Sharp files MVA and PSA LCD patent infringement lawsuit against CHOT, TPV, and Vizio

The U.S. International Trade Commission starts Section 337 investigation into CHOT, TPV, and Vizio.

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Key findings

- Sharp filed a patent infringement lawsuit against Xianyang CaiHong Optoelectronics Technology Co., Ltd. (CHOT) and CHOT's customer, the LCD TV subcontract manufacturer OEM, TPV, as well as TPV's customer, the US TV brand, Vizio. According to Sharp's press release dated March 11, 2020, "Sharp alleges that these entities have infringed 12 patents related to LCD, including polymer-sustained alignment (PSA) and high-definition (HD) display technologies."
- Vizio's 70-inch LCD TV, which TPV made with CHOT's 70-inch panel, is the main character of this patent infringement.
- At least five of Sharp's patents are in this case: US Patent #7255329, #7372533, #8022912, #8451204, and #8847863. These patents are all related to the multi-domain vertical alignment (MVA) mode, PSA, the driving electrode design of the MVA, and the improvement on the wide-view angle.

Sharp has been recognized as the earlier developer and manufacturer of the LCD, also the entrepreneur of the MVA wide-view angle mode. Thanks to Sharp's great efforts and innovation, this MVA mode is especially going through many technologies and process improvements in the past years, such as PSA or the ultraviolet-induced multi-domain vertical alignment (UV2A), and so on. Many LCD makers have been licensing from Sharp about the basic MVA model patent or cross-license with Sharp to protect their intellectual property.

As Omdia analyzed in the Market Insight entitled *The analysis on Samsung Display restructure LCD business*, in the case of LCD TV wide-view angle technology, there are two camps: the in-plane switching (IPS) and the vertical alignment (VA). The IPS camps consist of LG Display, BOE, and Panasonic LCD. The VA camp consists of Sharp, AUO, Innolux, Samsung Display, China Star, HKC, CEC Panda, and CHOT. The patent license is an important matter for LCD makers, especially on the wide-view angle technology. It is also about whether the LCD panel that is manufactured can be sold to the end customers—LCD TV OEMs and brands—without any patent issues.

AUO, Innolux, China Star, CEC Panda, and Samsung Display have all discussed or signed patent cooperation or cross-license agreement with Sharp. However, it is always a challenge for new Chinese LCD makers if their panels are violating Sharp's patents, or not.

According to the Sharp's press release from March 11, 2020, Sharp filed a patent infringement lawsuit against CHOT and CHOT's customer, the LCD TV subcontract manufacturer OEM, TPV, as well as TPV's customer, the US TV brand, Vizio. "Sharp alleges that these entities have infringed 12 patents related to LCD, including PSA and HD display technologies."

As Omdia analyzed in the *Large Area Display Product Roadmap Tracker*, CHOT is producing an LCD TV with the MVA technology.

Accordingly, and as stated in Sharp's press release:

> Sharp sought to resolve the alleged infringement through negotiations and brought the issue to CHOT's attention in November of 2019. After providing ample evidence of use and opportunities for a negotiation, CHOT failed to stop infringing Sharp's patents. To prevent further losses, Sharp is asserting its intellectual property rights against CHOT.

In May 2020, the patent infringement case becomes more prominent as the U.S. International Trade Commission (USITC) instituted a Section 337 investigation based on the patent infringement complaint filed Sharp against CHOT, TPV, and VIZIO—Sharp press release dated April 22, 2020.

According to the Omdia *TV Display & OEM Market Tracker*, CHOT's LCD TV open-cell customers are Changhong, Hisense, Konka, Samsung Electronics, TCL, and TPV. As shown below, TPV is especially buying 50-inch and 70-inch panels from CHOT as both companies have a strategic alliance relationship.

TPV's LCD TV assembly factory is on the same campus with CHOT's Gen8.6 fab in Xianyang, China. This is for strategic alliance and logistics convenience.

