

## G09G

**ARRANGEMENTS OR CIRCUITS FOR CONTROL OF INDICATING DEVICES USING STATIC MEANS TO PRESENT VARIABLE INFORMATION** (arrangements for transferring data between digital computers and displays [G06F 3/14](#); static indicating arrangements comprising an association of a number of separate sources or light control cells [G09F 9/00](#); static indicating arrangements comprising integral associations of a number of light sources [H01J](#), [H01K](#), [H10H](#), [H05B 33/12](#); scanning, transmission or reproduction of documents or the like, e.g. facsimile transmission, details thereof [H04N 1/00](#))

### Definition statement

*This place covers:*

- Arrangements or circuits for processing control signals to achieve the display, e.g. for the reception, storage, regeneration, coding, decoding, format manipulation, addressing of control signals.
- Solution of problems of displays by means of their control, i.e. control for which features of a display are relevant, e.g. to compensate for varying pixel behaviour, which may lead to non-uniformity in the display.
- Improvements of the control of displays, i.e. where the functionality of controlling a display is relevant, e.g. selective brightness adaptation for lowering energy consumption of the display, possibly after image analysis.
- The visual effect in the indicating means using the static means may be produced by the generation of an image on a screen, e.g. indirectly by scanning an electron beam onto a luminescent screen, directly by controlled light sources, by projection of light from controlled light sources or light modulators onto characters, symbols, or elements thereof drawn on a support, or by electric, magnetic, or mechanic control of the parameters of light rays from an independent source.

### Relationships with other classification places

Subclass [G09G](#) covers electronic control of display characterised by the display device itself, whereas it does not cover:

- electronic control characterized by the pictorial communication, e.g. television, which is covered by subclass [H04N](#), or
- aspects like rastering an image onto the target resolution by a raster image processor (RIP), or image enhancement aspects like augmented reality, which are covered by subclass [G06T](#).

Subclass [G09G](#) does not cover software modules, e.g. software driver modules for the display, or their interaction, such as interaction between software modules related to the display of windows or interaction between a software driver module for the display and the operating system which are covered by group [G06F 9/00](#).

### References

#### Limiting references

*This place does not cover:*

Microstructural devices comprising flexible or deformable elements, e.g. displays comprising elastic microtongues or membranes	<a href="#">B81B 3/00</a>
Optical devices or arrangements using movable or deformable optical elements for controlling the intensity, colour, phase, polarisation or direction of light, e.g. switching, gating, modulating, e.g. displays based on interference in an adjustable optical cavity	<a href="#">G02B 26/00</a>

## Limiting references

Optical devices or arrangements using movable or deformable optical elements for controlling the intensity of light, e.g. displays based on the rotation of particles under the influence of an external field, e.g. twisting microsphere displays	<a href="#">G02B 26/02</a>
Optical devices or arrangements using movable or deformable optical elements for controlling the direction of light, e.g. displays using a reflecting micromechanical device, like a MEMS mirror, DMD	<a href="#">G02B 26/08</a>
Devices or arrangements for the control of the intensity, phase, polarisation or colour of light arriving from an independent light source based on liquid crystals, e.g. single liquid crystal display cells	<a href="#">G02F 1/13</a>
Devices or arrangements for the control of the intensity, phase, polarisation or colour of light arriving from an independent light source based on electrochromic elements, e.g. electrochromic displays	<a href="#">G02F 1/15</a>
Devices or arrangements for the control of the intensity, phase, polarisation or colour of light arriving from an independent light source based on electrophoresis, e.g. electrophoretic displays	<a href="#">G02F 1/167</a>
Projectors and projection type viewers adapted for projection of either still pictures of motion pictures	<a href="#">G03B 21/12</a>
Digital output to display device	<a href="#">G06F 3/14</a>
Indicating arrangements being the ends of optical fibres for variable information in which the information is built-up on a support in which the desired character or characters are formed by combining individual elements	<a href="#">G09F 9/305</a>
Indicating arrangements being incandescent filaments for variable information in which the information is built-up on a support in which the desired character or characters are formed by combining individual elements	<a href="#">G09F 9/307</a>
Indicating arrangements being gas discharge devices for variable information in which the information is built-up on a support in which the desired character or characters are formed by combining individual elements, e.g. plasma display panels	<a href="#">G09F 9/313</a>
Indicating arrangements being semiconductor devices for variable information in which the information is built-up on a support in which the desired character or characters are formed by combining individual elements, e.g. light emitting diode displays	<a href="#">G09F 9/33</a>
Indicating arrangements being liquid crystals for variable information in which the information is built-up on a support in which the desired character or characters are formed by combining individual elements, e.g. liquid crystal displays	<a href="#">G09F 9/35</a>
Plasma display panels	<a href="#">H01J 11/00</a> , <a href="#">H01J 17/49</a>
Cathode ray tubes	<a href="#">H01J 31/00</a>
Scanning, transmission or reproduction of documents or the like, e.g. facsimile transmission; Details thereof	<a href="#">H04N 1/00</a>
Scanning details of television systems	<a href="#">H04N 3/00</a>
Projection arrangements for image reproduction	<a href="#">H04N 5/74</a>
Details of colour television systems	<a href="#">H04N 9/00</a>
Projection devices for colour picture display	<a href="#">H04N 9/31</a>
Colour television systems	<a href="#">H04N 11/00</a>

Stereoscopic television systems	<a href="#">H04N 13/00</a>
Electroluminescent light sources	<a href="#">H05B 33/00</a>
Circuit arrangements for electric light sources in general	<a href="#">H05B 47/00</a>
Assembling printed circuits with electric components, e.g. with resistor, displays consisting of a printed circuit board carrying a matrix of single LEDs	<a href="#">H05K 3/30</a>
Devices consisting of a plurality of semiconductor or other solid-state component formed in or on a common substrate, specially adapted for light emission, e.g. light emitting diode displays	<a href="#">H10H 29/10</a>
Solid state devices using organic materials as the active part specially adapted for light emission, e.g. displays using OLED or PLED	<a href="#">H10K 50/00</a>

### Informative references

Attention is drawn to the following places, which may be of interest for search:

Diagnosis; Surgery, Identification	<a href="#">A61B</a>
Instruments specially adapted for vehicles; Arrangement of instruments in or on vehicles	<a href="#">B60K 35/00</a>
Equipment for fitting in or to aircraft	<a href="#">B64D</a>
Combined instruments indicating more than one navigational value, e.g. for aircraft	<a href="#">G01C 23/00</a>
Cathode-ray oscilloscopes	<a href="#">G01R 13/20</a>
Optical scanning systems	<a href="#">G02B 26/10</a>
Image data processing or generation, in general	<a href="#">G06T</a>
Digital stores in which the information is moved stepwise, e.g. shift registers	<a href="#">G11C 19/00</a>

### Special rules of classification

The Indexing Codes in this subclass are to be used for classifying additional information relevant for the invention.

### Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

indicating device	display device
static means to display information	means not using movement of macroscopic parts for information build-up, e.g. displays using LCDs, LEDs, DMDs, ... for image build-up
to present	to display
variable information	information with variable content

### Synonyms and Keywords

In patent documents, the following abbreviations are often used:

CRT	Cathode Ray Tube
LCD	Liquid Crystal Display

AC-PDP	Alternate Current Plasma Display Panel
DC-PDP	Direct Current Plasma Display Panel
LED	Light Emitting Diode
OLED	Organic Light Emitting Diode
DMD	Digital Micromirror Device
MEMS	Microelectromechanical systems

## **G09G 1/00**

**Control arrangements or circuits, of interest only in connection with cathode-ray tube indicators; {General aspects or details, e.g. selection emphasis on particular characters, dashed line or dotted line generation; Preprocessing of data} (cathode-ray oscilloscopes [G01R 13/20](#); {radar display arrangements [G01S 7/04](#); display of digital non-picture data in television systems [H04N 7/0255](#)})**

### **Definition statement**

*This place covers:*

- Control arrangements or circuits, of interest only in connection with cathode-ray tube indicators;
- General aspects or details, e.g. selection emphasis on particular characters, dashed line or dotted line generation;
- Preprocessing of data therefor.

### **References**

#### **Limiting references**

*This place does not cover:*

Adaptations for aircraft instruments	<a href="#">B64D 43/00</a>
Aircraft flight instrument display	<a href="#">G01C 23/005</a>
Cathode-ray oscilloscopes	<a href="#">G01R 13/20</a>
Radar display arrangements display of digital non-picture data in television systems	<a href="#">G01S 7/04</a> , <a href="#">H04N 7/0255</a>
Television	<a href="#">H04N</a>

## Special rules of classification

Illustrative examples: EP0431581 (rotatable display, change of orientation of a video display; see also appropriate groups related to details specific for rotatable display arrangements, e. g. [G09G 1/04](#) for related adaptation of deflection circuits):

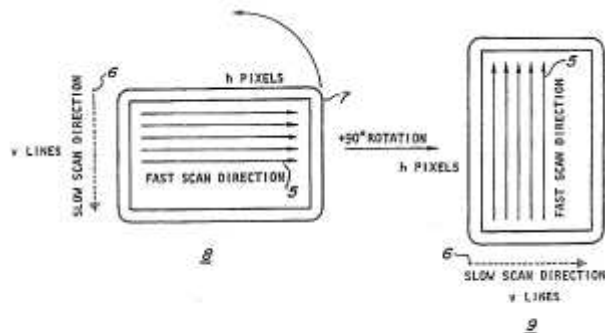
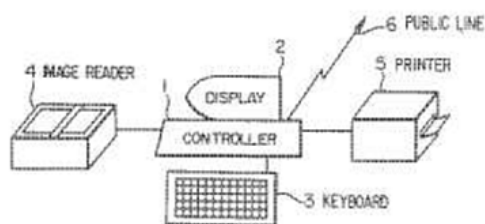
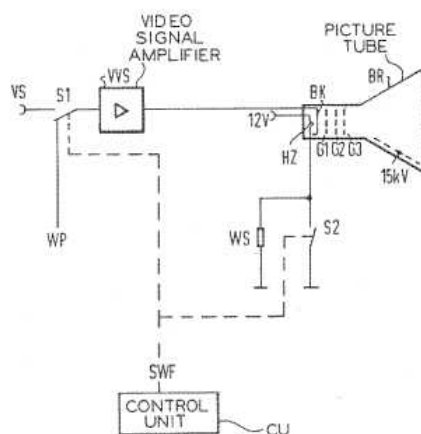


Figure 2

US4910785 (displaying code data and image data):



US5493336 (waiting state function):



## G09G 1/002

{Intensity circuits ([G09G 1/06](#) - [G09G 1/28](#) take precedence)}

### Definition statement

*This place covers:*

Control of the intensity of the electron beam in a CRT both directly (by control of the electron gun) and indirectly (by control of a signal having effect on the beam intensity), e. g. for brightness or contrast adjustment.

## References

### Limiting references

*This place does not cover:*

Using single beam tubes	<a href="#">G09G 1/06</a>
Using multi-beam tubes	<a href="#">G09G 1/20</a>
Using tubes permitting selection of a complete character from a number of characters	<a href="#">G09G 1/22</a>
Using tubes permitting selection of individual elements forming in combination a character	<a href="#">G09G 1/24</a>
Using storage tubes	<a href="#">G09G 1/26</a>
Using colour tubes	<a href="#">G09G 1/28</a>

### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Intensity circuits applicable to both CRT and panel displays	<a href="#">G09G 5/10</a>
Control of the overall brightness of a display	<a href="#">G09G 2320/0626</a>
Control of intensity of electron beams in oscilloscopes	<a href="#">G01R 13/26</a>
Control of intensity of electron beams in televisions	<a href="#">H04N</a> ; <a href="#">H04N 5/59</a> , <a href="#">H04N 5/68</a>

### Special rules of classification

Illustrative examples: DE1212325 (brightness adjustment of characters and Lissajous curves by phase shift at a pulse):

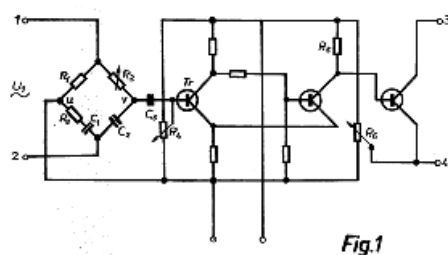


Fig.1

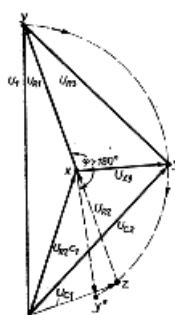
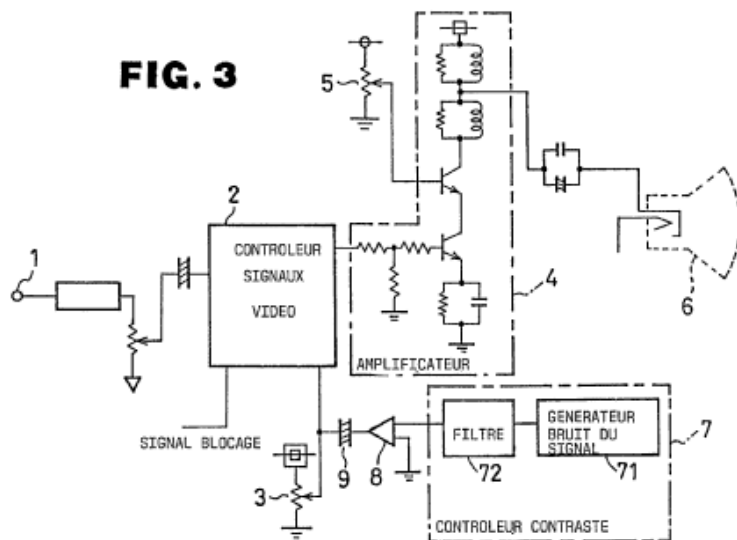
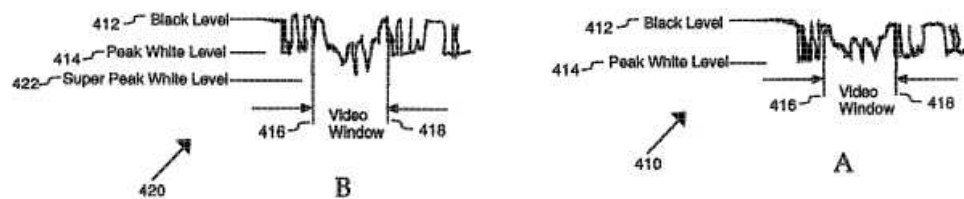


Fig.2

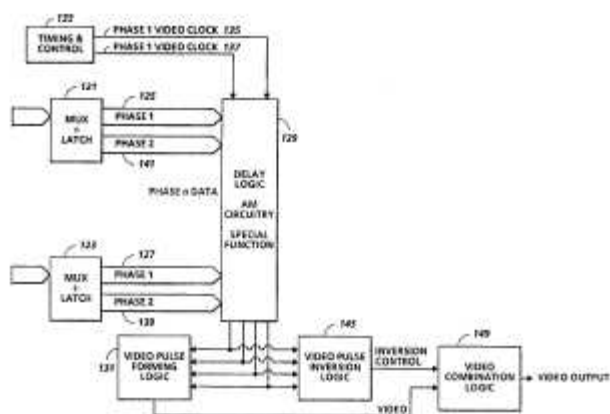
FR2691032 (brightness and contrast adjustment):



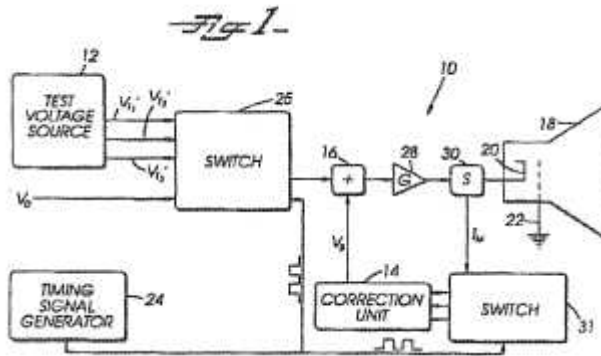
WO9905666 (generation of a higher luminance video window):



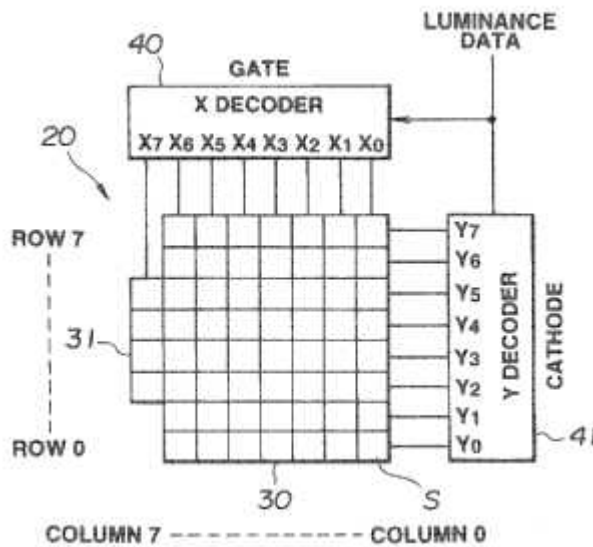
US5504462 (control of an intensity pulse signal in relation to pixel clock in a CRT or in a laser beam printer):



EP0840272 (feedback adjustment of the electron beam current):



US5786669 (FED emitters used just to produce the electron beam in a CRT; beam intensity controlled by the number of active microtips):



## G09G 1/005

### {Power supply circuits}

#### Definition statement

*This place covers:*

- Circuits for power management specific for CRTs;
- Details of power supply specific for CRTs.

