products having similar features, such as Motionflow XR 800 technology. Such products include, but are not limited to the XBR X940E and X930E Series televisions, *e.g.*:

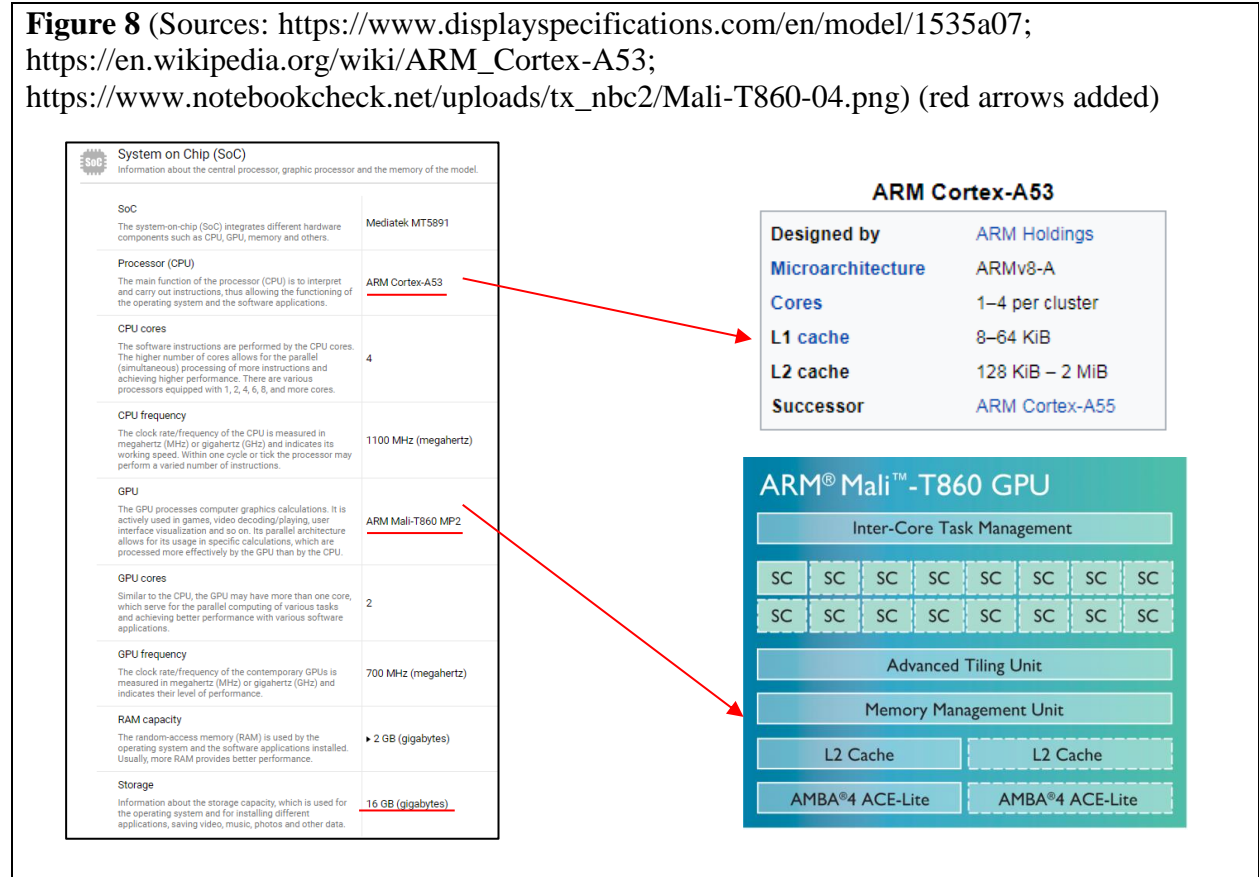
Figure 7 (Source: <https://www.sony.com/electronics/televisions/XBR-X930E-X940E-Series>)

X940E / X930E | LED | 4K Ultra HD | High Dynamic Range
(HDR) | Smart TV (Android TV™)
XBR X940E / X930E Series