The following table shows CHOT's LCD TV customers.

Table 1: CHOT's LCD TV customer (4Q 2019, unit: thousand pieces)

Panel to OEMs in units (000s)					Panel sizes
	CHOT				Grand total
OEM	30"-32"	50"-52"	58"-60"	70"-75"	246
Changhong	60	156	30		285
Hisense		210	75		78
Konka		66	12		129
Samsung				129	0
Skyworth		0			303
TCL		303			760
TPV	250	240	75	195	594
Other OEMs	0	455	3	136	2,395
Grand total	310	1,430	195	460	246

Source: Omdia

According to the Sharp press release titled "ITC Institutes Section 337 Investigation Filed by Sharp Against CHOT, et al." dated May 21, 2020, the USITC "instituted a Section 337 investigation based on the patent infringement complaint filed on April 21, 2020 by Sharp against CHOT, TPV, and VIZIO."

The press release further states that:

> "Sharp has demonstrated to the ITC that its complaint was properly filed and an investigation should be instituted. Sharp's complaint shows significant, continuous investments in the liquid crystal display ("LCD") market in the United States. Therefore, Sharp is asking the ITC to protect its rights from infringers of Sharp's patents and to issue a limited exclusion order barring infringing CHOT products, and devices using infringing CHOT products, from entry into the United States, and a cease and desist order preventing CHOT and other defendants from advertising and selling infringing devices and products in the United States."
>
> Sharp requests the ITC to bar all CHOT products of all panel sizes, including 70" panels, that practice Sharp's asserted patents. Sharp expects the final decision from the ITC to be made

before the conclusion of the patent litigation filed by Sharp in March 2020 against CHOT and other defendants in the U.S. District Court of the Central District of California.

Vizio's 70-inch LCD TV, which TPV made with CHOT's 70-inch panel is the key of this patent infringement.

Furthermore, in the United States, Sharp is also selling its 70-inch LCD TV, which Foxconn made with Sharp's own LCD TV panel that Sakai Display Products Corporation (SDP) made in Sakai, Japan. Omdia believes that this is the reason why Sharp chose the United States as the patent infringement lawsuit battlefield.

Interestingly, Vizio is also Foxconn's LCD TV OEM customer and uses the panel from Foxconn Group (including Sharp and Innolux). Therefore, Omdia also believes that this patent infringement lawsuit is targeting CHOT and TPV but not necessarily VIZIO. It is standard business protocol that when CHOT sells LCD TV panels to Vizio, CHOT should be endorsing the panels to avoid patent infringement. This will also protect its customer like Vizio to avoid any legal disputes or sales obstacles.

The following table shows Vizio's subcontract OEM , according to the *TV Display & OEM Market Tracker.*

Table 2: OEM to Vizio brand (4Q 2019), unit: thousand pieces

OEM to brand shipments (000s)									OEMs
Brand	**Size**	**Amtran/ Raken**	**BOE**	**Foxconn**	**HKC**	**Innolux**	**TPV**	**Other OEMs**	**Grand total**
Vizio	22–25"					174	24		**198**
	30–32"	13	30		4	180	75	35	**337**
	40"					325			**325**
	42–43"	5	51				10	21	**86**
	50–52"					426	7	14	**447**
	55"	33	24				90	6	**153**
	58–60"			41			51		**92**
	65"	13	36			135	36	80	**300**
	70–75"		9	100			27		**136**
Vizio total		**64**	**150**	**141**	**4**	**1,240**	**320**	**156**	**2,074**
Grand total		**64**	**150**	**141**	**4**	**1,240**	**320**	**156**	**2,074**

Source: Omdia

Based on the Omdia analysis, there are main five major patents that Sharp claimed in this patent infringement case. The following are text from the United States Patent and Trademark Office and/or Google Patents:

US Patent No. 7372533

- Patent filed application by Sharp: June 2005
- Patent application granted: May 2008
- Patent expiration: March 2022

