



US009984603B1

(12) **United States Patent Hall**

(10) **Patent No.:** US 9,984,603 B1
(45) **Date of Patent:** *May 29, 2018

- (54) **MODULAR DISPLAY PANEL**
- (71) Applicant: **Ultravision Technologies, LLC**, Dallas, TX (US)
- (72) Inventor: **William Y. Hall**, Dallas, TX (US)
- (73) Assignee: **ULTRAVISION TECHNOLOGIES, LLC**, Dallas, TX (US)
- (*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days. days.

This patent is subject to a terminal disclaimer.

- (21) Appl. No.: **15/881,394**
- (22) Filed: **Jan. 26, 2018**

Related U.S. Application Data

- (63) Continuation of application No. 15/369,304, filed on Dec. 5, 2016, now Pat. No. 9,916,782, which is a (Continued)
- (51) **Int. Cl.**
G09F 13/00 (2006.01)
G09F 13/22 (2006.01)
(Continued)
- (52) **U.S. Cl.**
CPC *G09F 13/22* (2013.01); *F21K 9/20* (2016.08); *F21V 23/023* (2013.01);
(Continued)
- (58) **Field of Classification Search**
CPC G06F 3/1446; F21V 23/023
See application file for complete search history.

(56) **References Cited**
U.S. PATENT DOCUMENTS

1,816,254 A 7/1931 Heath
3,150,455 A 9/1964 Indort
(Continued)

FOREIGN PATENT DOCUMENTS

CN 2706836 Y 6/2005
CN 2733499 Y 10/2005
(Continued)

OTHER PUBLICATIONS

LighthouseLED, "Possibilities" and "Specifications," Aug. 9, 2013, 1 page.
(Continued)

Primary Examiner — Kristina N Junge
(74) *Attorney, Agent, or Firm* — Slater Matsil, LLP

(57) **ABSTRACT**

Embodiments of the present invention relate to modular display panels. In one embodiment, a modular display panel includes a printed circuit board, a shell, a plurality of LEDs, a power supply, and a heat conducting structure. The LEDs are attached to a first side of the printed circuit board. The shell contacts an opposite second side of the printed circuit board. The shell includes a back surface that includes an outer back surface of the panel. A driver circuit is disposed in the shell. The sidewalls of the shell include plastic. The printed circuit board is disposed between the power supply and the LEDs. The power supply includes a power converter for converting alternating current (AC) power to direct current (DC) power. The heat conducting structure is disposed between the power supply and the back surface of the shell. The modular display panel is sealed to be waterproof.

30 Claims, 64 Drawing Sheets