40. Sony televisions include a storage adapted to store one or more image frames. For example, the Sony 55X930E includes a storage capable of storing one or more image frames, *e.g.*:

Figure 8 (Sources: <https://www.displayspecifications.com/en/model/1535a07>; https://en.wikipedia.org/wiki/ARM_Cortex-A53; https://www.notebookcheck.net/uploads/tx_nbc2/Mali-T860-04.png) (red arrows added)



41. Sony televisions include a processor adapted to obtain a first image frame from a first video stream. For example, the Sony 55X930E includes a Sony 4k HDR Processor X1 Extreme, capable of obtaining a first image frame from a first video stream via any of its video input connections. The video stream could come from a cable box, DVD/Blu-Ray player, computer, or one of many other sources, *e.g.*:

Figure 9 (Source: <https://www.sony.com/electronics/televisions/XBR-X930E-X940E-Series/specifications>)

	55" class (54.6" diag) XBR-55X930E	65" class (64.5" diag) XBR-65X930E	75" class (74.5" diag) XBR-75X940E
PICTURE PROCESSOR	4K HDR Processor X1™ Extreme		
	55" class (54.6" diag) XBR-55X930E	65" class (64.5" diag) XBR-65X930E	75" class (74.5" diag) XBR-75X940E
COMPONENT VIDEO (Y/PB/PR) INPUT(S)	1 (side hybrid with composite)		
COMPOSITE VIDEO INPUT(S)	2 (1 side analog conversion/1 side hybrid with component)		
RS-232C INPUT(S)	1 (bottom/mini jack)		
HDMI INPUTS TOTAL	4 (1 side/3 bottom)		
HDCP	HDCP2.2 (for HDMI™ 1/2/3/4)		

42. Sony televisions expand the first image frame to generate a modified image frame, wherein the modified image frame is different from the first image frame. For example, the Sony 55X930E has a screen resolution of 3,840 x 2,160 pixels. It has an upscaler, which in real-time expands the received image frames (most often 720p or 1080i) to a modified image frame with the screen's resolution (3,840 x 2,160). As the first image frame and the modified image frame are different sizes, the modified image frame is different from the first image frame, *e.g.*:

Figure 10 (Sources: <https://www.sony.com/electronics/televisions/XBR-X930E-X940E-Series/specifications>; <http://www.spectrum.net/support/tv/hdtv-picture-formats>; <https://www.sony.com/electronics/televisions/XBR-X930E-X940E-Series/specifications>) (red lines added)

4K HDR Processor X1™ Extreme:
So real you can feel it

Made to enhance the latest generation of 4K HDR pictures, the 4K HDR Processor X1™ Extreme brings reality to every scene. With 40% more real-time image processing than our renowned 4K Processor X1™, it delivers unprecedented picture quality for everything you watch, upscaling content from any source nearer to 4K HDR quality.

- Since the vast majority of programming is currently produced in 720p and 1080i, if your television is enabled with 1080p or 4K technology, your TV will convert our HD signal so you can continue to enjoy Spectrum TV.

DISPLAY RESOLUTION (H X V, PIXELS)	3840 x 2160
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43. Sony televisions generate a first altered image frame that includes first and second non-overlapping portions. For example, the Sony 55X930E features Motionflow XR 960 technology. Motionflow XR 960 is the United States equivalent of Sony’s Motionflow XR 800, prevalent in Asia and other parts of the world operating with 50Hz multiples for televisions, *e.g.*:

Figure 11 (Sources: <https://www.sony.com/electronics/televisions/XBR-X930E-X940E-Series/specifications>; <https://www.cnet.com/news/fake-refresh-rates-is-your-tv-really-120hz>)

MOTION ENHANCER (NATIVE HZ)	Motionflow™ XR 960 (native 120 Hz)
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Here are two images pulled from **Sony's Asia site**. These TVs are for 50Hz electricity (the U.S. is 60), so the versions of TVs it gets are multiples of 50, whereas ours are multiples of 60. Same concept, though. Here's MotionFlow 800 (our 960):