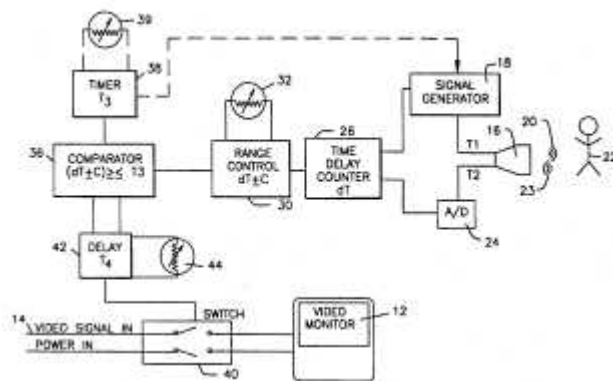
*Illustrative examples:*

Special power supply for deflection amplifiers: US3863099.



## Definition statement

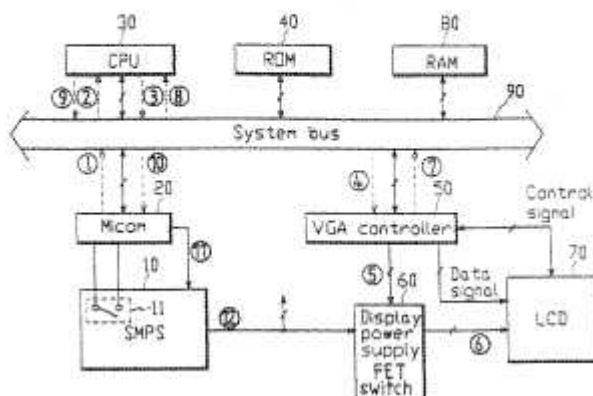
Power control for user protection from EM radiation and excessive optical brightness: US5521652.



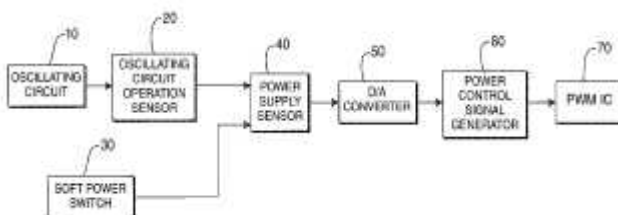
From X-rays: DE29900611U.

Power control for energy saving, to synchronize with computer standby / shutdown for an LCD, possibly applicabile also to a CRT: EP0863455.

FIG.3

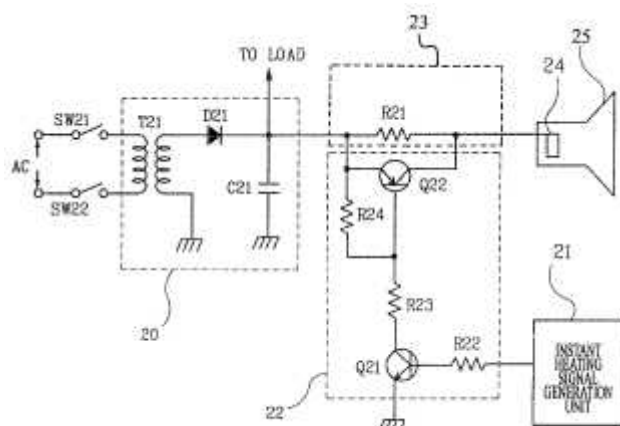


In combination with a soft power switch: US6092206.



## Definition statement

Details of power control of cathode heater: US6084355.



## References

## Limiting references

This place does not cover:

Power supply in general	<a href="#">G05F 3/00</a>
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## Special rules of classification

Use the Indexing Codes [G09G 2330/021](#) - [G09G 2330/024](#) for power management.

## G09G 1/007

## {Circuits for displaying split screens}

## Definition statement

This place covers:

Independent management of multiple screen areas in positions that are not quickly varied by an user interface (e. g. with a fixed tiling), e. g. with use of linked row pointers for controlling the screen partition and / or scrolling, e. g. using hardware mechanisms specific for CRTs.

## Definition statement

Illustrative examples: to change the displayed information by activating different parts of the screen:  
EP0680776:

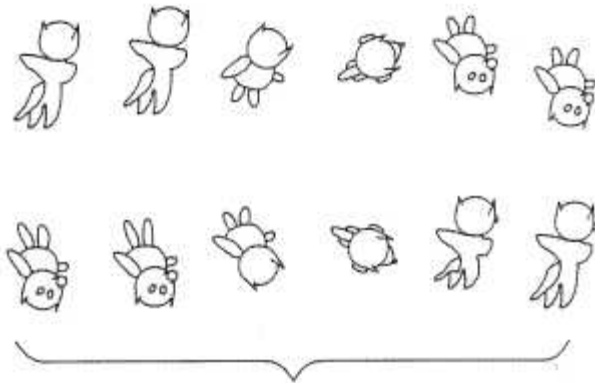
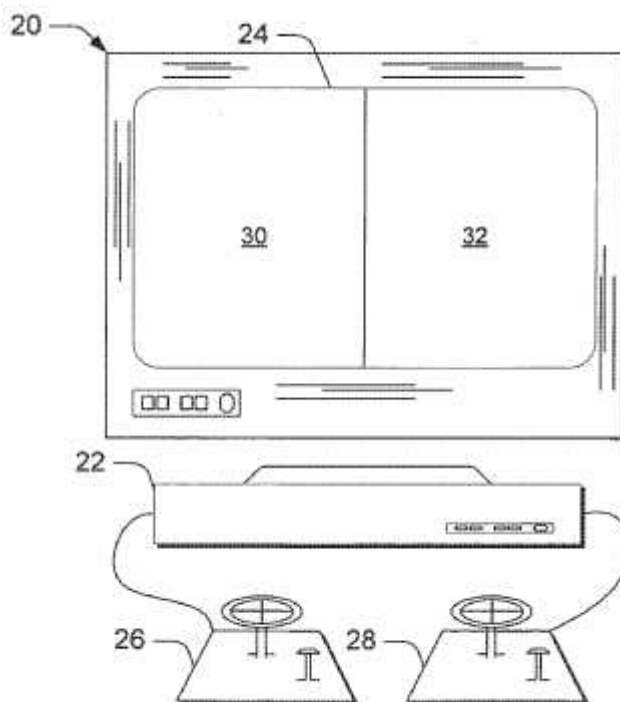


FIG. - 17

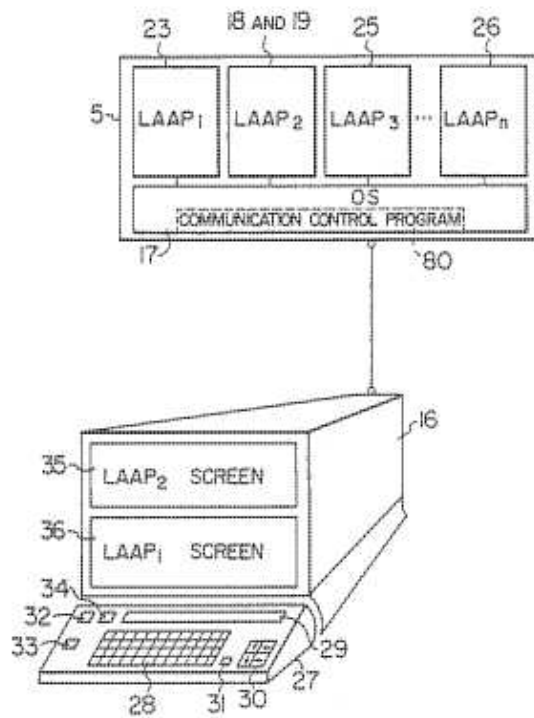
Systems for plural display areas on one screen tiling in x and y directions according to a descriptor data collection, but without user interface: EP0200036.

With hardware control of the video screen in different areas: US2006044216.



Definition statement

Same as above: US4550386.

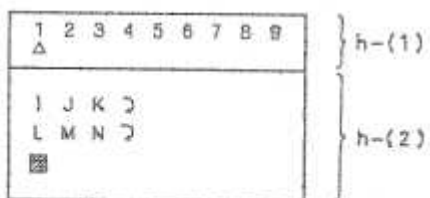


Hardware control of a text area and of a screen area with a character menu: EP0274439.

FIG. 3A

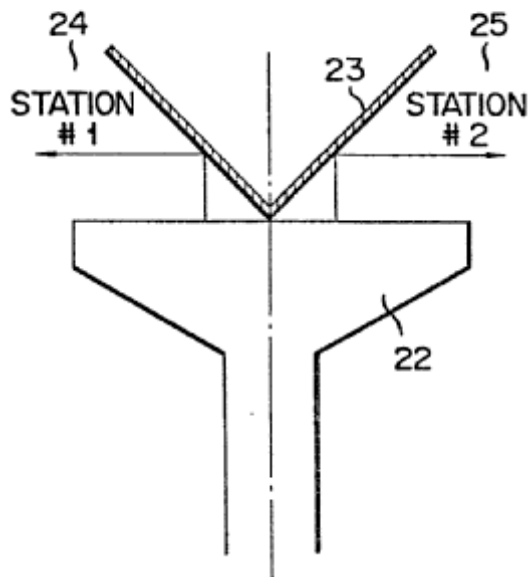


FIG. 3B



Systems with divided screen in two halves of the screen used by different users: EP0018759.

FIG. 2



## References

### Informative references

Attention is drawn to the following places, which may be of interest for search:

Multiple view displays	<a href="#">G09G 3/001</a>
Display of multiple viewports (such as windows)	<a href="#">G09G 5/14</a>
Split matrices (D.A: be careful. This is not really related.)	<a href="#">G09G 2310/0221</a>
One image signal (VGA) contains plural images; a splitter divides and provides to plural displays	<a href="#">G06F 3/1431</a> , <a href="#">G06F 3/1423</a>
Split screen control with user interaction	<a href="#">G06F 2203/04803</a>

## G09G 1/02

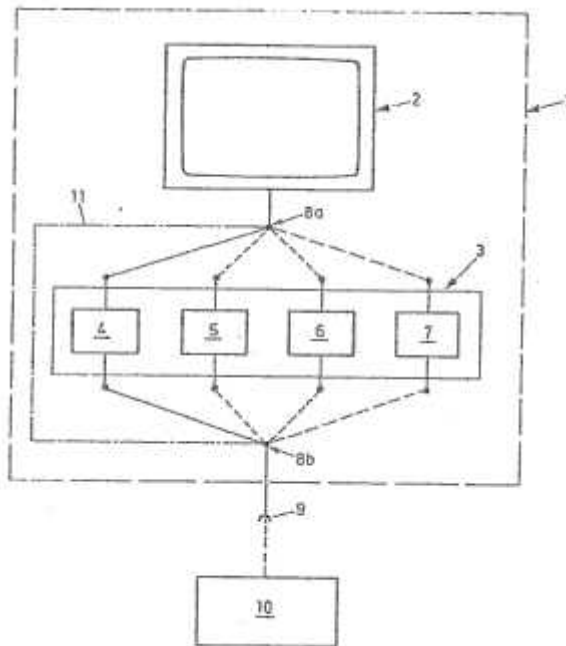
Storage circuits ([G09G 1/06](#) - [G09G 1/28](#) take precedence)

### Definition statement

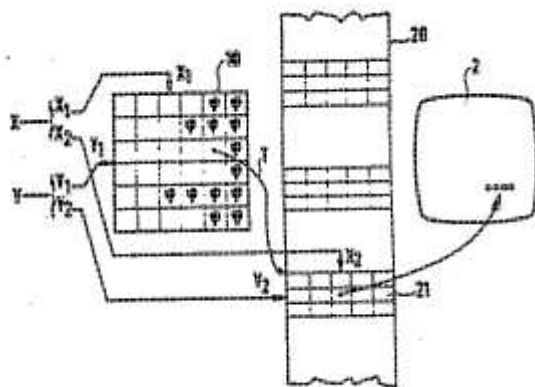
*This place covers:*

Display buffer/memory management; multiple monitors or variable display arrangements.

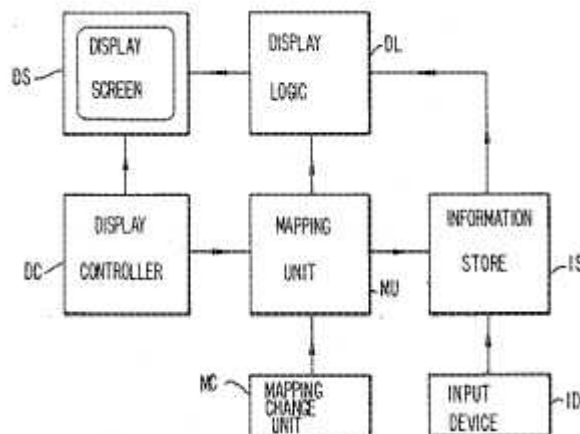
Illustrative examples: DE3607474



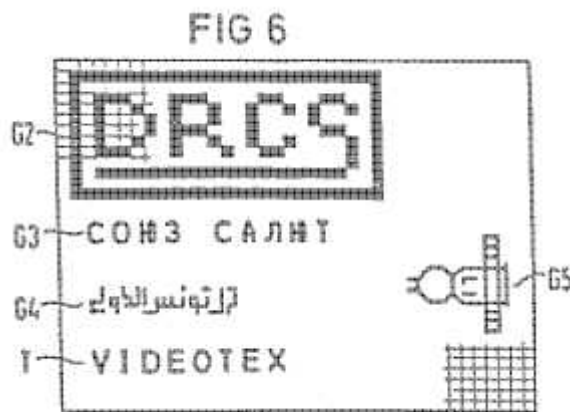
FR2559933



US4618858



Character generation system: EP0053661.



## References

### Limiting references

*This place does not cover:*

Using single beam tubes	<a href="#">G09G 1/06</a>
With combined raster scan and calligraphic display	<a href="#">G09G 1/07</a>
The beam directly tracing characters, the information to be displayed controlling the deflection	<a href="#">G09G 1/08</a>
The deflection signals being produced by essentially digital means, e.g. incrementally	<a href="#">G09G 1/10</a>
The deflection signals being produced by essentially analogue means	<a href="#">G09G 1/12</a>
The beam tracing a pattern independent of the information to be displayed, this latter determining the parts of the pattern rendered respectively visible and invisible	<a href="#">G09G 1/14</a>
Circuits for displaying horizontal and vertical lines	<a href="#">G09G 1/143</a>
Flicker reduction circuits	<a href="#">G09G 1/146</a>

The pattern of rectangular co-ordinates extending over the whole area of the screen, i.e. television type raster	<a href="#">G09G 1/16</a>
For displaying digital inputs as analog magnitudes, e.g. curves, bar graphs, coordinate axes, singly or in combination with alpha-numeric characters	<a href="#">G09G 1/162</a>
Details of a display terminal using a CRT, the details relating to the control arrangement of the display terminal and to the interfaces thereto	<a href="#">G09G 1/165</a>
Details of the interface to the display terminal specific for a CRT	<a href="#">G09G 1/167</a>
A small local pattern covering only a single character, and stepping to a position for the following character, e.g. in rectangular or polar co-ordinates, or in the form of a framed star	<a href="#">G09G 1/18</a>
Using multi-beam tubes	<a href="#">G09G 1/20</a>
Using tubes permitting selection of a complete character from a number of characters	<a href="#">G09G 1/22</a>
Using tubes permitting selection of individual elements forming in combination a character	<a href="#">G09G 1/24</a>
Using storage tubes	<a href="#">G09G 1/26</a>
Using colour tubes	<a href="#">G09G 1/28</a>

**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Storage tubes (the storage effect being realized by means of the tube)	<a href="#">G09G 1/26</a>
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**G09G 1/04**

**Deflection circuits {; Constructional details not otherwise provided for (electron-optical arrangements [H01J 29/46](#), [H01J 37/04](#), [H01J 37/302](#))}**

**Definition statement**

*This place covers:*

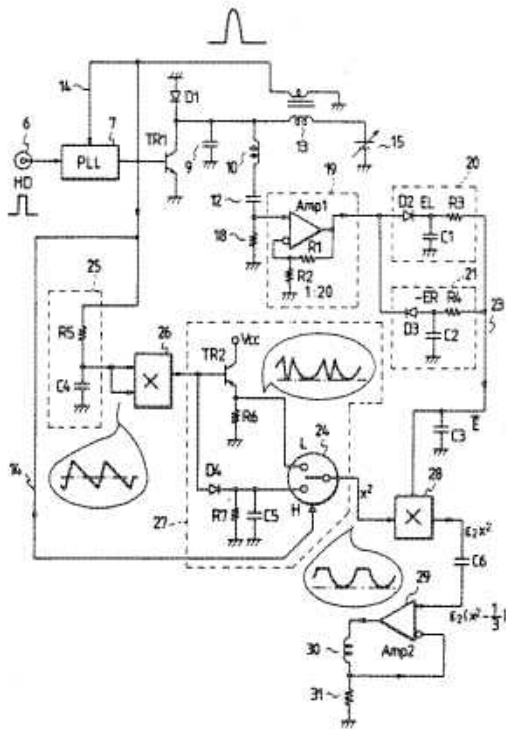
Details of deflection circuits specific for computer generated displays (in absence of indications of features that render a deflection circuit so specific, not to be classified in [G09G](#)).

Illustrative examples:



## Definition statement

Deflection circuits for distortion correction: US5070281.