- Patent abstract: It is an object of the invention to provide a substrate for a LCD having optical transmittance improved without reducing the speed of a response to a tone change and a LCD utilizing the same. There is provided a drain bus line formed on an array substrate which sandwiches a liquid crystal in combination with an opposite substrate provided in a face-to-face relationship therewith, a TFT connected to the drain bus line, and a pixel electrode which has stripe-shaped electrodes, along with spaces, connected to the TFT and provided in parallel with the drain bus line, stripe-shaped electrodes in the vicinity of the drain bus line having an electrode width formed narrower than the width of internal electrodes located inside the same.
- Technology description: This patent is specially related to the polymer-fixing method for the MVA. The conventional MVA-LCDs have a problem in that they appear dark when displaying white because of low luminance. This is primarily attributable to the fact that transmittance decreases because dark lines appear above protrusions or slits which serve as boundaries for alignment separation. In order to mitigate this problem and to provide MVA LCDs having high luminance and capable of high-speed response, the use of a polymer-fixing method has been proposed. According to the polymer-fixing method, a liquid crystal compound obtained by mixing polymeric components such as a monomer and an oligomer (hereinafter simply represented by "monomer') in a liquid crystal is sealed between substrates. The monomer is polymerized with liquid crystal molecules tilted by applying a Voltage between the Substrates. As a result, a liquid crystal layer tilted at a predetermined pre-tilt angle is obtained even after terminating the application of the Voltage, which makes it possible to fix the alignment of the liquid crystal.
- Key words: MVA, polymer-fixing, alignment.

US Patent No. 7245329

- Patent filed application by Sharp: December 2002
- Patent application granted: July 2007
- Patent expiration: December 2022
- Patent abstract: A substrate for a LCD comprises a TFT substrate for holding opposing Substrates arranged opposed to each other as well as a liquid crystal composition obtained by mixing a monomer into liquid crystals. A plurality of bus lines are formed on the TFT substrate intersecting each other through an insulating film, and thin-film transistors are formed close to positions where the plurality of bus lines and intersect each other. A plurality of thin-film transistors for polymerization are formed for applying a Voltage to the pixel electrodes at the time of polymerizing the monomer, and a first common electrode wiring for polymerization is electrically connected to the gate electrodes of the plurality of thin-film transistors for polymerization.
- Technology description: LCD of MVA mode (multi-domain vertical alignment mode) by Vertically aligning liquid crystals having a negative dielectric anisotropy and having a bank structure (linear protuberance) and a slit of electrode on a Substrate

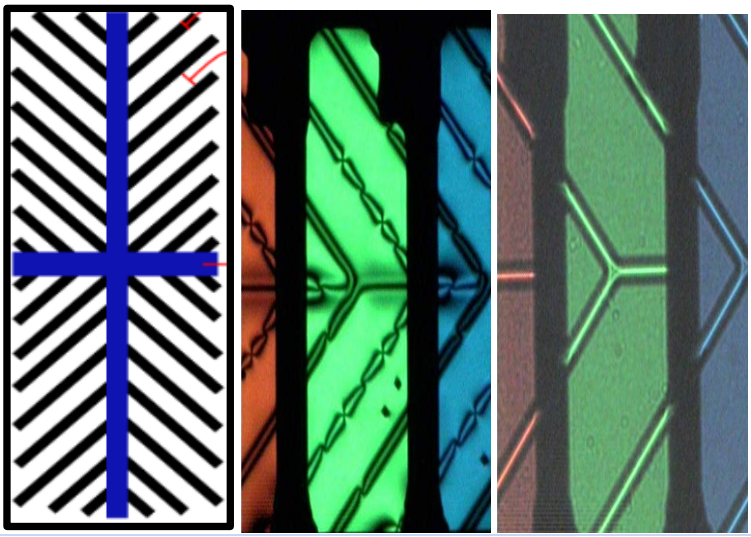
as an alignment regulating structure. Being provided with an alignment regulating structure, it is allowed to control the alignment of liquid crystals in a plurality of directions of when a Voltage is applied even without rubbing the alignment film. The liquid crystal display device of the MVA mode is Superior in viewing angle characteristics. According to the polymer fixing system, a liquid crystal composition obtained by adding a trace amount of a monomer that polymerizes upon the irradiation with ultraviolet rays (UV) to the liquid crystals having a negative dielectric anisotropy, is sealed between two pieces of substrates having vertically alignment films formed on the Surfaces thereof facing each other. Thereafter, a predetermined Voltage is applied across the substrates to tilt the liquid crystal molecules which are, then, irradiated with UV to polymerize the monomer.

