(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 544 427 A3**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **92310381.6**

(22) Date of filing: **13.11.92**

(51) Int. Cl.5: **G09G 3/36**, B22D 27/04, C22C 1/10

(30) Priority: **27.11.91 JP 312319/91**

(43) Date of publication of application:
02.06.93 Bulletin 93/22

(84) Designated Contracting States:
DE FR GB NL

(88) Date of deferred publication of the search report:
21.07.93 Bulletin 93/29

(71) Applicant: **SHARP KABUSHIKI KAISHA**
22-22 Nagaike-cho Abeno-ku
Osaka 545(JP)

(72) Inventor: **Nakanishi, Kaoru**
1081-52, Nakashou
Izumisano-shi, Osaka-fu(JP)
Inventor: **Seihara, Kouichirou**
2-10-2-403, Hirose
Kokubu-shi, Kagoshima-ken(JP)

(74) Representative: **Brown, Kenneth Richard et al**
R.G.C. Jenkins & Co. 26 Caxton Street
London SW1H 0RJ (GB)

(54) Display module drive circuit having a digital source driver capable of generating multi-level drive voltages from a single external power source.

(57) A display module drive circuit has a gate driver and a source driver. The source driver has a shift register (1), a sampling memory (2), a hold memory (3), a timing signal generating circuit (4), a voltage control circuit (5), and an output voltage generating circuit (6) having a capacitor and a switch. The timing signal generating circuit (4) generates timing signals (T_0-T_7) having different pulse widths in each of horizontal periods. The number of the timing signals (T_0-T_7) depends on the number of density levels of an image to be displayed. Upon receipt of digital video signals (HnD_0, HnD_1, HnD_2) and the timing signals (T_0-T_7), the voltage control circuit (5) selects one of the timing signals (T_0-T_7) based on the contents of the video signals (HnD_0, HnD_1, and HnD_2) in each horizontal period and outputs a control signal (CON1, CON2) at a specified level for a period corresponding to the pulse width of the selected timing signal. The capacitor of the output voltage generating circuit (6) is charged with an external power voltage while the control signal (CON1, CON2) is being received by the switch, so that a drive voltage is generated. The external power voltage is supplied from an external power source offering an electrical potential which becomes higher with time.

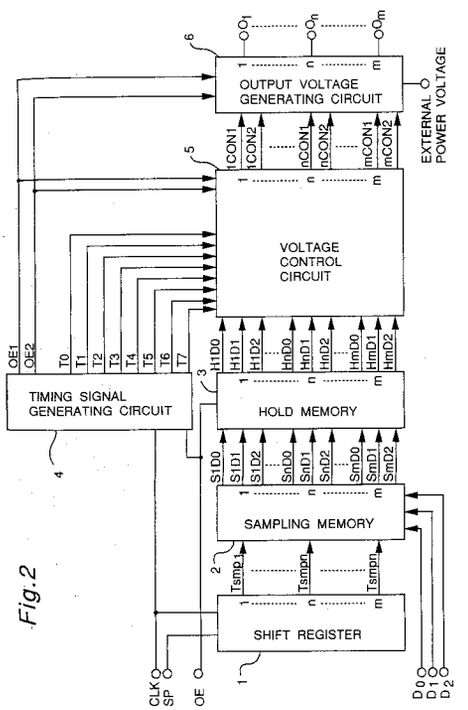

Fig.2

EP 0 544 427 A3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 31 0381

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	EP-A-0 298 255 (SEIKO EPSON CO.) 11 January 1989	1,10,11	G09G3/36
A	* Abstract * * column 4, line 21 - column 5, line 47; figures 1A,1B,5A,5B * * column 7, line 7 - column 8, line 21 *	6,9	
Y	EP-A-0 347 720 (HITACHI LTD.) 27 December 1989 * Abstract * * column 1, line 41 - column 3, line 37; figures 1-4 *	1,10-12	
A	US-A-4 998 099 (TAKATOSHI ISHII) 5 March 1991 * column 4, line 27 - line 52; figure 4 *	3	
A	EP-A-0 417 578 (DEUTSCHE THOMSON-BRANDT GMBH) 20 March 1991 * Abstract * * column 7, line 21 - line 45; figures 1,9,10 *	2,4,5,7,8	
Y	PATENT ABSTRACTS OF JAPAN vol. 12, no. 216 (P-719)21 June 1988 & JP-A-63 014 129 (SEIKO EPSON CO.) 21 January 1988 * abstract *	12	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

G09G
H04N

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	11 MAY 1993	CORSI F.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P0401)