GB1285554

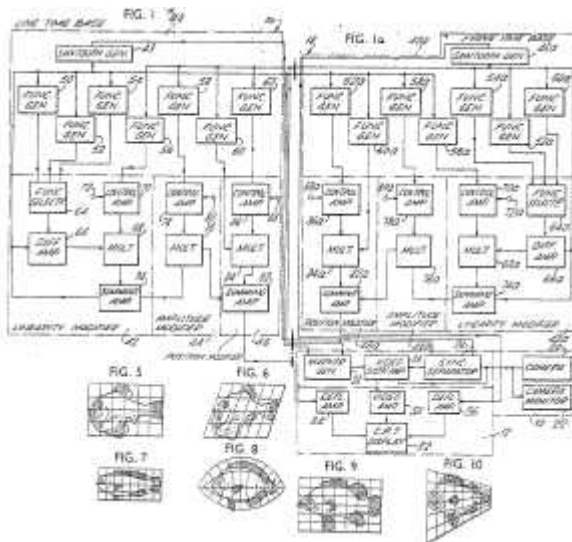
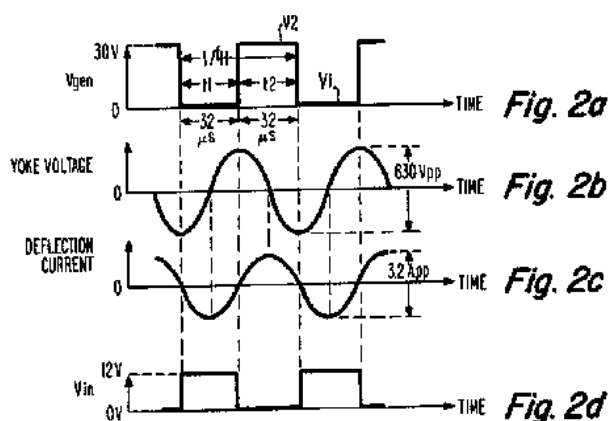
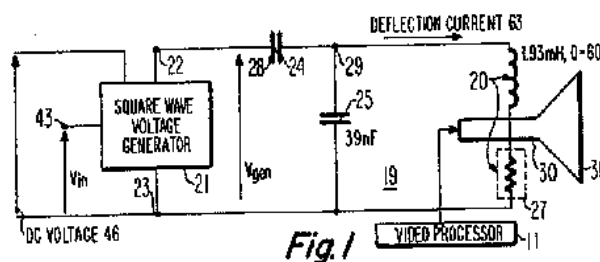


FIG. 4



Sinusoidal deflection current for bidirectional scanning: GB2157136.



## References

### Informative references

Attention is drawn to the following places, which may be of interest for search:

Arrangements of electrodes and associated parts for generating or controlling the ray or beam, e.g. electron-optical arrangement.	<a href="#">H01J 29/46</a>
Arrangements for deflecting ray or beam; circuit arrangements for producing saw-tooth pulses or other deflecting voltages and currents.	<a href="#">H01J 29/70</a>
Arrangements of electrodes and associated parts for generating or controlling the discharge, e.g. electron-optical arrangement, ion-optical arrangement.	<a href="#">H01J 37/04</a>
Controlling tubes by external information, e.g. program control.	<a href="#">H01J 37/302</a>
Generating pulses having essentially a finite slope or stepped portions	<a href="#">H03K 4/00</a>
Manipulating pulses having a finite slope and not covered by one of the other main groups of this subclass.	<a href="#">H03K 6/00</a>
Details of scanning of a TV system, by deflecting an electron beam in a CRT (includes documents for which the use in a TV or in a computer monitor is not specified)	<a href="#">H04N 3/16</a>
Prevention of damage of the CRT in the event of failure of scanning	<a href="#">H04N 3/20</a>

## G09G 1/06

using single beam tubes ([G09G 1/26](#), [G09G 1/28](#) take precedence), {e.g. three-dimensional or perspective representation, rotation or translation of display pattern, hidden lines, shadows ([G09G 1/28](#) takes precedence; stereoscopic TV-systems, details thereof [H04N 13/00](#); oscilloscopes for three-dimensional representation [G01R 13/206](#); vectorscopes [G01R 13/208](#))}

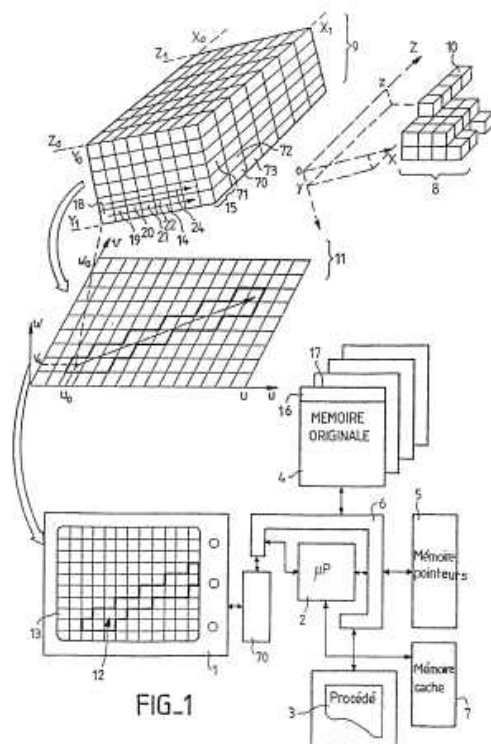
### Definition statement

*This place covers:*

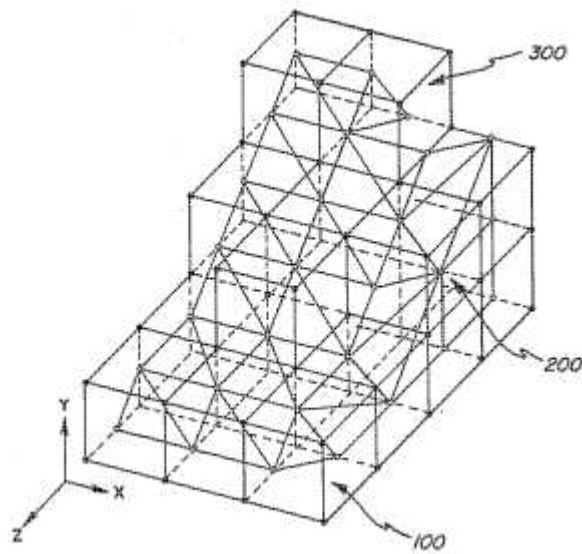
Three-dimensional or perspective representation, rotation or translation of display pattern, hidden lines, shadows automatic brightness compensation half-tone display.

Illustrative examples:

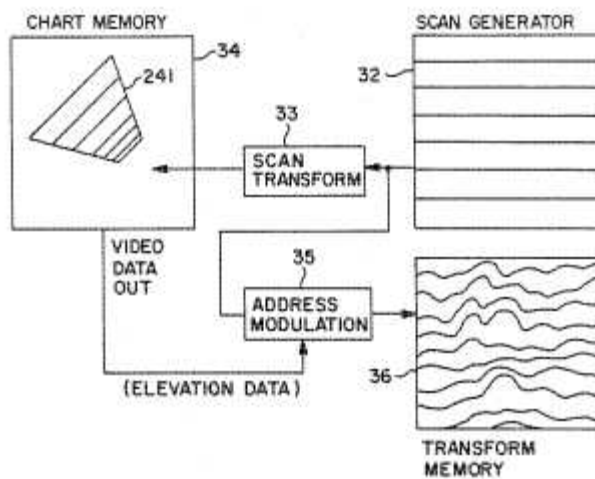
Three-dimensional or perspective representation: EP0458692.



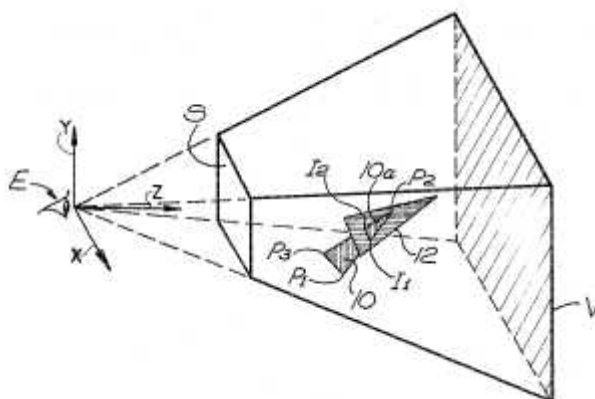
US4821210



US4841292

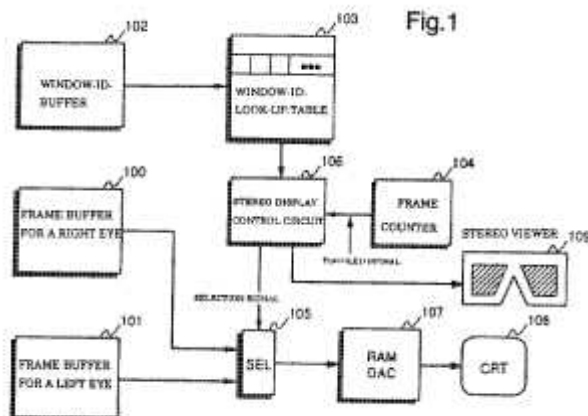


US3889107



Display that involves the spectator to use special glasses: DE4417664, US5162779.

GB2308284



## References

### Limiting references

*This place does not cover:*

Using storage tubes	<a href="#">G09G 1/26</a>
Using colour tubes. Note: The usual kind of colour tubes with one beam per colour (usually RGB), each beam being individually controlled in intensity but all beams being commonly deflected, are considered as "single beam tubes" unless colour specific details are disclosed	<a href="#">G09G 1/28</a>

### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Control of overall brightness	<a href="#">G09G 2320/0626</a>
Aircraft flight instrument display	<a href="#">G01C 23/005</a>
Oscilloscopes for three-dimensional representation	<a href="#">G01R 13/206</a>
Vectorscopes	<a href="#">G01R 13/208</a>
Image rendering, image processing	<a href="#">G06T</a>
Stereoscopic TV-systems, details thereof	<a href="#">H04N 13/00</a>

## G09G 1/07

**with combined raster scan and calligraphic display**

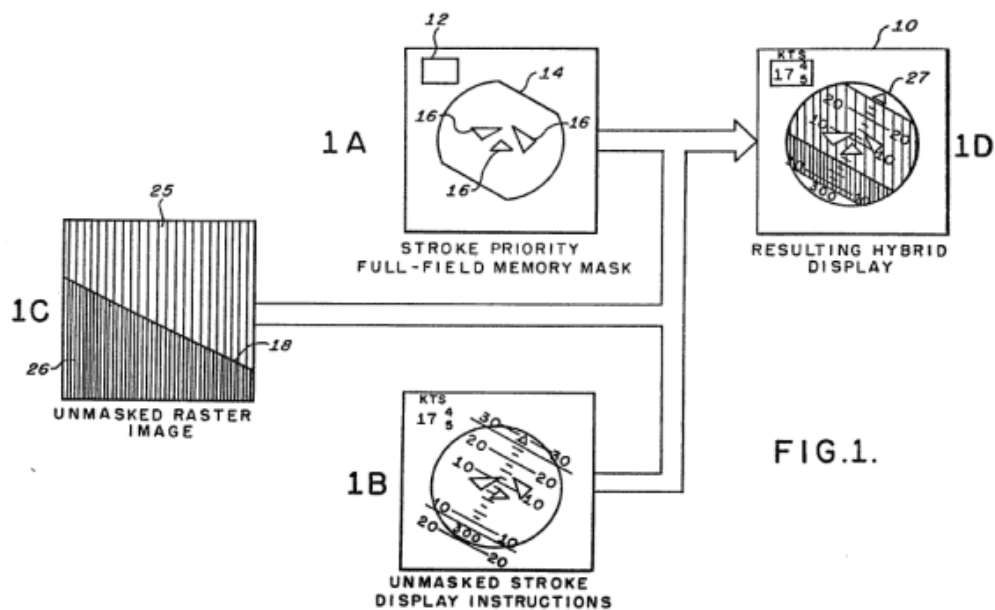
### Definition statement

*This place covers:*

CRTs combining a vector stroke display with a raster scan display, mostly superimposed.

Illustrative examples:

EP0158480



EP0043703

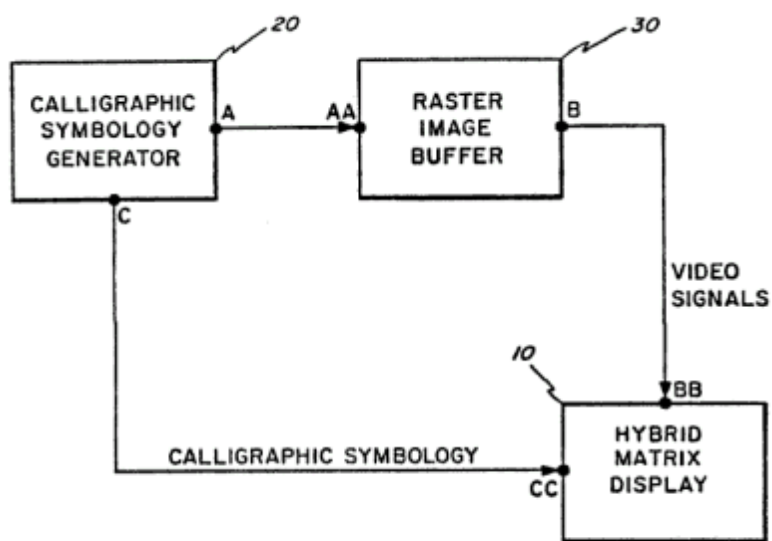


FIG. 1

## References

### Informative references

Attention is drawn to the following places, which may be of interest for search:

CRTs having only vector stroke display	<a href="#">G09G 1/08</a>
CRTs having only raster scan display	<a href="#">G09G 1/14</a>

### Special rules of classification

Raster displays with stroke-to-raster conversion are also placed in this class.

### G09G 1/08

the beam directly tracing characters, the information to be displayed controlling the deflection {and the intensity} as a function of time in two spatial co-ordinates, e.g. according to a cartesian co-ordinate system

### Definition statement

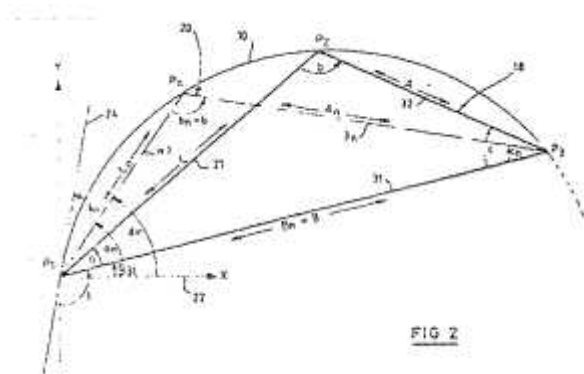
*This place covers:*

CRTs with vector stroke displays.

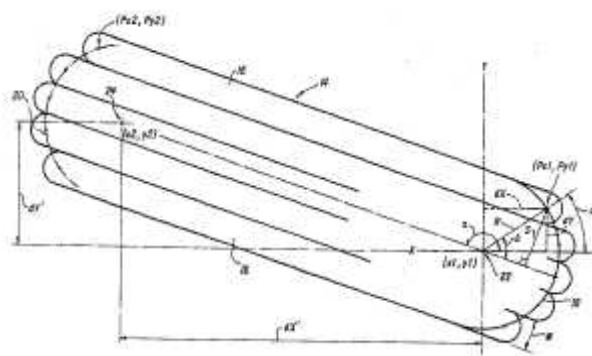
Illustrative examples:

Curve and line generators.

Curve generator: EP0288720.



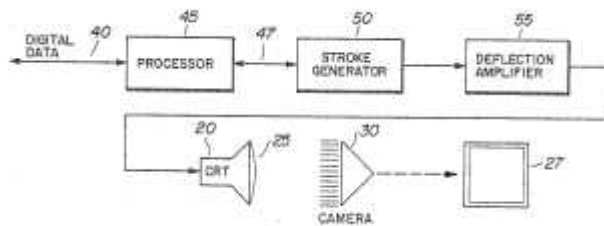
Digital technique for constructing variable width lines: US4601002.





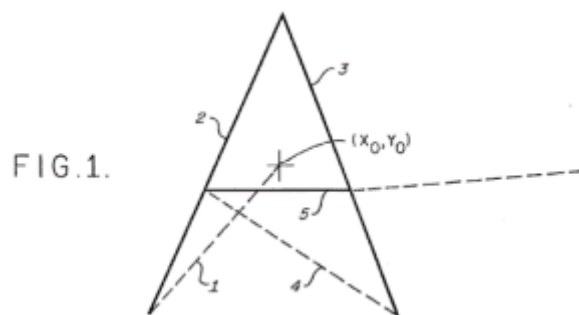
Definition statement

Enhancement of the resolution of end points of a line: US4939673.



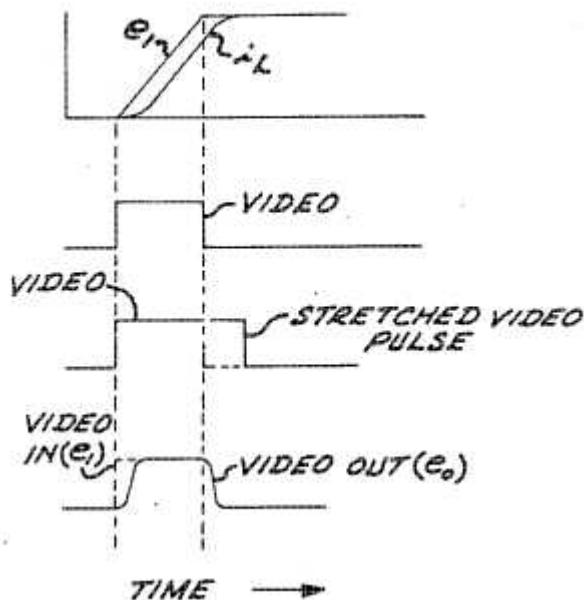
Character generators specific for vector stroke displays, without reference to a specific digital or analog deflection technique.