- Key words: MVA, UV (Ultraviolet), vertically alignment films.

US Patent No. 8847863

- Patent filed application by Sharp: December 2010
- Patent application granted: September 2014
- Patent expiration: April 2031
- Patent abstract: Disclosed is a LCD device of active matrix type. Each pixel electrode includes either a single regional electrode or two or more regional electrodes which are electrically connected to each other. The or each regional electrode is provided with: a first electrode (cross-shaped electrode) which has a pattern dividing a first region into a plurality of second regions; and a plurality of stripe electrodes which are provided in each of the second regions so as to extend from the first electrode and So as to be separated from each other by a distance. A storage capacitor line (CSL) is provided facing one of pixel electrodes in a film thickness direction to form a storage capacitor. The storage capacitor line (CSL) is provided so as not to extend facing an edge of a first region in the film thickness direction parallelly to the edge. This invention eliminates irregular orientation of liquid crystal molecules in polymer Sustained alignment.
- Technology description: MVA (Multi-domain Vertical Alignment)-driven liquid crystal display devices are widely known which realize wide viewing angles by dividing a liquid crystal layer into domains and changing the orientation into which liquid crystal molecules tilt from one domain to the other. Some liquid crystal display devices of this type incorporate a so-called “fish bone' pixel electrode. The electrode includes a plurality of stripe electrodes formed in a pattern that runs in different directions in different domains, and the Stripe electrodes act as an alignment regulator for the formation of the domains used in MVA driving.
- Key words: MVA, PSA (Polymer Sustained Alignment), CSL (Capacitor Storage Line), fish bone' pixel electrode
- This is viewed as an important basic technology of the MVA, especially the so-called “fish-bone” pixel electrode, as shown below.

Figure 1: The fishbone electrode of the MVA LCD technology (figure and picture)



Source: Omdia

US Patent No. 8022912

- Patent filed application by Sharp: July 2005
- Patent application granted: September 2011
- Patent expiration: July 2029
- Patent abstract: In a liquid crystal display device performing multi-picture element driving, gate OFF timing of a switching element connected between each sub picture element and a signal line is matched with phase timing when all the subsidiary capacity wires are at the same potential. This prevents the occurrence of uneven luminance appearing in a lateral streak.
- Technology description: As a problem of viewing angle characteristics, a new problem that Y (Gama) characteristics in front view observation and Y (Gama) characteristic in side view observation are different, namely, a new problem of viewing angle dependency of Y (Gama) characteristics has appeared. The problem of viewing angle dependency of Y (Gama) characteristics is more prominent in MVA mode or ASM mode than in IPS mode. The inventor of the present application proposes a multi picture element driving method as a method for improving the above viewing angle dependency of Y characteristics. The multi-picture element driving is a technology for composing one display picture element by using two or more Sub picture elements having different luminance levels, so as to improve viewing angle characteristics (viewing angle dependency of Y characteristics).
- Key words: MVA, Y (Gama) characteristic

US Patent No. 8451204

- Patent filed application by Sharp: August 2011
- Patent application granted: May 2013

- Patent expiration: July 2025
- Patent abstract: a liquid crystal display device performing multi-picture element driving, gate OFF timing of a switching element connected between each sub picture element and a signal line is matched with phase timing when all the subsidiary capacity wires are at the same potential. This prevents the occurrence of uneven luminance appearing in a lateral streak.
- This patent is basically like US patent No. 8022912 but with more details and various technology approach to improve the wide view angle under the MVA mode and Y (Gama) characteristic.