44. Sony televisions insert additional frames between images. This results in generating altered image frames with first and second non-overlapping portions, *e.g.*:

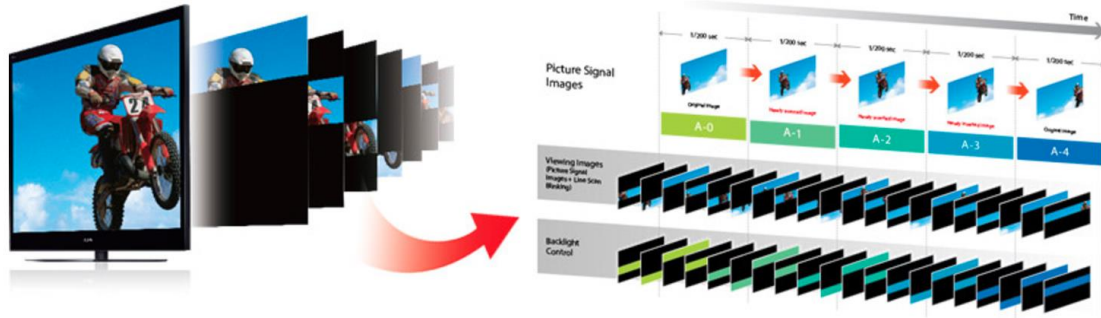
Figure 12 (Source: <https://www.sony-mea.com/microsite/bravia/led-backlit-lcd-tv-picture-quality.html>)

Motionflow™ XR 800

Sony's most advanced Motionflow™ ever.



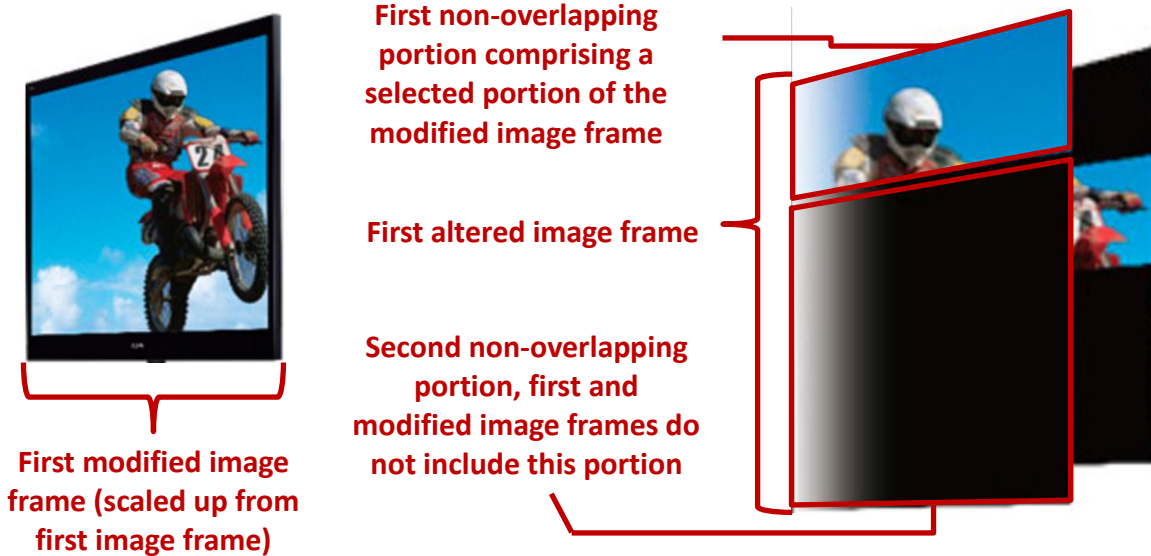
Sony's latest Motionflow™ technology utilises all the features that made its predecessors industry leaders in motion blur reduction, as well as a few new advances. These include a 4-times speed play which inserts 3 additional frames between images, and a choice of "Clear" or "Clear Plus" mode which uses a line scan method to reduce blur and shortens the apparent response time of the liquid crystal respectively.