Stroke writing character apparatus and method: EP0138339.



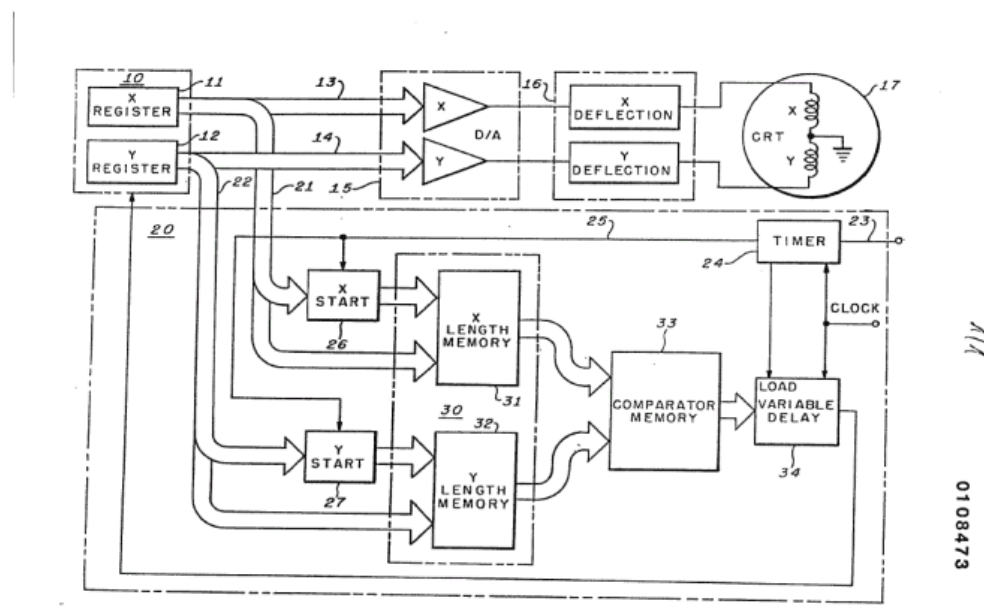
Video compensation apparatus.

Compensation of the delay between X and Y (deflection) channels and Z (intensity) channel in a stroke mode CRT display: US5047756.



## Definition statement

Slew length timer for the determination of the time interval between start and end of a segment on the display: EP0108473.



## References

## Informative references

Attention is drawn to the following places, which may be of interest for search:

Function generators (e.g. Circles and vectors for bit-mapped displays), eventually combined with smoothing	<a href="#">G09G 5/20</a>
Writing vectors into a bit-mapped memory	<a href="#">G09G 5/393</a>
General purpose image data processing	<a href="#">G06T</a>

## G09G 1/10

the deflection signals being produced by essentially digital means, e.g. incrementally

## Definition statement

This place covers:

For example:

Digital generation of character segments: FR2095711.

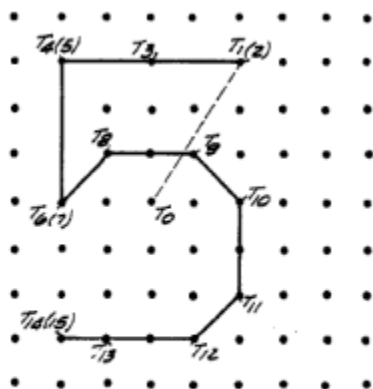


FIG. 6.

EP0130245

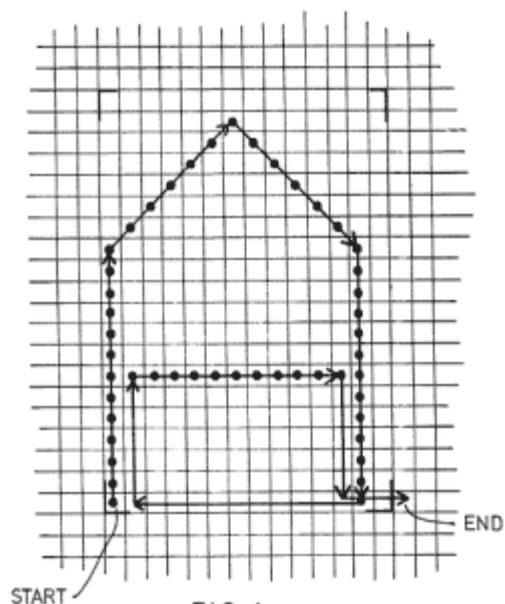


FIG. 1

With introduction of a digital value to define stroke curvature: US3594756.

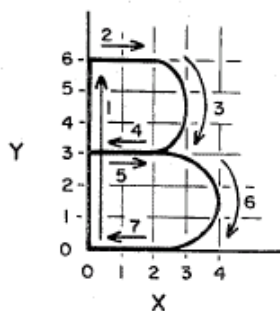


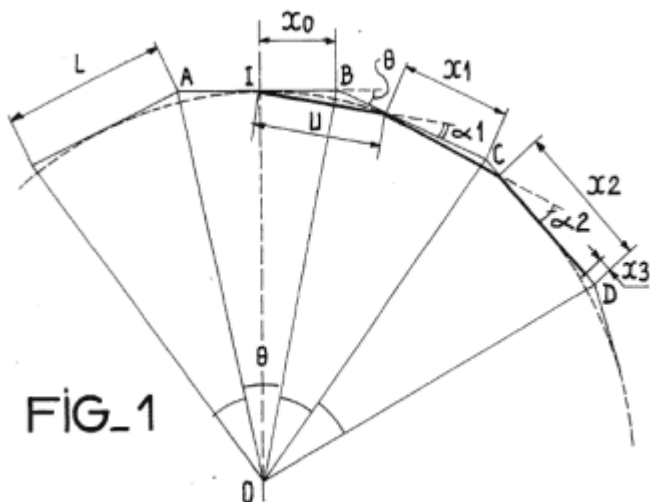
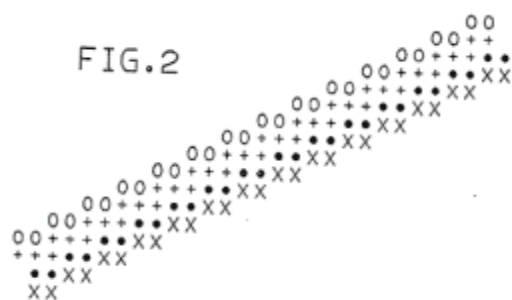
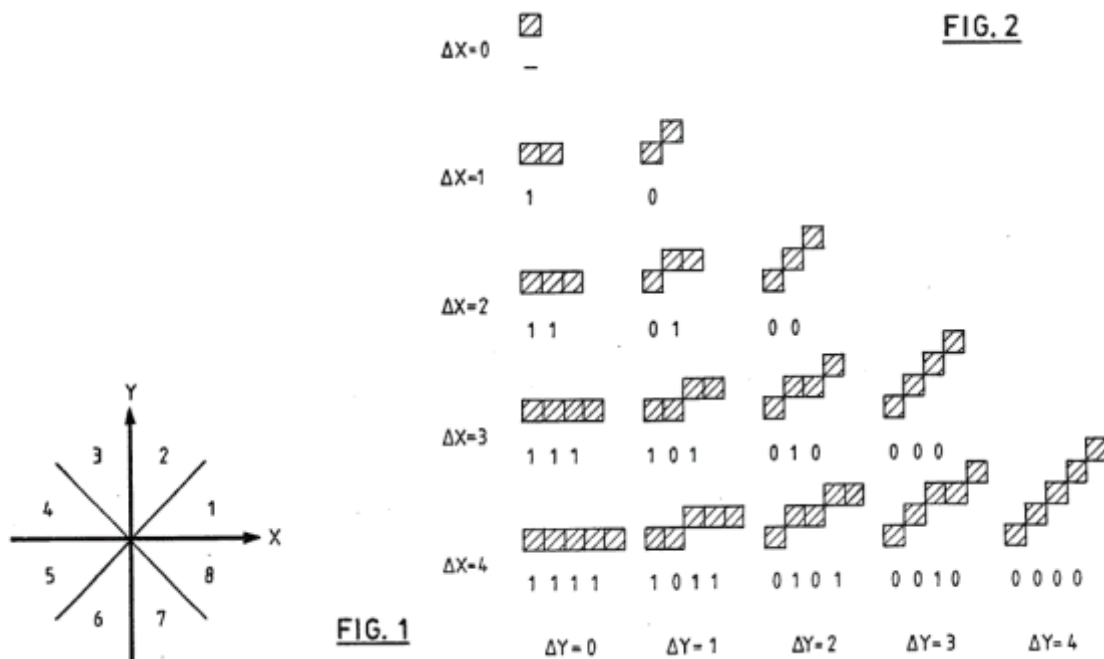
Fig. 3b

STROKE	COORDINATES	INTEN.	CURVE	
	X, Y → X', Y'			
1	0, 0 → 0, 6	3	0	R
2	0, 6 → 2, 6	1	0	
3	2, 6 → 2, 3	2	1	
4	2, 3 → 0, 3	1	0	
5	0, 3 → 2, 3	0	0	R
6	2, 3 → 2, 0	3	2	
7	2, 0 → 0, 0	1	0	
8	0, 0 → 0, 0	0	0	

Fig. 3c

Line and curvature drawing.

Line generator based on Bresenham's algorithm: GB2207839.



**G09G 1/12**

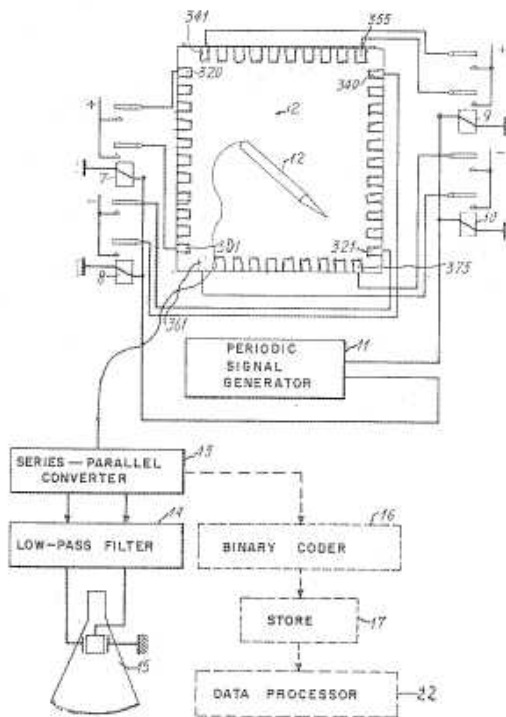
the deflection signals being produced by essentially analogue means

**Definition statement**

*This place covers:*

For example:

Graphic data transcription apparatus using a writing plate: US3632874.



Use of a carrier drift arrangement to generate waveforms used for deflection in vector stroke displays: US3025342.

**G09G 1/143**

{Circuits for displaying horizontal and vertical lines}

**Definition statement**

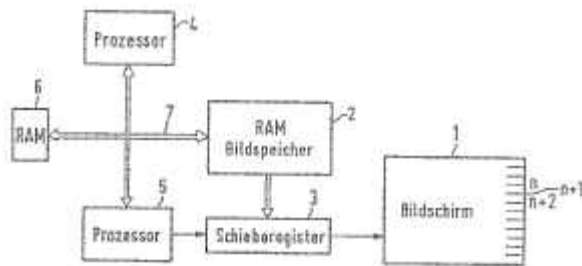
*This place covers:*

For example: GB2040146, FR2249597.

**G09G 1/146****{Flicker reduction circuits}****Definition statement**

*This place covers:*

Illustrative example of subject matter classified in this place:

**References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Flicker reduction other than flicker reduction circuits used for single beam cathode-ray tubes	<a href="#">G09G 2320/0247</a>
Flicker reduction in television systems	<a href="#">H04N 7/0132</a>

**G09G 1/16**

**the pattern of rectangular co-ordinates extending over the whole area of the screen, i.e. television type raster**

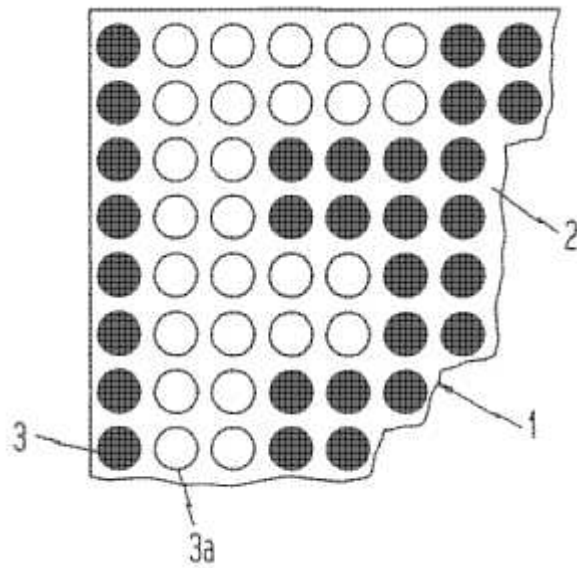
**Definition statement**

*This place covers:*

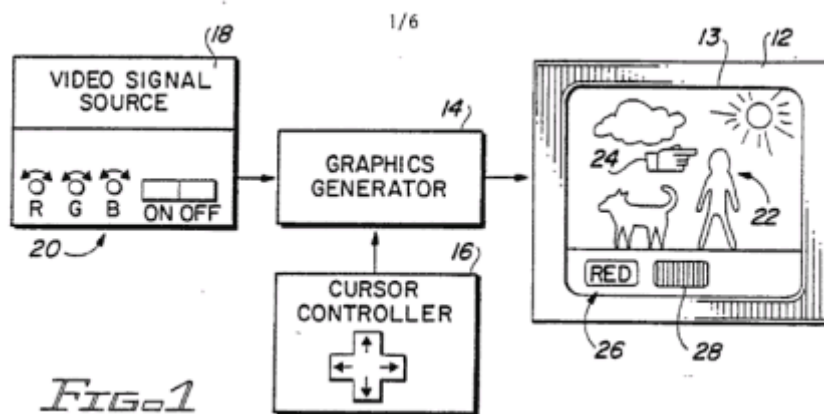
- interfacing with monochrome display monitors;
- video signals (e.g. camera signals ) combined with display data (e.g. computer display data);
- multisync monitor;
- CRT adapter for multiple CRT types;
- variable format in general;
- bidirectional scan;
- video mixer;
- scrambling of video signals;
- inversion control e.g. with a switch: black on white or white on black
- monochrome ==> monochrome with LUTs;
- coupling details display card <=> monitor.

Illustrative examples:

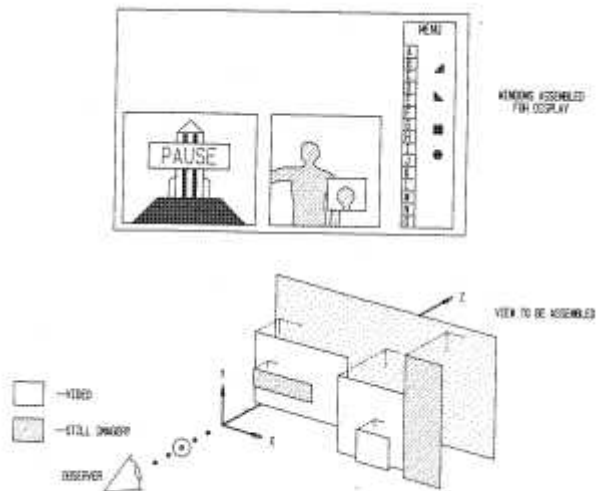
Screen saver: DE4142894.



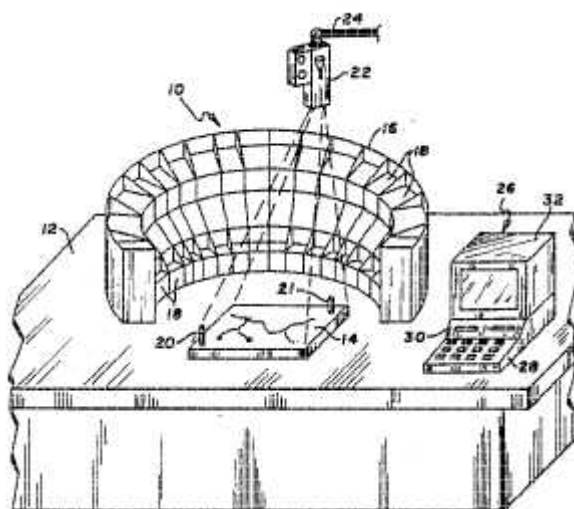
Graphics display system: WO8906415.



Raster assembly processor: US4947257.



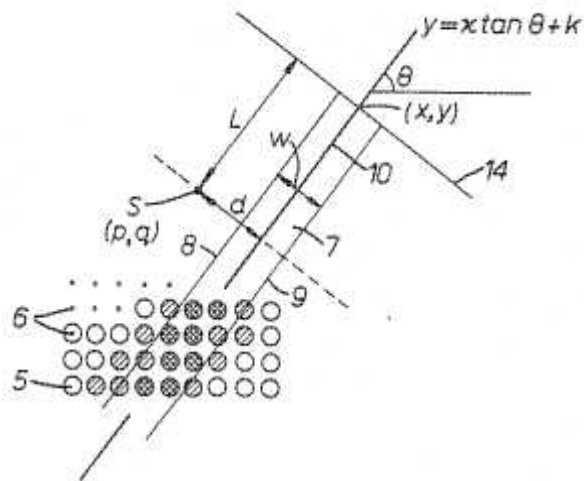
Interfacing video information and computer-generated graphics on a visual display terminal:  
US4958297.