Finally, according to Sharp's March 11, 2020 press release:

> For over forty years as a leading company in the industry, Sharp has devoted substantial resources to the development of cutting-edge technology to its customers, including liquid crystal panel and 8K display devices. As a result, Sharp has established a solid reputation as an innovator in the field and holds more than 10,000 display patents in the United States, China, Japan, and other countries. Sharp's patent portfolio covers most core display technologies, beginning with foundational inventions and extending to recent advances, including Indium Gallium Zinc Oxide Semiconductor ("IGZO"), Ultraviolet induced multi-domain Vertical Alignment ("UV2A"), Low-Temperature Polycrystalline Silicon ("LTPS"), Multi-Primary Colors ("MPC"), Free-Form Display, PSA, and High Definition Display Technologies. Most of the world's display makers recognize the positions of Sharp's proprietary technologies and have benefited for many years from licensing Sharp's patent portfolio.
>
> In the lawsuit, Sharp alleges that these companies are infringing Sharp's LCD patents and seeks an injunction prohibiting further acts of infringement and compensation for lost profits and for use of Sharp's technology in each infringing liquid crystal panel.

Appendix

Further reading

The analysis on Samsung Display restructure LCD business, May 18, 2020

Sharp, "Sharp Files Patent Infringement Lawsuit Regarding Liquid Crystal Panels against CHOT, et al., in the United States," March 11, 2020

Large Area Display Product Roadmap Tracker, April 24, 2020

Sharp, "Sharp Files ITC Patent Infringement Complaint Against CHOT, et al.," April 22, 2020

TV Display & OEM Market Tracker - Q4 2019, March 31, 2020

Sharp, "ITC Institutes Section 337 Investigation Filed by Sharp Against CHOT, et al.," May 22, 2020

TV Display & OEM Market Tracker, March 31, 2020

The United States Patent and Trademark Office, US Patent No. 7372533, http://patft.uspto.gov/netacgi/nph-

Parser?Sect1=PTO1&Sect2=HITOFF&d=PALL&p=1&u=%2Fnetahtml%2FPTO%2Fsrchnum.htm&r=1&f=G&l=50&s1=7372533.PN.&OS=PN/7372533&RS=PN/7372533

Google Patents, US Patent No. 7372533, https://patents.google.com/patent/US7372533B2/en?oq=7372533

The United States Patent and Trademark Office, US Patent No. 7245329, http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO1&Sect2=HITOFF&d=PALL&p=1&u=%2Fnetahtml%2FPTO%2Fsrchnum.htm&r=1&f=G&l=50&s1=7245329.PN.&OS=PN/7245329&RS=PN/7245329

Google Patents, US Patent No. 7245329, https://patents.google.com/patent/US7245329B2/en?oq=7245329

The United States Patent and Trademark Office, US Patent No. 8847863, http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO1&Sect2=HITOFF&d=PALL&p=1&u=%2Fnetahtml%2FPTO%2Fsrchnum.htm&r=1&f=G&l=50&s1=8847863.PN.&OS=PN/8847863&RS=PN/8847863

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The United States Patent and Trademark Office, US Patent No. 8451204, http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO1&Sect2=HITOFF&d=PALL&p=1&u=%2Fnetahtml%2FPTO%2Fsrchnum.htm&r=1&f=G&l=50&s1=8451204.PN.&OS=PN/8451204&RS=PN/8451204

Google Patents, US Patent No. 8451204, https://patents.google.com/patent/US8451204B2/en?oq=8451204

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