45. Below is a breakdown of the first altered image frame created by Sony televisions

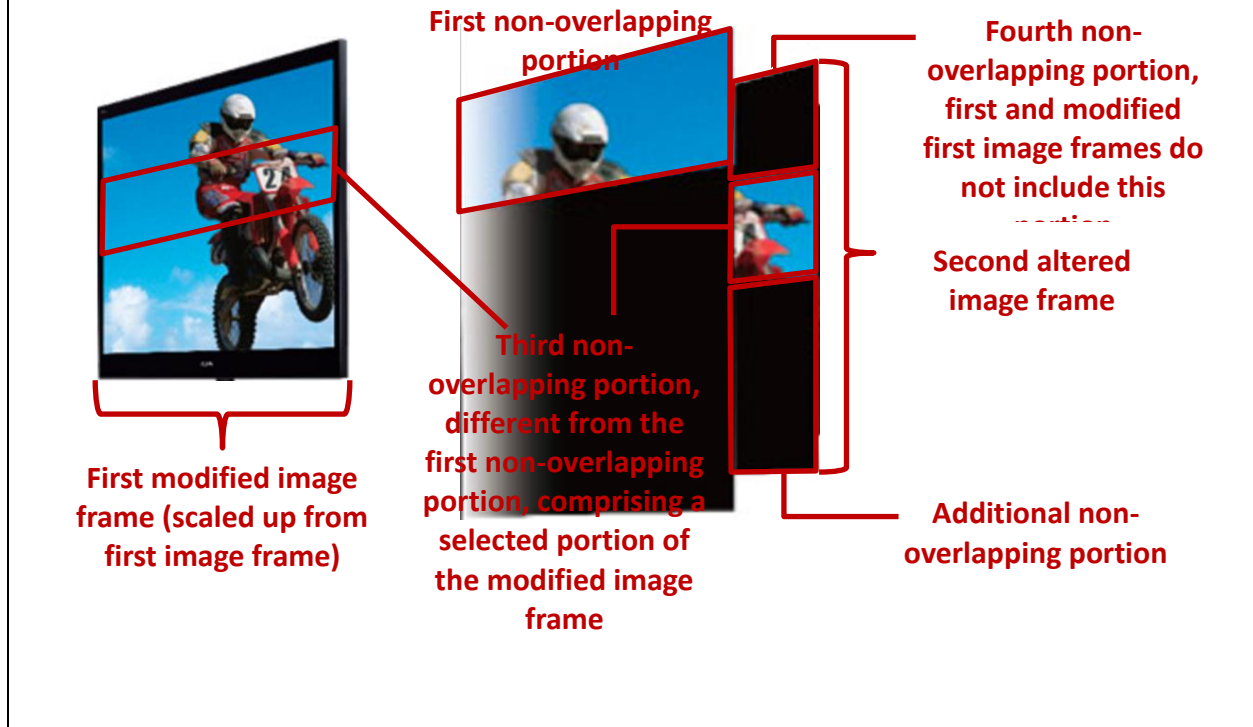
(e.g. via the Motionflow feature), e.g.:

Figure 13 (Source: <https://www.sony-mea.com/microsite/bravia/led-backlit-lcd-tv-picture-quality.html>) (red boxes, red lines, and red text added)



46. Below is a breakdown of the second altered image frame created by Sony televisions (e.g. the Motionflow feature), e.g.:

Figure 14 (Source: <https://www.sony-mea.com/microsite/bravia/led-backlit-lcd-tv-picture-quality.html>) (red boxes, red lines, and red text added)



47. By making, using, selling, importing, and offering for sale Sony televisions and other similar products, Sony is infringing the claims of the '408 Patent, including but not limited to claim 1. Sony has committed these acts of infringement without license or authorization.

48. Sony had actual knowledge of the '408 patent at least as early as December 2017, having been informed of the issuance of the '408 patent by VEI at that time.

49. Specifically, VEI – through its counsel – informed Sony of the issuance of the '408 patent and of Sony's infringement of that patent by electronic communication on December 20, 2017.