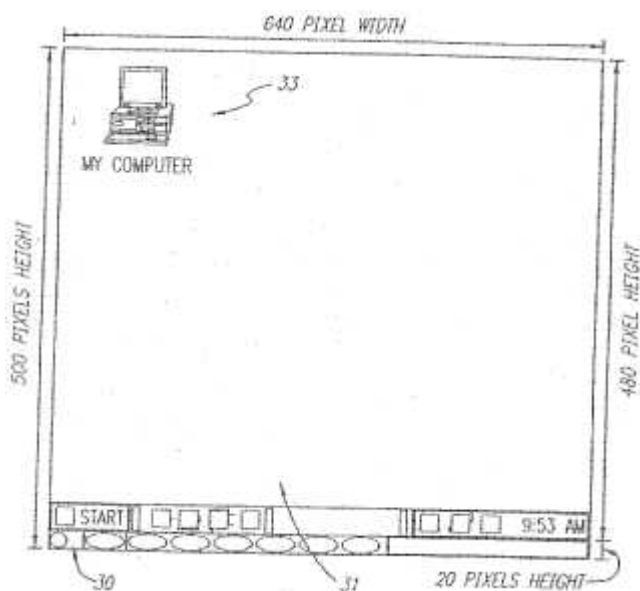


Definition statement

Improving apparent smoothness on gray-scale displays: US4612540.

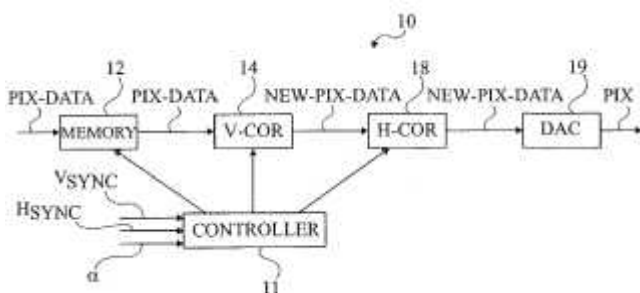


Displaying data in a second display area (obtained by overscan): US2002149593



Radiation elimination circuit: DE29917219U, DE29917219U.

Correcting the rotation of a video display. US2003189639.



## References

### Limiting references

*This place does not cover:*

Deflection circuits	<a href="#">G09G 1/04</a>
Synchronisation between the display unit and other units, e.g. other display units, video-disc players	<a href="#">G09G 5/12</a>
Control of the character-code memory, Resolution modifying circuits, e.g. variable screen formats, resolution change between memory contents and display screen	<a href="#">G09G 5/227</a>
Control of display attribute	<a href="#">G09G 5/30</a>
Control of the bit-mapped memory, Resolution modifying circuits, e.g. variable screen formats	<a href="#">G09G 5/391</a>

### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Prevention of data theft by detection of electromagnetic stray radiation of VDU	<a href="#">G06F 21/00</a>
Coupling parts for selective co-operation with a counterpart in different ways to establish different circuits, e.g. For voltage selection, for series-parallel selection	<a href="#">H01R 29/00</a>
Circuits special to multi-standard TV receivers	<a href="#">H04N 3/27</a>
For additional information on a television signal	<a href="#">H04N 5/445</a>

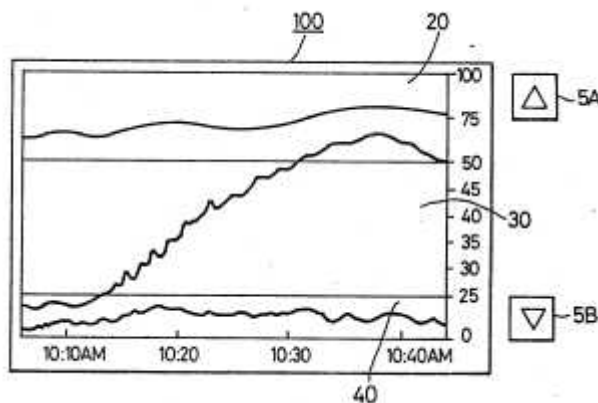
**G09G 1/162**

{for displaying digital inputs as analog magnitudes, e.g. curves, bar graphs, coordinate axes, singly or in combination with alpha-numeric characters (cathode-ray oscilloscopes for displaying analog inputs, singly or in combination with alpha-numeric characters [G01R 13/20](#); television receiver circuitry for displaying supplementary, e.g. alpha-numeric, information [H04N 5/445](#))}

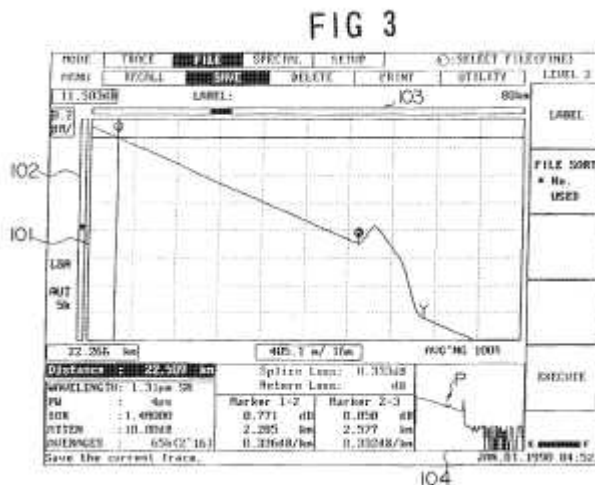
**Definition statement**

*This place covers:*

Method and apparatus for enlarging a trend graph: US5261031.

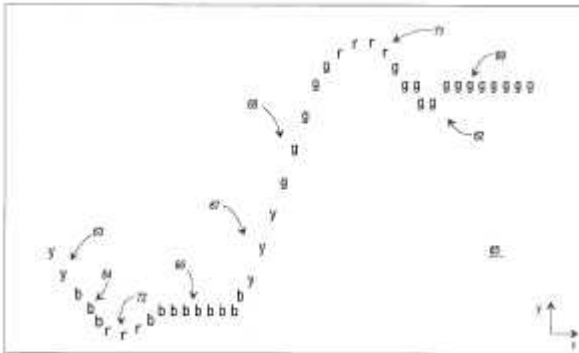


Waveform signal display controlling device and method: EP0987673.



Method to scale electrocardiograph (ECG) waveforms independent from display resolution: EP0932139.

Trace coloring system and method: US5959607.



Displaying graphic data: EP0636965.

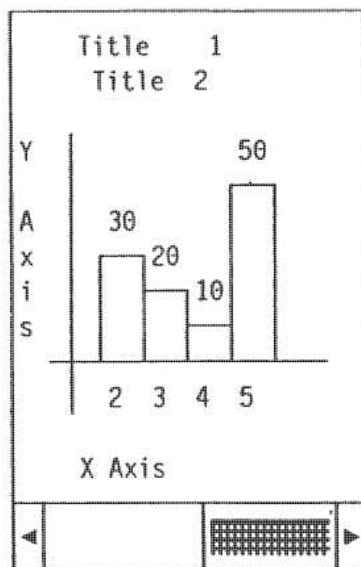


FIG. 4

## References

### Informative references

Attention is drawn to the following places, which may be of interest for search:

Cathode-ray oscilloscopes for displaying analog inputs, singly or in combination with alpha-numeric characters	<a href="#">G01R 13/20</a>
Television receiver circuitry for displaying supplementary, e.g. Alpha-numeric, information	<a href="#">H04N 5/445</a>

## G09G 1/165

{Details of a display terminal using a CRT, the details relating to the control arrangement of the display terminal and to the interfaces thereto (details suitable for both CRT and flat panel [G09G 5/003](#); specific for a flat panel [G09G 3/2092](#))}

### Definition statement

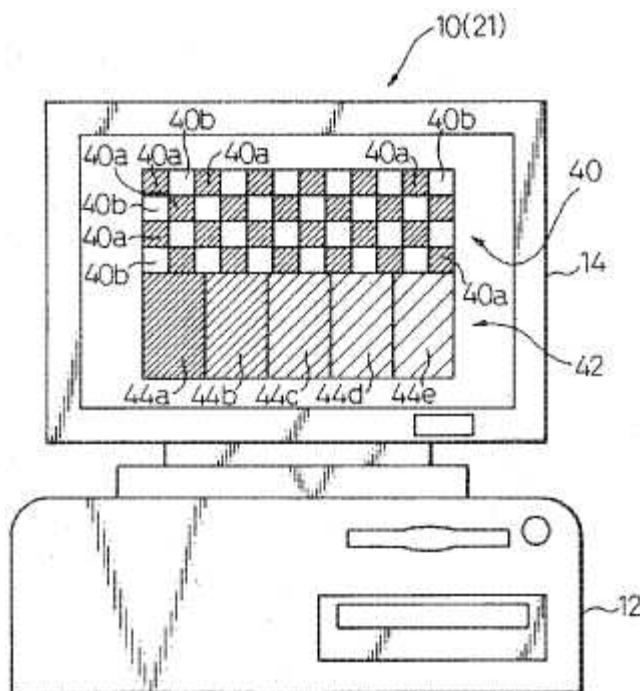
*This place covers:*

Arrangements for data processing done in order to adapt the incoming data to the display on a CRT; details of the deflection signals or driving signals of the CRT in dependence of the data to be displayed.

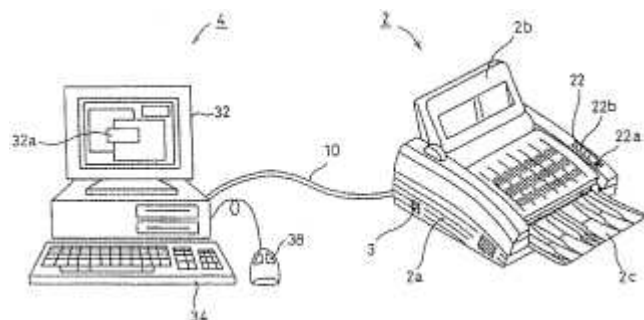
The codes [G09G 1/165](#) and below apply only if a monitor-architecture can be identified (click to see definition; the same rule applies for [G09G 3/2092](#) and [G09G 5/003](#)). The [G09G 1/165](#) and below is used only in exceptional cases where the processing is clearly specific to a CRT. Anything that might as well be used for other technologies is to be classified under the [G09G 5/003](#) and its (more detailed) sub-groups.

Illustrative examples:

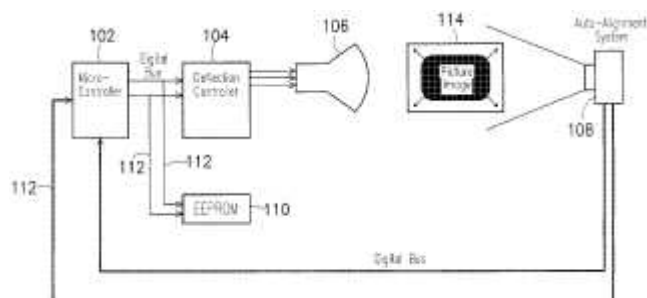
Monitor calibration: US2003053001.



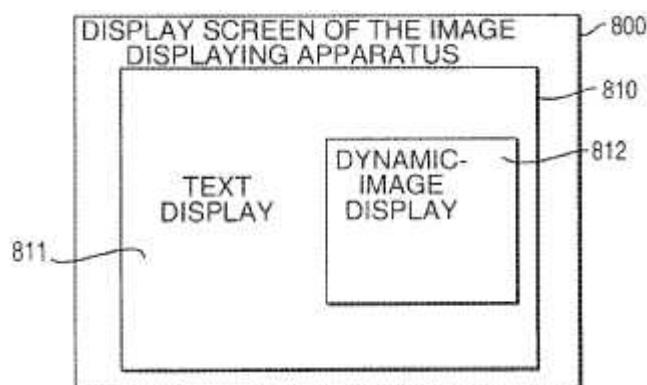
Screen alignment and positioning: US2002180769.



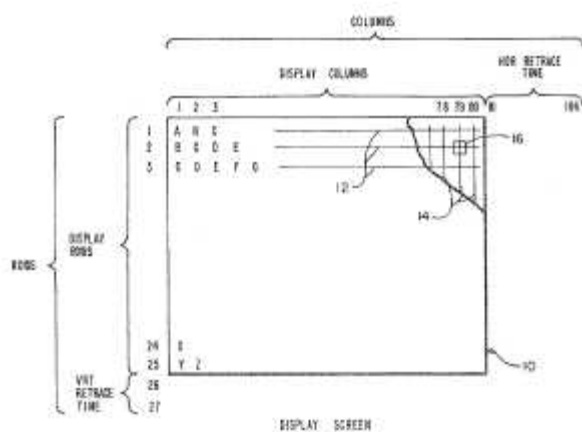
Screen alignment and positioning: US2002180769.



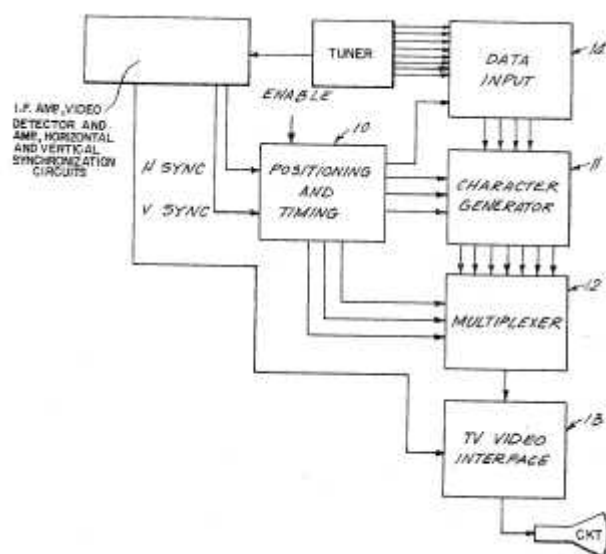
US4338597



US4338597



US4081797



## References

### Limiting references

This place does not cover:

Details specific for a flat panel	<a href="#">G09G 3/2092</a>
Details suitable for both CRT and flat panel	<a href="#">G09G 5/003</a>

### Informative references

Attention is drawn to the following places, which may be of interest for search:

Interfacing with colour display	<a href="#">G09G 1/285</a>
Control of matrices with row and column drivers	<a href="#">G09G 3/3611</a>
Using display panels	<a href="#">G06F 3/147</a>
Using cathode-ray tubes	<a href="#">G06F 3/153</a>

## Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Display terminal	Means an apparatus connected to a source of display data (usually a graphics controller of a computer, or directly to the computer itself) adapted to display images generated by this source of data. In general a "Display terminal" is an arrangement including a display device (e.g. a CRT with its driving electronic or a flat panel including its row and column drivers), a display device controller (the hardware and software (usually a microprocessor) that controls the display device and that allows its functioning by, for example, generating the signals that are needed to bring the data to the drivers) and a display terminal controller (the hardware and software used to control the display terminal as a whole and to interface the display terminal to the graphics controller, to adapt data and control signals, for example in an LCD driven by a VGA type graphics controller).
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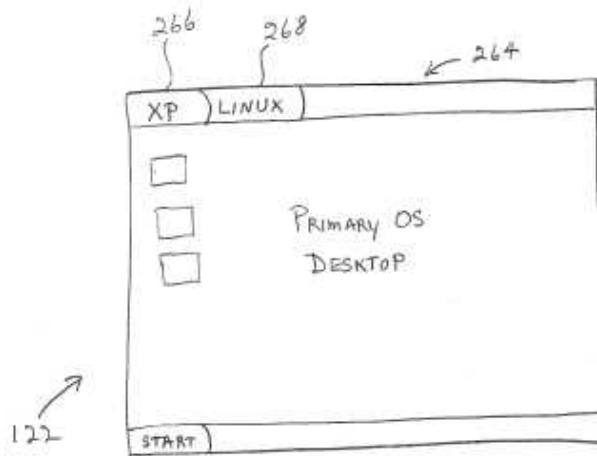
**G09G 1/167**

{Details of the interface to the display terminal specific for a CRT (details suitable for both CRT and flat panel [G09G 5/006](#), specific for a flat panel [G09G 3/2096](#))}

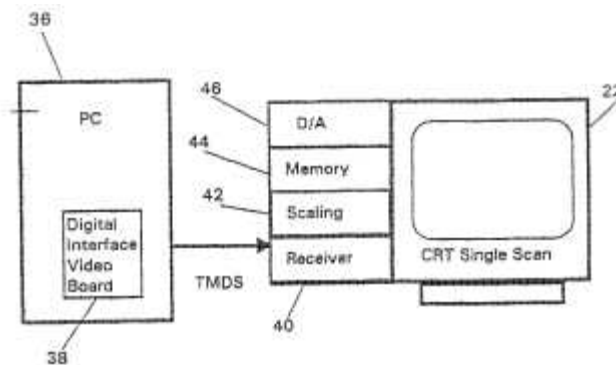
**Definition statement**

*This place covers:*

Illustrative examples: Parallel data display of multiple executing environments:US2004226041.



Single horizontal scan range CRT monitor: WO0129811.



Improved signal restoration: US6529248.





Adding display data channel to existing display: GB2294135.

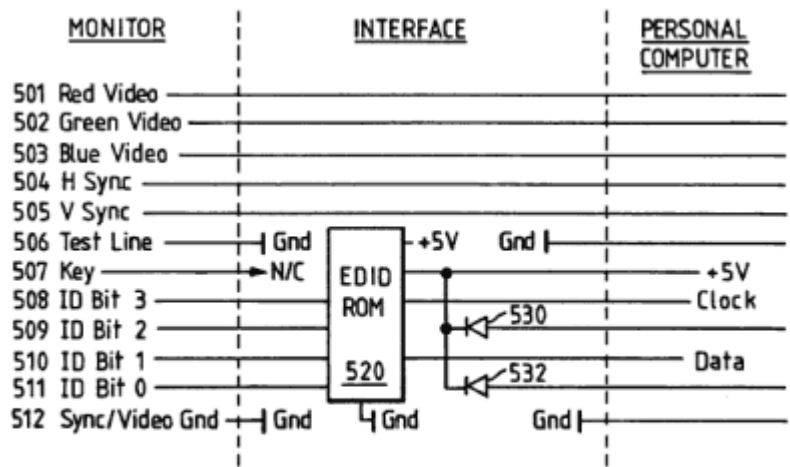
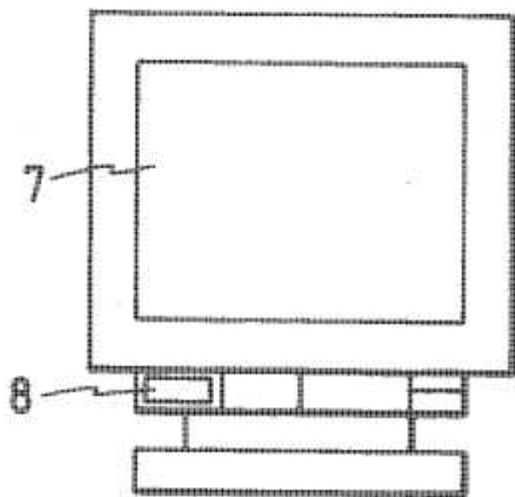


FIG. 6

Separate message section on CRT display device: US5384576.



## References

### Limiting references

*This place does not cover:*

Specific for a flat panel	<a href="#">G09G 3/2096</a>
Suitable for both CRT and flat panel	<a href="#">G09G 5/006</a>
Control arrangements or circuits for visual indicators common to cathode-ray tube indicators and other visual indicators, Details of the interface to a display terminal	<a href="#">G09G 5/006</a>

### Informative references

Attention is drawn to the following places, which may be of interest for search:

Interfacing with colour display	<a href="#">G09G 1/285</a>
Control of matrices with row and column drivers	<a href="#">G09G 3/3611</a>
Using display panels	<a href="#">G06F 3/147</a>
Using cathode-ray tubes	<a href="#">G06F 3/153</a>

### Special rules of classification

The class [G09G 1/167](#) includes "details of the interface to a CRT display terminal". If a television set is used as a display terminal, the class [G09G 5/006](#) should be given and not the [G09G 1/167](#). This is because the signals generated for a television set are standard television signals (NTSC or PAL...): the television itself might have an lcd or plasma panel. If the interface to the display terminal has some details about the signals of the interface, and if these details are clearly means for a CRT terminal (e.g. level or polarity of a h-synch or v-synch signals, black level adjustment...) then the documents are classified in the [G09G 1/167](#).

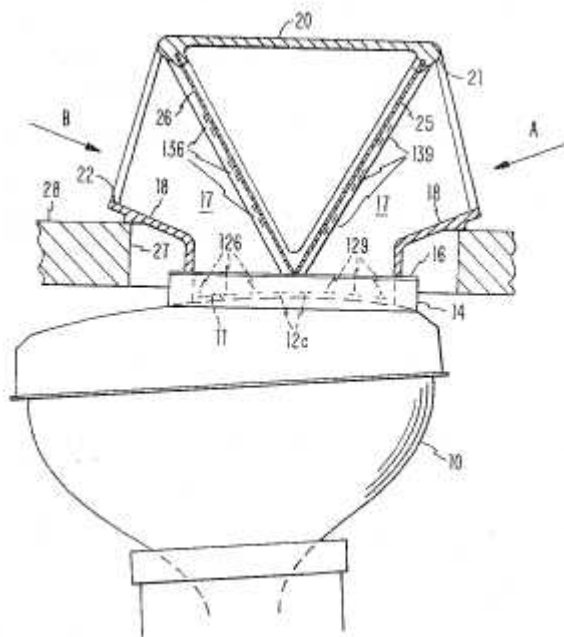
### G09G 1/18

**a small local pattern covering only a single character, and stepping to a position for the following character, e.g. in rectangular or polar co-ordinates, or in the form of a framed star**

### Definition statement

*This place covers:*

Illustrative example of subject matter classified in this group (US3777059):



**G09G 1/20**

using multi-beam tubes ([G09G 1/26](#), [G09G 1/28](#) take precedence)

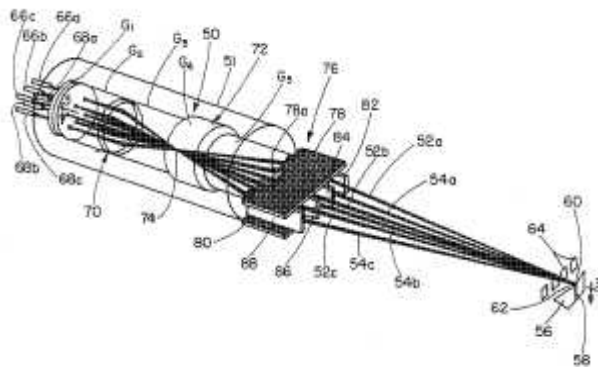
**Definition statement**

*This place covers:*

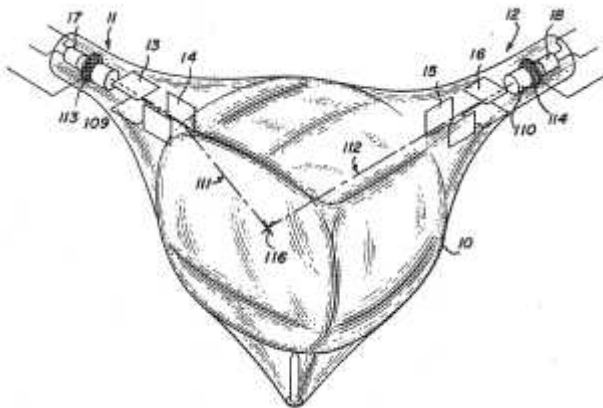
Multiple beams and beam deflection necessary! A flat panel using deflection is considered as being a multiple beam CRT.

Illustrative examples:

Common focus: US5382883.



US4063233



Separated regions: EP1054379, DE1137143.

For intensity control: US5691608,



FR2296228.

## References

### Limiting references

*This place does not cover:*

Using storage tubes	<a href="#">G09G 1/26</a>
Using colour tubes	<a href="#">G09G 1/28</a>

### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Using large area or array source	<a href="#">H01J 31/127</a>
Producing multiple scanning	<a href="#">H04N 3/28</a>
With more than one beam in a tube	<a href="#">H04N 9/20</a>

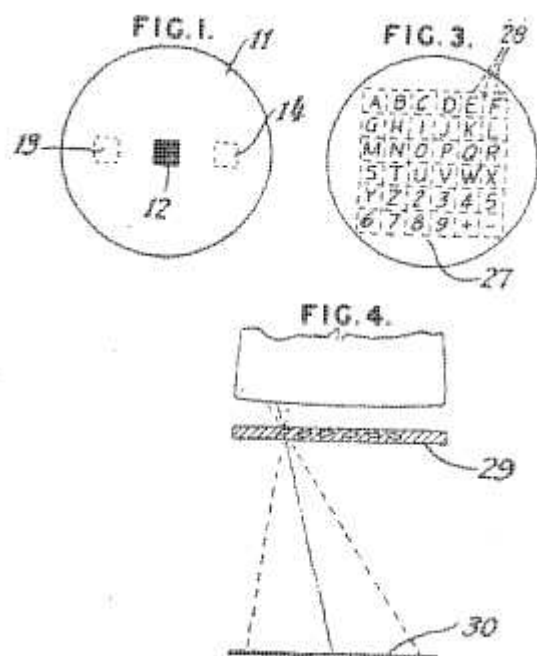
## G09G 1/22

using tubes permitting selection of a complete character from a number of characters {(tubes therefor [H01J 31/16](#))}

### Definition statement

*This place covers:*

Illustrative example of subject matter classified in this group (GB929976):



and US2925526, US2866189.

## References

### Informative references

Attention is drawn to the following places, which may be of interest for search:

Tubes therefor	<a href="#">H01J 31/16</a>
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## G09G 1/26

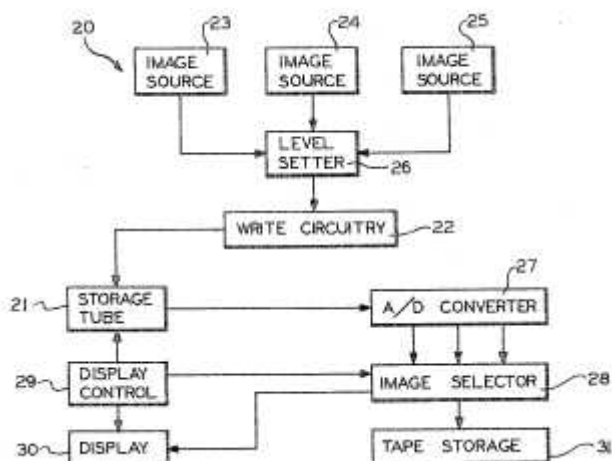
using storage tubes {(tubes therefor [H01J 31/58](#))}

### Definition statement

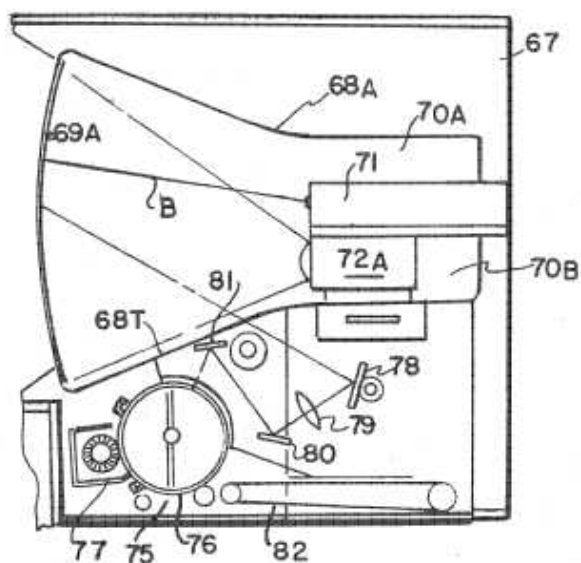
This place covers:

Illustrative examples of subject matter classified in this group:

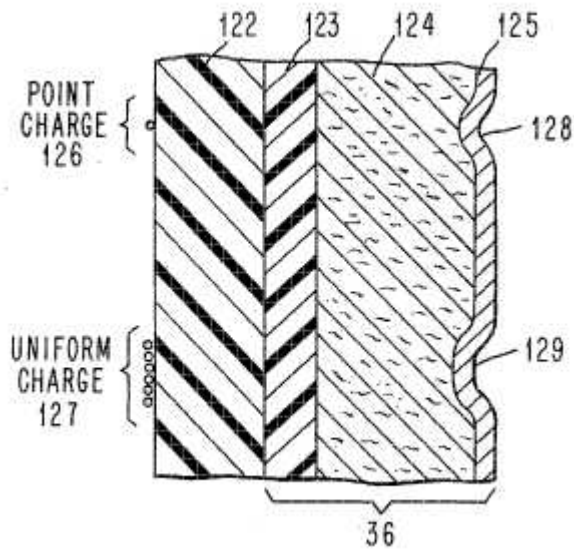
US3639910



US4107741



US3902012



## References

### Informative references

Attention is drawn to the following places, which may be of interest for search:

Tubes therefor	<a href="#">H01J 31/58</a>
----------------	----------------------------

## G09G 1/28

using colour tubes {(tubes therefor [H01J 31/20](#))}

### Definition statement

This place covers:

Specific circuits for CRT tubes (e.g. for a penetron tube).

Illustrative examples:

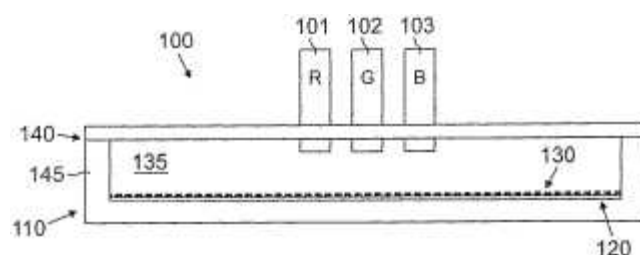
Color shadow mask cathode ray tube: WO8203494.

Position programmed colour CRT: NL7505346.

Colour image display system - CRT with display areas and associated circuitry: DE2329081.

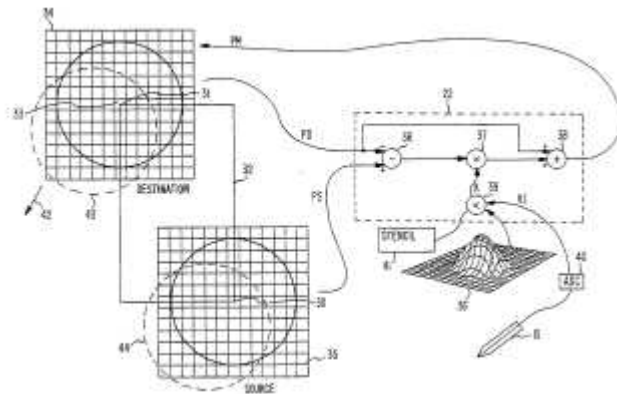
Multi-color crt display system: US3280254.

Cathode ray tube with addressable nanotubes: US6515639.



## Definition statement

Image processing system utilizing brush profile: US5412767.



## References

## Informative references

Attention is drawn to the following places, which may be of interest for search:

Display of colours in general	<a href="#">G09G 5/02</a>
Measurement of color	<a href="#">G01J 3/46</a>
Tubes therefor	<a href="#">H01J 31/20</a>
Color picture communication systems	<a href="#">H04N 1/46</a>

## G09G 1/285

{Interfacing with colour displays, e.g. TV receiver}

## Definition statement

This place covers:

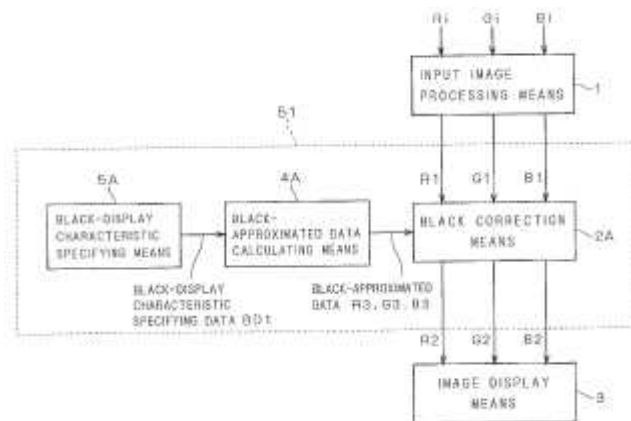
- specific interface circuits between the color processing output circuit (e.g. output of video ram or color lookup table if present) and the color display tube;
- fiber-optic data link between color control circuit and CRT-monitor;
- color normalisation for display terminals: e.g. adapting the LUT content to the specific colors of the phosphors and to the gamma curve of the display;
- monitor sensing circuits (color  $\Leftrightarrow$  monochrome).

Illustrative examples:

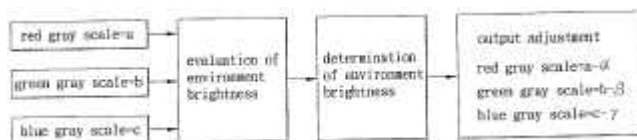


## Definition statement

Display device with black correction unit: US2002150293.



Compensation method for improving color saturation and image quality of plasma display panel by adjusting the strength of input image signals: US2002167467.



## Plasma displays

Method and apparatus for automatically calibrating a CRT: EP0539943.

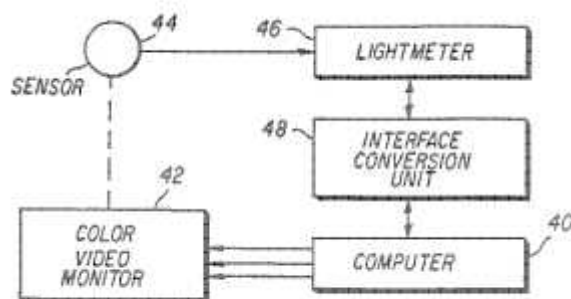
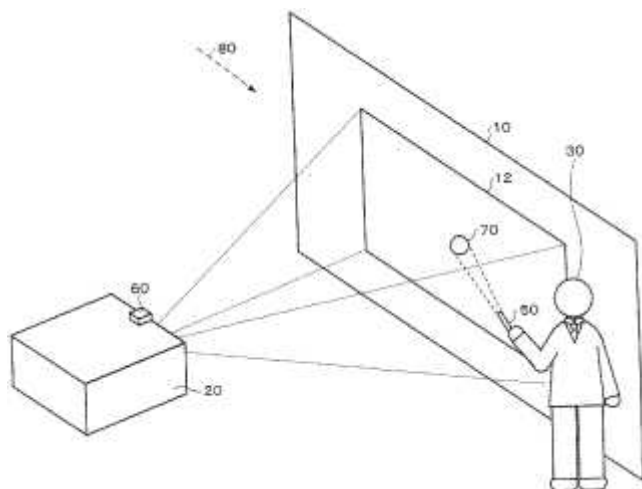


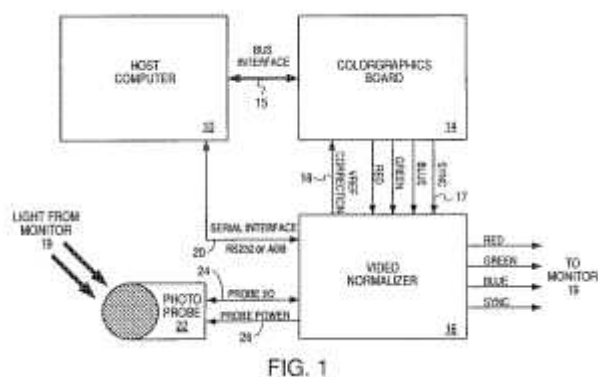
FIG. 3

## Definition statement

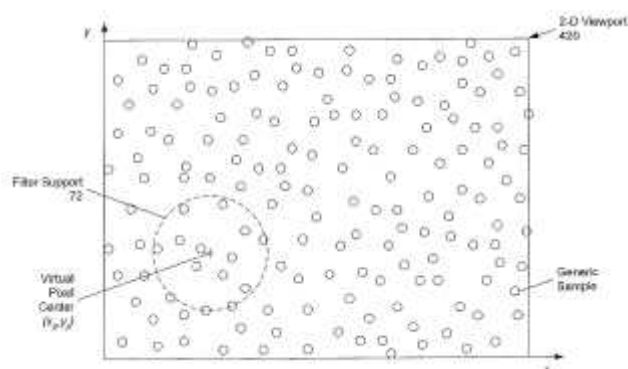
Image display system that performs grayscale correction in accordance with the on-site environment:  
US2003147053.