50. Furthermore, counsel for VEI reiterated its intent to seek redress for Sony's infringement of the '408 patent to counsel for Sony at least as early as February 12, 2017.

51. Nonetheless, Sony has continued to manufacture, sell and distributed the accused products after being informed of the '408 patent. Sony's continued manufacture, sale and distribution, in the face of its knowledge of the '408 patent constitutes willful infringement.

52. Sony has injured VEI and is liable to VEI for direct and indirect infringement of the claims of the '408 Patent pursuant to 35 U.S.C. § 271(a), (b), and (c).

53. As a result of Defendant's infringement of the '408 Patent, VEI has suffered harm and seeks monetary damages in an amount adequate to compensate for infringement, but in no event less than a reasonable royalty for the use made of the invention by Sony, together with interest and costs as fixed by the Court.

54. Further, as a result of Sony's willful violation, VEI is entitled to recover treble damages, or such multiple damages as the Court finds just, for Sony's infringement of the '902 Patent.

COUNT III

INFRINGEMENT OF U.S. PATENT NO. 9,948,922

55. Plaintiff incorporates by reference each of the allegations in the foregoing paragraphs, and further alleges as follows:

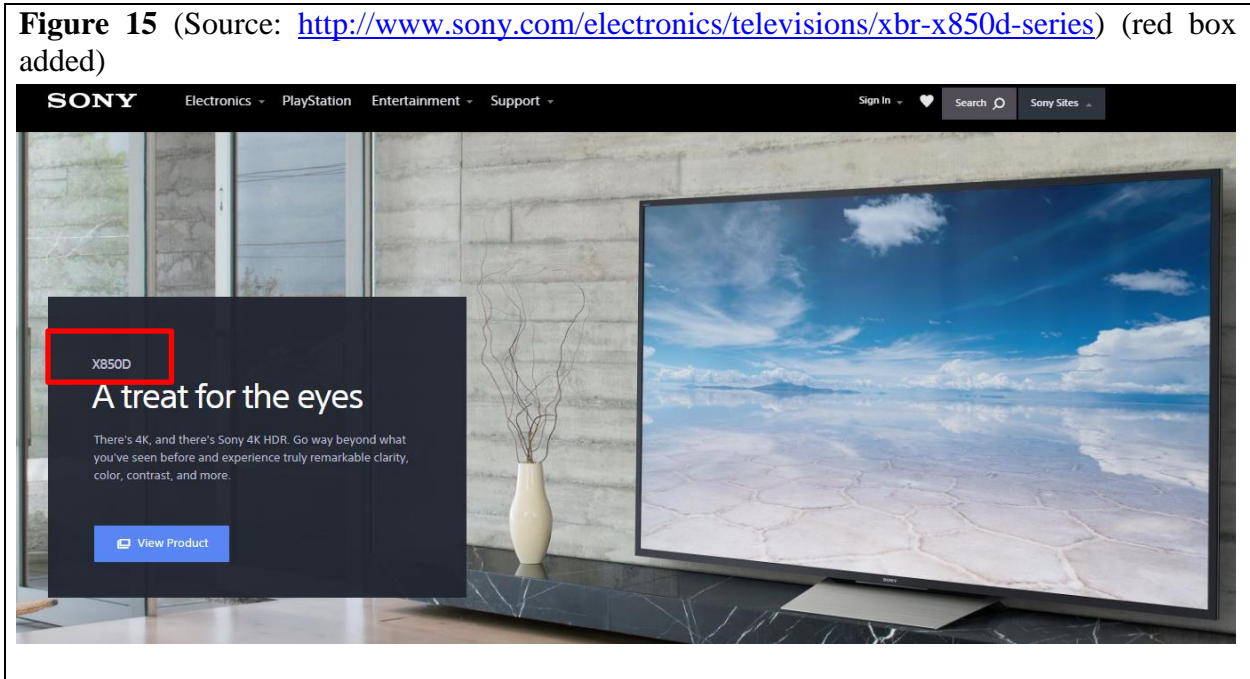
56. On April 17, 2018, the United States Patent and Trademark Office issued the '922 Patent for inventions covering an apparatus which in one claimed embodiment comprises a storage adapted to store one or more image frames; a processor adapted to obtain a first image frame and a second image frame from a first video stream; generate a first modified image frame by expanding the first image frame, wherein the first modified image frame is different from the first image frame; generate a second modified image frame by expanding the second image frame, wherein the second modified image frame is different from the second image frame; generate a bridge frame, wherein the bridge frame is a solid color, wherein the bridge frame is different from the first image frame and different from the second image frame; display the first modified image frame; display the bridge frame; and display the second modified image frame. A true and correct copy of the '922 Patent is attached as Exhibit C.