Light output correction of a display monitor. EP0514025.



Multi-spectral color correction. US2002122044.



## G09G 3/00

Control arrangements or circuits, of interest only in connection with visual indicators other than cathode-ray tubes

## Definition statement

This place covers:

- Control of flat panel display in general.

## Definition statement

- Control of rotatable displays: to display information on a screen in either a horizontal orientation (landscape) or vertical orientation (portrait) the display controller is able to change the orientation of the displayed information. In some cases the physical screen is also rotated.

## References

## Informative references

Attention is drawn to the following places, which may be of interest for search:

Control of illumination source, e.g. backlight for non-intrinsically emissive displays	<a href="#">G09G 3/3406</a>
Scanning systems for optical devices or arrangements using movable or deformable optical elements for controlling the intensity, colour, phase, polarisation or direction of light, e.g. switching, gating, modulating.	<a href="#">G02B 26/10</a>
Visual indicators for traffic control systems.	<a href="#">G08G</a>

## G09G 3/001

{using specific devices not provided for in groups [G09G 3/02](#) - [G09G 3/36](#), e.g. using an intermediate record carrier such as a film slide; Projection systems; Display of non-alphanumerical information, solely or in combination with alphanumerical information, e.g. digital display on projected diapositive as background (slide projectors per se [G03B 23/00](#) = 42 HP)}

## Definition statement

This place covers:

- Using an intermediate record carrier such as a film slide.
- Control of projection systems or displays.
- Display of non-alphanumerical information, solely or in combination with alphanumerical information, e.g. digital display on projected diapositive as background.
- Control of rotating or moving display (Roled): one or more (usually linear) arrays of light emitting elements are rotated or moved to display an image on a virtual screen created on the surface of revolution or movement.
- Control of stereoscopic computer displays.
- Control of multiple view displays, i.e. displays producing e.g. two images which are visible under different viewing angles.

Illustrative examples of subject matter classified in this place:

1.

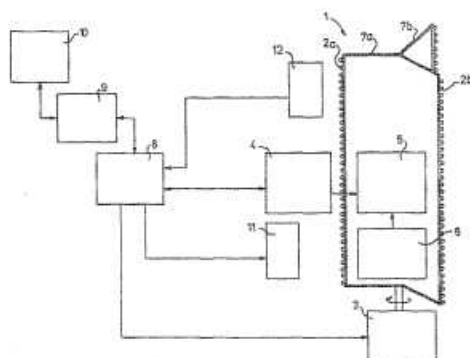


Figure 1 illustrates a display device with rotating display elements.

2.

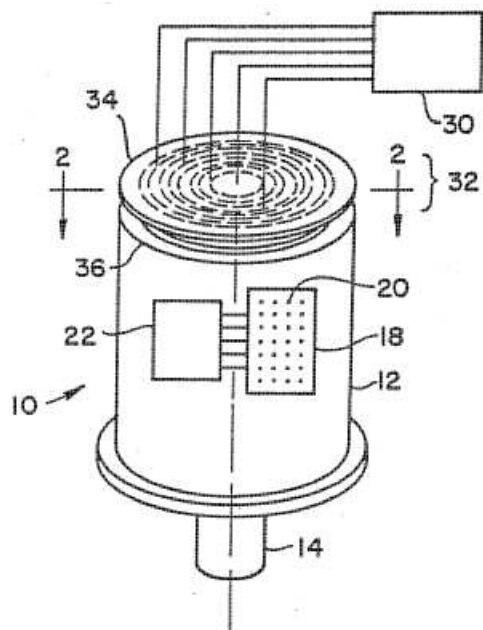


Figure 2 illustrates a high-speed link for rotating display.

3.

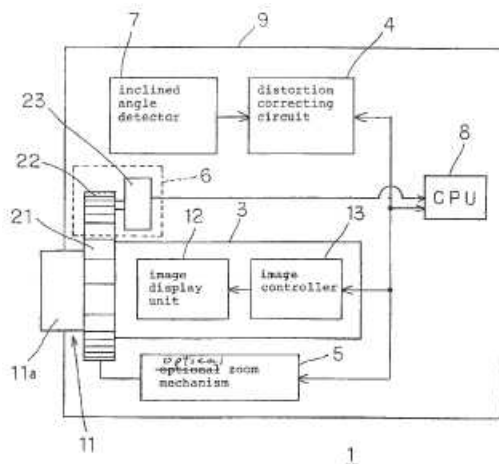


Figure 3 illustrates a projector with image modified to compensate distortions from projecting onto a screen from a side, so called "Keystone correction".

Definition statement

4.

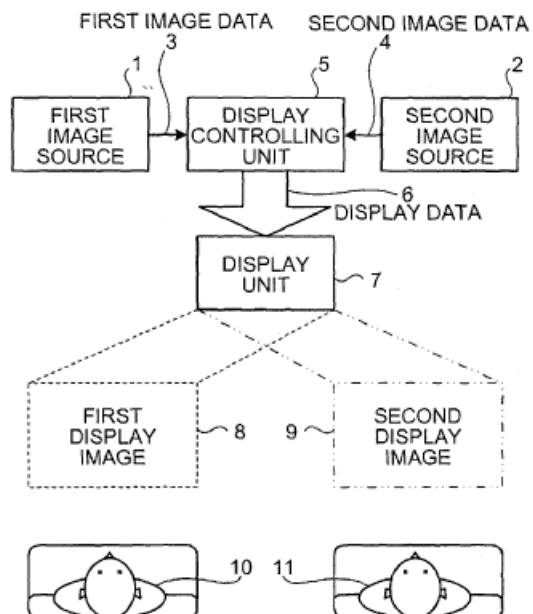
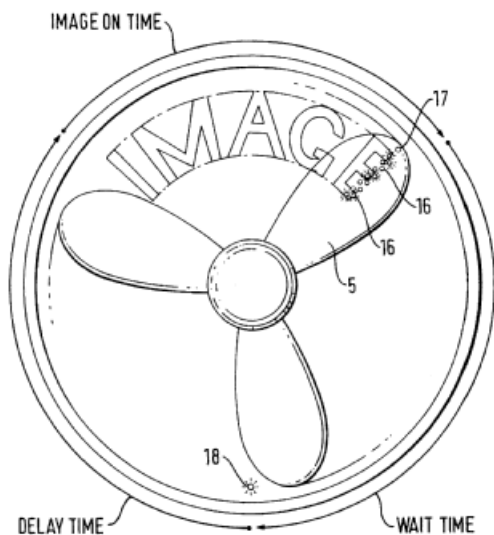
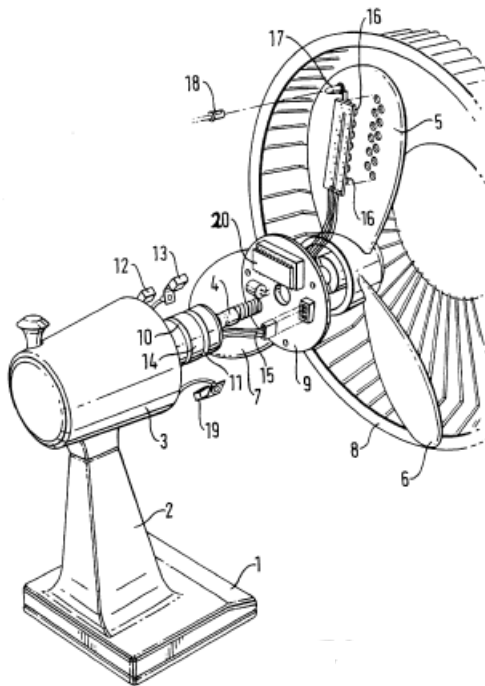


Figure 4 illustrates a coloured display which displays two different images depending on the viewing direction.

5a.



5b.



Figures 5a and 5b illustrate an image display apparatus.

6.



Figure 6 illustrates a baton using light emitting cell array to form a display.

7.

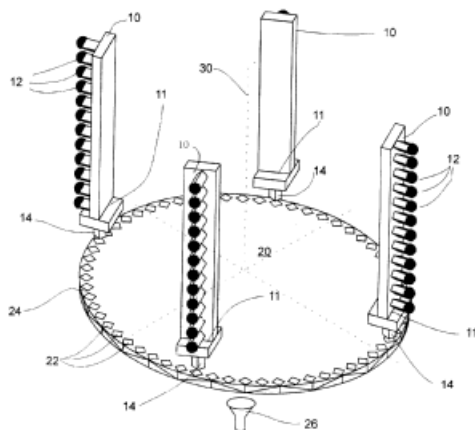


Figure 7 illustrates a rotating drum or blade with linear array of light sources.

## References

### Limiting references

*This place does not cover:*

Slide projectors	<a href="#">G03B 23/00</a>
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### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Circuits for displaying split screens (including CRTs with divided screens)	<a href="#">G09G 1/007</a>
Projection display for cars (e.g. HUDs)	<a href="#">B60K 35/23</a>
Light guides specially adapted for lighting devices or systems	<a href="#">G02B 6/0001</a>
Mountings, adjusting means, or light-tight connections, for optical elements adapted for automatic focusing or varying magnification	<a href="#">G02B 7/09</a>
Systems for automatic generation of focusing signals including a sight line detecting device	<a href="#">G02B 7/287</a>
Head mounted displays	<a href="#">G02B 27/017</a>
Head mounted displays characterised by optical features	<a href="#">G02B 27/0172</a>
Head mounted displays characterised by mechanical features	<a href="#">G02B 27/0176</a>
Other optical systems for producing stereoscopic or other 3D effects	<a href="#">G02B 30/00</a>
Stereoscopic and volumetric TV display	<a href="#">G02B 30/00</a>
Other optical systems for producing stereoscopic or other 3D effects, the image being built up from image elements distributed over a 3D volume	<a href="#">G02B 30/00</a>
Other optical systems for producing stereoscopic or other 3D effects, the volume being constructed from a stack or sequence of 2D planes	<a href="#">G02B 30/52</a>
Slide projectors per se	<a href="#">G03B 23/00</a>
Displaying, advertising, signs, labels or name-plates, seals	<a href="#">G09F</a>
Mobile visual advertising	<a href="#">G09F 21/00</a>
Scanning details of television systems by switched stationary formation of lamps, photocells or light relays (e.g. optical fibers)	<a href="#">H04N 3/12</a>

Projectors for colour picture display	<a href="#">H04N 9/31</a>
Stereoscopic video systems	<a href="#">H04N 13/00</a>

## G09G 3/004

{to give the appearance of moving signs}

### Definition statement

*This place covers:*

Display devices wherein, different from a standard panel:

- the displayed image has a higher resolution than the display device itself; and
- at any time, only part of the complete image is displayed.

Illustrative example: EP0709818



## G09G 3/006

{Electronic inspection or testing of displays and display drivers, e.g. of LED or LCD displays (testing individual LED's [G01R 31/2635](#); testing lamps [G01R 31/44](#); testing of optical features of LCD displays [G02F 1/1309](#))}

### Definition statement

*This place covers:*

Testing or inspecting flat panel displays by electrical means, i.e. by checking electrical signals and parameters while driving the panel, possibly under special driving conditions specific for the test.

### References

#### Limiting references

*This place does not cover:*

Testing of individual LEDs	<a href="#">G01R 31/2635</a>
Testing lamps	<a href="#">G01R 31/44</a>



Testing of optical features of LCD displays	<a href="#">G02F 1/1309</a>
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### Informative references

Attention is drawn to the following places, which may be of interest for search:

Investigating or analysing materials by the use of optical means, i.e. using infrared, visible, or ultraviolet light; etc. Inspecting patterns on the surface of objects.	<a href="#">G01N 21/956</a>
Testing of electronic circuits	<a href="#">G01R 31/282</a>
Diagnosis, testing or measuring for television systems or their details	<a href="#">H04N 17/00</a>

### Special rules of classification

Does not apply to testing during manufacturing of non-finished flat panel displays, when the result of the testing are used to determine parameters of the subsequent manufacturing steps (such testing is regarded as a step of manufacturing).

Also, does not apply if the testing/inspecting is carried out by optical means (e.g. optical measurements), which is classified in [G01R](#). In some "mixed" or doubtful cases classifications in both [G09G 3/006](#) and [G01R](#) may be given.

Does not apply to mere calibration of display devices, i.e. to the setting of control parameters for properly functioning displays based on detection of operation parameters (e.g. detection of colour, luminance etc), for which Indexing Code [G09G 2320/0693](#) applies.

## G09G 3/02

### by tracing or scanning a light beam on a screen

#### Definition statement

This place covers:

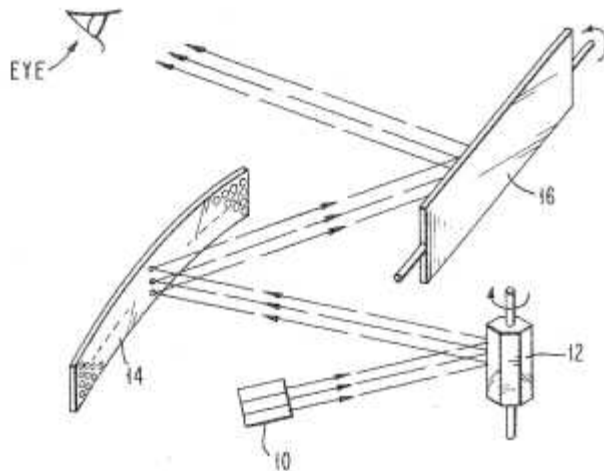
- Control of displays using a deflected and modulated light beam for directly producing the displayed image on the screen.
- Control of displays using deflected and modulated light beams, which are generated by a linear array, for directly producing the displayed image on the screen.
- Control of displays using a deflected and modulated light beam to control an array of photosensitive elements that receive it and consequently command each a pixel display element.
- Control of displays using a deflected and modulated light beam for optically writing image data on a photosensitive surface that commands a display such as a light modulator.
- Control of stereoscopic displays.
- Control of multiple view displays, i.e. displays producing e.g. two images which are visible under different viewing angles.

Illustrative examples:

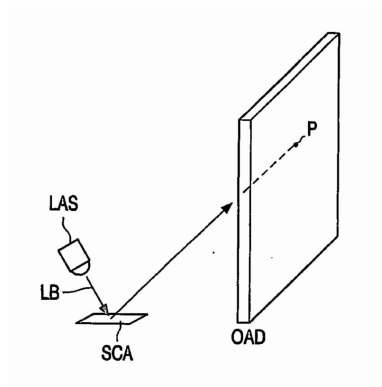
US3739370 (deflected light beam producing the displayed image on the screen)

## Definition statement

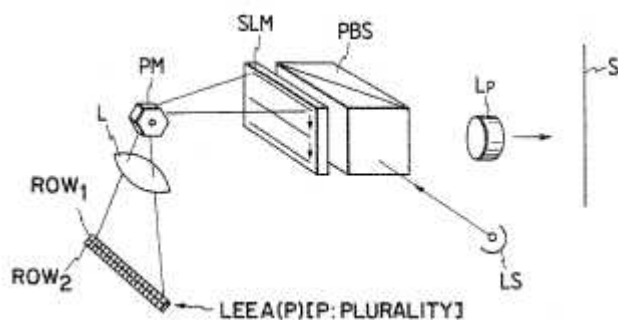
US4097115 (Control of optical scanning device for producing a multiple line scan using a linear array of sources and a textured scanned surface)



US2006132452 (control of a display using a deflected and modulated light beam to control an array of photosensitive elements that receive it and consequently command each a pixel display element)



US5463468 (control of a display using a deflected and modulated light beam for optically writing image data on a photosensitive surface that commands a display such as a light modulator)



## G09G 3/04

for presentation of a single character by selection from a plurality of characters, or by composing the character by combination of individual elements, e.g. segments {using a combination of such display devices for composing words, rows or the like, in a frame with fixed character positions}

### Definition statement

*This place covers:*

- Control of displays for displaying a character composed by a fixed number of display elements as segments or dots, i.e. the character position within the display device is fixed, and the specific character composition by combination of individual display elements to be displayed is selected from a plurality of predefined character compositions without specifying a display technology or with details of two or more display technology, but aspects of general character for various, if not all display technologies.
- Control of displays for displaying a character by selection from a plurality of complete characters.