57. Sony has been and is now directly and indirectly infringing one or more claims of the '922 Patent, in this judicial District and elsewhere in the United States.

58. For example, Sony directly infringes the '922 Patent, including but not limited to

claim 1, by making, using, selling, importing, and offering for sale Sony televisions. The Sony XBR-55X850D (“Sony X850D”) is representative of the products accused, which encompass other Sony products having similar features, such as Motionflow XR 800 technology, *e.g.*:

Figure 15 (Source: <http://www.sony.com/electronics/televisions/xbr-x850d-series>) (red box added)



59. Sony televisions include a storage adapted to store one or more image frames. For example, the Sony X850D includes a storage capable of storing one or more image frames, *e.g.*:

Figure 16 (Sources: <http://www.display specifications.com/en/model/d70e3ee;> https://en.wikipedia.org/wiki/ARM_Cortex-A17; <https://www.arm.com/products/multimedia/mali-gpu/high-performance/mali-t624.php>) (red arrows and lines added)

54.6" Sony XBR-55X850D - Specifications

System on Chip (SoC)
Information about the central processor, graphic processor and the memory of the model.

SoC The system-on-chip (SoC) integrates different hardware components such as CPU, GPU, memory and others.	Mediatek MT5890
Processor (CPU) The main function of the processor (CPU) is to interpret and carry out instructions, thus allowing the functioning of the operating system and the software applications.	<u>ARM Cortex-A17</u>
CPU cores The software instructions are performed by the CPU cores. The higher number of cores allows for the parallel (simultaneous) processing of more instructions and achieving higher performance. There are various processors equipped with 1, 2, 4, 6, 8, and more cores.	2
GPU The GPU processes computer graphics calculations. It is actively used in games, video decoding/playing, user interface visualization and so on. Its parallel architecture allows for its usage in specific calculations, which are processed more effectively by the GPU than by the CPU.	<u>ARM Mali-T624</u>
Storage Information about the storage capacity, which is used for the operating system and for installing different applications, saving video, music, photos and other data.	<u>16 GB (gigabytes)</u>

ARM Cortex-A17

Designed by ARM Holdings
Microarchitecture ARMv7-A
Cores 1–4, can be combined with less powerful A7 cores in a big.LITTLE configuration^[1]
L1 cache 32–64 KiB instruction 32 KiB data^[1]
L2 cache 256 KiB–8 MiB^[1] (configurable L2 cache controller)

ARM® Mali™ -T624

- Inter-Core Task Management
- Shader Core
- Shader Core
- Shader Core
- Shader Core
- Memory Management Unit
- Level 2 Cache/SCU
- AMBA®4 ACE-Lite

60. Sony televisions include a processor adapted to obtain a first image frame and a second image frame from a first video stream. For example, the Sony X850D includes a processor adapted to obtain a first image frame and a second image frame from a first video stream. For example, the SonyX850D includes a processor capable of obtaining a first image frame and a second image frame from a first video stream via any of its video input connections. The video stream could come from a cable box, DVD/Blu-Ray player, computer, or one of many other sources, *e.g.*:


Figure 17 (Sources: <http://www.displayspecifications.com/en/model/d70e3ee>; <http://www.rtings.com/tv/reviews/sony/x850d/settings>) (red box added)

System on Chip (SoC)	
Information about the central processor, graphic processor and the memory of the model.	
SoC The system-on-chip (SoC) integrates different hardware components such as CPU, GPU, memory and others.	Mediatek MT5890
Processor (CPU) The main function of the processor (CPU) is to interpret and carry out instructions, thus allowing the functioning of the operating system and the software applications.	ARM Cortex-A17
CPU cores The software instructions are performed by the CPU cores. The higher number of cores allows for the parallel (simultaneous) processing of more instructions and achieving higher performance. There are various processors equipped with 1, 2, 4, 6, 8, and more cores.	2
GPU The GPU processes computer graphics calculations. It is actively used in games, video decoding/playing, user interface visualization and so on. Its parallel architecture allows for its usage in specific calculations, which are processed more effectively by the GPU than by the CPU.	ARM Mali-T624
Storage Information about the storage capacity, which is used for the operating system and for installing different applications, saving video, music, photos and other data.	16 GB (gigabytes)

Connectivity	
Available connectivity ports, slots and interfaces.	
Connectivity Information about the available connectivity ports, slots and interfaces such as USB, infrared port, SD card slot, audio/video and network interfaces, etc.	<ul style="list-style-type: none"> ▶ 2 x USB 2.0 (max 0.5 A) ▶ 1 x USB 3.0 (max 0.9 A) ▶ 1 x Ethernet RJ45 ▶ 4 x HDMI 2.0 (ARC; CEC; MHL) ▶ 1 x Satellite In (Main; F-type female) ▶ 1 x AV Composite In (Video + L/R) ▶ 1 x AV Component In (YPbPr + L/R) ▶ 1 x Optical Audio Out ▶ 1 x 3.5 mm Audio Out ▶ 1 x RS232 (C) ▶ 1 x IR Out


61. Sony televisions generate a first modified image frame by expanding the first image frame, wherein the first modified image frame is different from the first image frame and generate a second modified image frame by expanding the second image frame, wherein the second modified image frame is different from the second image frame. For example, the Sony X850D generates a first modified image frame by expanding the first image frame and generates a second modified image frame by expanding the second image frame. The Sony X850D has a screen resolution of 3840 x 2160 pixels. It performs upscaling which expands the input frame in real-time to a modified image frame matching the screen resolution. Since the image frame and the first modified image frame are different sizes (*e.g.*, achieved through interpolation), the first modified image frame is different from the first image frame. Since the second image frame and the second modified image frame are different sizes (*e.g.*, achieved through interpolation), the second modified image frame is different from the second image frame, *e.g.*:

Figure 18 (Sources: <http://www.displaySpecifications.com/en/model/d70e3ee>;
<http://www.sony.com/electronics/televisions/xbr-x850d-series>;
https://en.wikipedia.org/wiki/Video_scaler) (red lines added)

<p>Resolution</p> <p>Information about the number of pixels on the horizontal and vertical side of the screen. A higher resolution allows the display of a more detailed and of higher quality image.</p>	<p>3840 x 2160 pixels Ultra HD (UHD) / 4K / 2160p</p>
<p style="text-align: center;">4K Clarity</p> <p>Images are sharpened and refined in real time, using advanced noise reduction, detail enhancement and upscaling technology to achieve remarkable clarity.</p> 	
<p>A video scaler is a system which converts video signals from one display resolution to another; typically, <u>scalers are used to convert a signal from a lower resolution (such as 480p standard definition) to a higher resolution (such as 1080i high definition)</u>, a process known as "upconversion" or "upscaling" (by contrast, converting from high to low resolution is known as "downconversion" or "downscaling").</p>	

62. Sony televisions generate a bridge frame, wherein the bridge frame is a solid color, wherein the bridge frame is different from the first image frame and different from the second image frame. For example, the Sony X850D generates a solid color bridge frame that is different from the first image frame and the second image frame. The Sony X850D uses black frame insertion (“BFI”). BFI creates a solid black frame that is different from the first frame and different from the second image frame, *e.g.*:

Figure 19 (Sources: <http://www.rtings.com/tv/tests/motion/image-flicker>; 15/217,612 specification) (red box and red lines added)




BLACK FRAME INSERTION (BFI)

To pass our black frame insertion test, the TV must have an option to introduce more black frames into a 60 fps source. A TV which doesn't flicker when using our calibration settings even when the backlight is dimmed requires an option to add flicker to pass this test. For a TV which does flicker it needs to be able to reduce this backlight frequency. This is visible in the backlight oscilloscope as a change in the pattern. The blur photo with black frame insertion enabled is taken with the same methodology described [here](#).

What it is: Option to turn screen black between frames

When it matters: Reduces eye tracking blur in sports or video games

Good value: Yes




substantially similar. In electronic media, the bridge-picture may simply be a timed unlit-screen pause between serial re-appearances of the two or more similar image pictures. The rolling movements of

63. Sony televisions display the first modified image frame; display the bridge frame; and display the second modified image frame. For example, the Sony X850D displays the first modified image frame, displays the bridge frame, and displays the second modified image frame. The Sony X850D processor is adapted to display the first modified image frame (*i.e.*, first upscaled image), the bridge frame (*i.e.*, black frame), and the second modified image frame (*i.e.*, second upscaled image), *e.g.*:

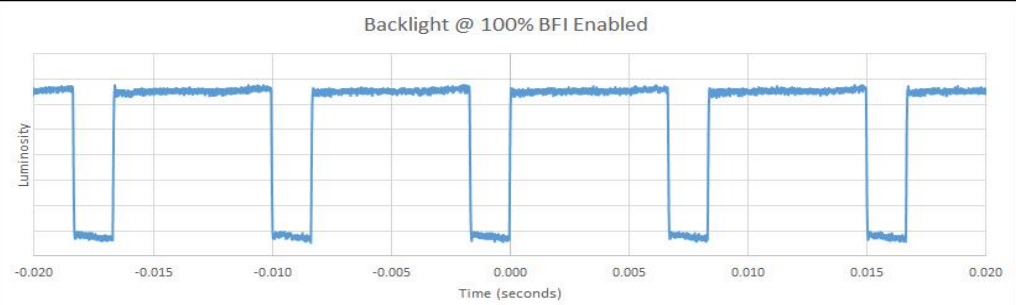
Figure 20 (Sources: <http://www.sony.com/electronics/televisions/xbr-x850d-series>; <http://www.rtings.com/tv/tests/motion/image-flicker>)

4K Clarity

Images are sharpened and refined in real time, using advanced noise reduction, detail enhancement and upscaling technology to achieve remarkable clarity.



Backlight @ 100% BFI Enabled



64. By making, using, selling, offering for sale, and importing active 3D glasses, Sony is infringing the claims of the '304 Patent, including but not limited to claim 1. Sony has committed these acts of infringement without license or authorization.

65. Sony has injured VEI and is liable to VEI for direct and indirect infringement of the claims of the '701 Patent pursuant to 35 U.S.C. § 271(a), (b), and (c).

66. As a result of Sony's infringement of the '304 Patent, VEI has suffered harm and seeks monetary damages in an amount adequate to compensate for infringement, but in no event less than a reasonable royalty for the use made of the invention by Sony, together with interest and costs as fixed by the Court.

PRAYER FOR RELIEF

Plaintiff respectfully requests the following relief from this Court:

A. That Defendant has directly and indirectly infringed the '902, '408, and '922 Patents;

B. That Defendant's infringement of the '902 and '408 patents is willful, entitling Plaintiff to enhanced damages under 35 U.S.C. § 284 as the Court finds just;

C. That Defendant be ordered to pay damages to VEI, together with costs, expenses, pre-judgment interest, and post-judgment interest as allowed by law;

A declaration that this case is exceptional under 35 U.S.C. § 285, and an award of VEI's reasonable attorneys' fees

D. That the Court enter judgment against Defendant, and in favor of VEI in all respects;

E. For any such other and further relief as the Court deems just and equitable.

JURY TRIAL DEMANDED

Pursuant to Rule 38 of the Federal Rules of Civil Procedure, VEI requests a trial by jury of any issues so triable by right.

Dated: June 29, 2018

Respectfully submitted,
/s/ Stamatios Stamoulis

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