### References

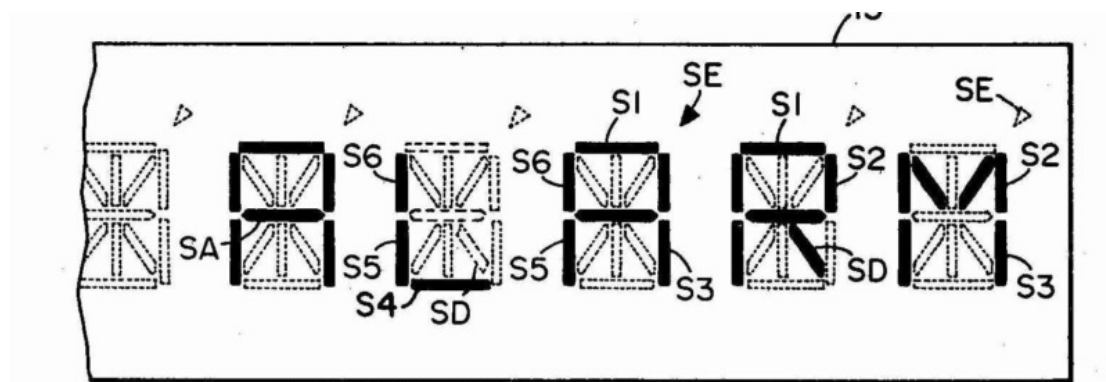
#### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

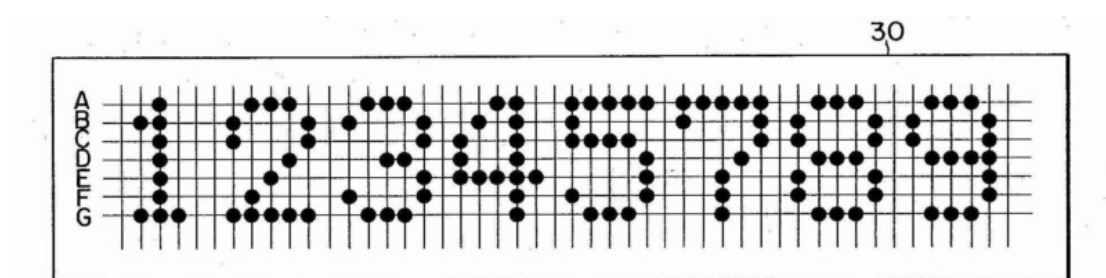
Control of displays having display elements arranged in a matrix	<a href="#">G09G 3/20</a>
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#### Examples

US4458243 (control of a segment display with each character being loaded from a ROM and generated at a fixed position by 14 segments)



US4504829 (control of a dot character display with each character being loaded from a memory and generated at a fixed position by 5 times 7 dots)

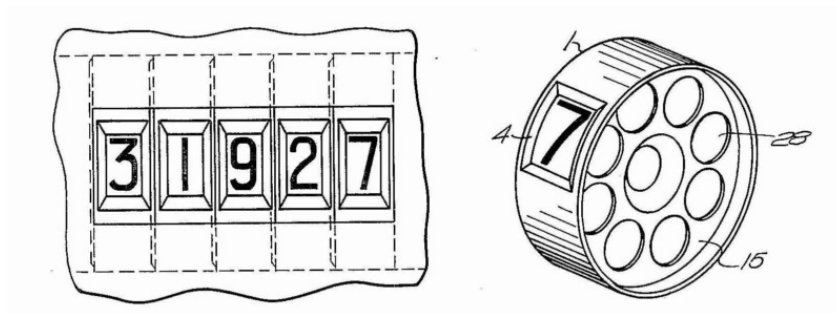


**G09G 3/045****{Selecting complete characters}****Definition statement**

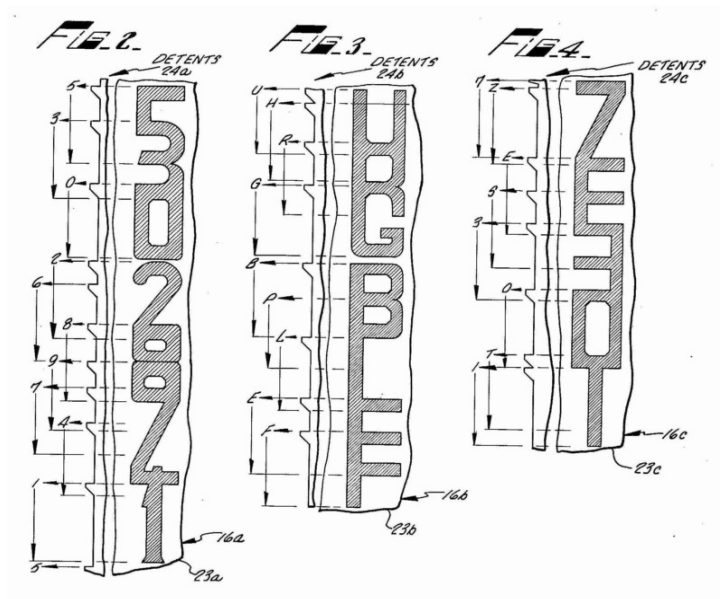
*This place covers:*

Control of displays for displaying a character by selection from a plurality of complete characters.

Illustrative examples: US3218625 (control of a display wheel for converting binary code to display position)



US3200396 (control of a display using fused characters)

**G09G 3/06****using controlled light sources****Definition statement**

*This place covers:*

Control of displays using controlled light sources for displaying a character composed by a fixed number of display elements as segments or dots.

## References

### Informative references

Attention is drawn to the following places, which may be of interest for search:

Control of displays using controlled light sources as display elements arranged in a matrix	<a href="#">G09G 3/22</a>
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## Special rules of classification

In this group, documents concerning the control of character displays using controlled light sources not covered by any of the groups [G09G 3/08](#) - [G09G 3/14](#) are classified, e.g. the control of vacuum fluorescent character displays.

## G09G 3/08

### using incandescent filaments

#### Definition statement

*This place covers:*

Control of displays using incandescent filaments, i.e. incandescent light bulbs, for displaying a character composed by a fixed number of display elements as segments or dots.

## References

### Informative references

Attention is drawn to the following places, which may be of interest for search:

Control of displays using incandescent filaments, i.e. incandescent light bulbs, as display elements arranged in a matrix	<a href="#">G09G 3/24</a>
---	---------------------------

## G09G 3/10

### using gas tubes

#### Definition statement

*This place covers:*

Control of displays using gas tubes, e.g. luminous plasma discharge cells, for displaying a character composed by a fixed number of display elements as segments or dots.

## References

### Informative references

Attention is drawn to the following places, which may be of interest for search:

Control of displays using luminous gas-discharge cells, e.g. luminous plasma discharge cells, as display elements arranged in a matrix	<a href="#">G09G 3/28</a>
--	---------------------------

**G09G 3/12****using electroluminescent elements****Definition statement**

*This place covers:*

Control of displays using electroluminescent display elements for displaying a character composed by a fixed number of display elements as segments or dots.

**References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Control of displays using cathode-ray tubes with phosphor screens	<a href="#">G09G 1/00</a>
Control of displays using electroluminescent display elements arranged in a matrix	<a href="#">G09G 3/30</a>

**G09G 3/14****Semiconductor devices, e.g. diodes****Definition statement**

*This place covers:*

Control of displays using electroluminescent display elements, which are semiconductor devices, e.g. diodes or transistors, for displaying a character composed by a fixed number of display elements as segments or dots.

**References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Control of displays using electroluminescent display elements, which are semiconductor devices, e.g. diodes or transistors, arranged in a matrix	<a href="#">G09G 3/32</a>
Control of displays using organic electroluminescent display elements, which are semiconductor devices, e.g. diodes or transistors, arranged in a matrix	<a href="#">G09G 3/3208</a>

**G09G 3/16****by control of light from an independent source****Definition statement**

*This place covers:*

- Control of displays using display elements, which do not emit light, but selectively control the light from an independent light source by transmission, reflection, or absorption of, for displaying a character composed by a fixed number of display elements as segments or dots
- Control of an independent light source used in displays using display elements, which selectively control the light from the independent source, for displaying a character composed by a fixed number of display elements as segments or dots

## References

### Informative references

Attention is drawn to the following places, which may be of interest for search:

Control of displays using display elements arranged in a matrix, which do not emit light, but selectively control the transmission, reflection, or absorption of light from an independent light source	<a href="#">G09G 3/34</a>
Control of an independent light source used in displays using display elements arranged in a matrix, which selectively control the light from the independent source	<a href="#">G09G 3/3406</a>

## Special rules of classification

In this group, documents concerning the control of character displays not covered by the groups [G09G 3/18](#) or [G09G 3/19](#) are classified, e.g. the control of electrophoretic character displays.

## G09G 3/18

### using liquid crystals

#### Definition statement

*This place covers:*

Control of displays using liquid crystal display elements for displaying a character composed by a fixed number of display elements as segments or dots.

## References

### Informative references

Attention is drawn to the following places, which may be of interest for search:

Control of displays using liquid crystal display elements arranged in a matrix	<a href="#">G09G 3/36</a>
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## G09G 3/19

### using electrochromic devices

#### Definition statement

*This place covers:*

Control of displays using electrochromic display elements for displaying a character composed by a fixed number of display elements as segments or dots.

## References

### Informative references

Attention is drawn to the following places, which may be of interest for search:

Control of displays using electrochromic display elements arranged in a matrix	<a href="#">G09G 3/38</a>
--	---------------------------

## G09G 3/20

for presentation of an assembly of a number of characters, e.g. a page, by composing the assembly by combination of individual elements arranged in a matrix {no fixed position being assigned to or needed to be assigned to the individual characters or partial characters}

### Definition statement

*This place covers:*

- Control of displays having display elements arranged in a matrix with details of two or more display technology, but aspects of general character for various, if not all display technologies.
- Control of displays having display elements arranged in a matrix without specifying a display technology.

### References

#### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Electronic inspection or testing of displays and display drivers	<a href="#">G09G 3/006</a>
Control arrangements or circuits for presentation of a single character by selection from a plurality of characters, or by composing the character by combination of individual elements, e.g. segments	<a href="#">G09G 3/04</a>

### Special rules of classification

For control arrangements or circuits with details concerning the control of intermediate tones of elements arranged in a matrix, a code within [G09G 3/2007](#) is to be given, and with details concerning the colour, [G09G 3/2003](#) is to be given. For control arrangements or circuits for elements arranged in a matrix with details of one specific display technology, a code corresponding to the specific display technology is to be given, e.g. [G09G 3/38](#) for using electrochromic elements.

## G09G 3/2003

{Display of colours (specific for liquid crystal displays [G09G 3/3607](#))}

### Definition statement

*This place covers:*

Control of a display to display a coloured image with aspects specific for flat panel displays.

### References

#### Limiting references

*This place does not cover:*

Control of a liquid crystal display for displaying a coloured image	<a href="#">G09G 3/3607</a>
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#### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Control of a display for displaying a coloured image in general	<a href="#">G09G 5/02</a>
---	---------------------------



**G09G 3/2007****{Display of intermediate tones}****Definition statement**

*This place covers:*

Control of a display to display an image having intermediate tones with aspects specific for flat panel displays.

**Special rules of classification**

Does not apply to a control of the brightness of a display as a whole, for which the Indexing Code [G09G 2320/0626](#) should be given.

**G09G 3/2011****{by amplitude modulation}****Definition statement**

*This place covers:*

Control of a display to display an image having intermediate tones by modulating the amplitude of the analog signals applied to the display elements.

**Special rules of classification**

This code is only given if specific details of the amplitude modulation are present or the amplitude modulation plays a significant role, but not for indicating the presence of a usual amplitude modulation in a document.

**G09G 3/2014****{by modulation of the duration of a single pulse during which the logic level remains constant}****Definition statement**

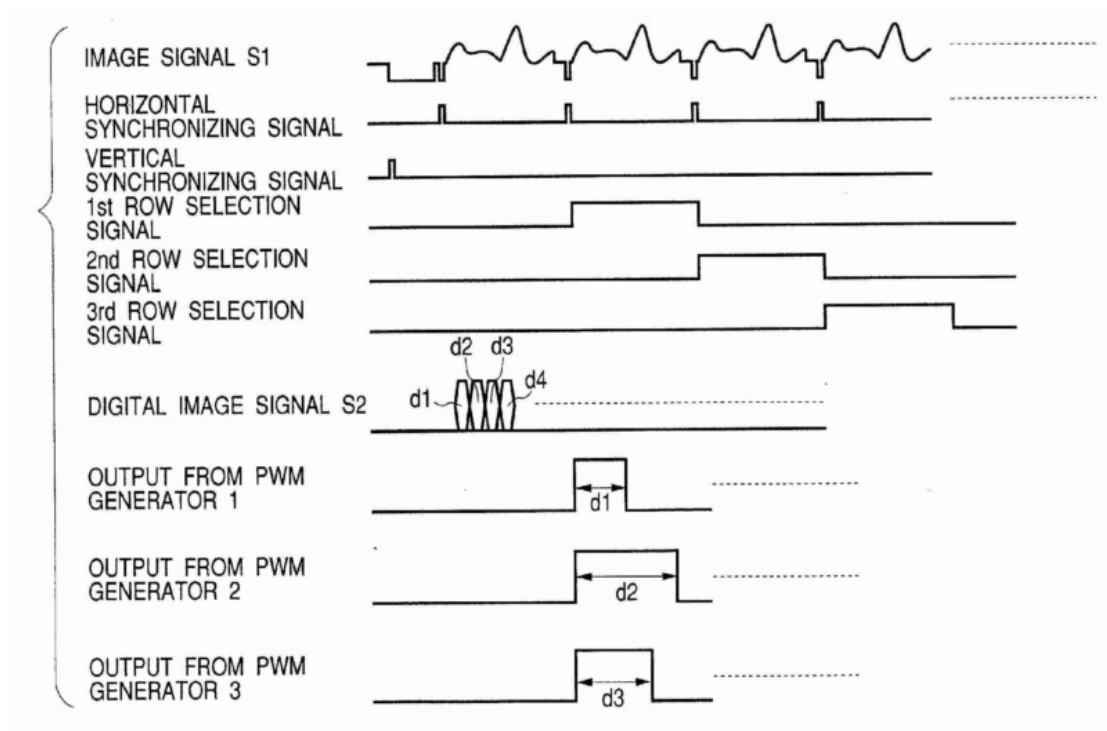
*This place covers:*

Control of a display to display an image having intermediate tones by modulating the duration of a single pulse applied to the display element or by modulating the duration of several pulses applied to the display element in the same manner.

Illustrative examples:

## Definition statement

US2003/0117420 (modulation of the intermediate tone displayed by a pixel by varying the width applied to a data electrode during a scan period determined by the scan signal applied to the scan electrode)

**G09G 3/2018**

**{by time modulation using two or more time intervals}**

**Definition statement**

*This place covers:*

- Control of a display to display an image having intermediate tones by frame rate control or temporal dithering, i.e. the intermediate tone is generated by selectively activating a display element in a number of frames.
- Control of a display to display an image having intermediate tones by modulating the duration of several pulses applied to the display element in a different manner for each pulse.

**G09G 3/2022**

**{using sub-frames}**

**Definition statement**

*This place covers:*

- Control of a display to display an image having intermediate tones by using sub-frames, i.e. selectively activating a display element in a number of non-overlapping time periods, in which a frame is subdivided.
- Control of a display to display an image having intermediate tones by using sub-frames, i.e. selectively activating a display element in a number of non-overlapping time periods, in which a frame is subdivided, wherein no details of the ratios of the duration of one sub-frame to the duration of another sub-frame are given.
- Control of a display to display an image having intermediate tones by using sub-frames, i.e. selectively activating a display element in a number of non-overlapping time periods, in which a

## Definition statement

frame is subdivided, wherein the durations of the sub-frames are binary numbers, i.e. the duration of the second shortest sub-frame is twice the duration of the shortest sub-frame, the third shortest sub-frame is four times the duration of the shortest sub-frame, ..., and the duration of the  $n$ th shortest sub-frame is  $(n-1)$  times the duration of the shortest sub-frame.

**Special rules of classification**

For plasma display panels, this code is only to be given if specific details of the generation of intermediate tones using sub-frames are present or the generation of intermediate tones using sub-frames plays a significant role, but not for indicating the presence of a usual generation of intermediate tones using sub-frames in a document.

**G09G 3/2025**

{the sub-frames having all the same time duration}

**Definition statement**

*This place covers:*

Control of a display to display an image having intermediate tones by using sub-frames having all the same duration, i.e. a frame rate control with the intermediate tone being generated by selectively activating a display element in a number of sub-frames.

**G09G 3/2029**

{the sub-frames having non-binary weights}

**Definition statement**

*This place covers:*

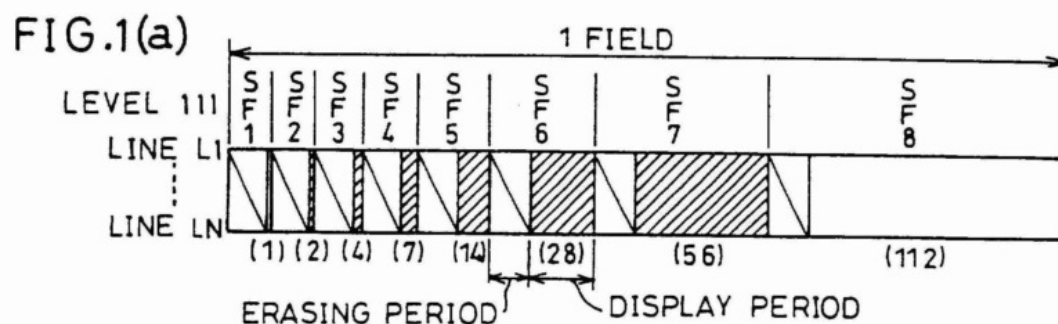
Control of a display for displaying an image having intermediate tones by using sub-frames, wherein the durations of the sub-frames are not all binary numbers, i.e. at least for one sub-frame it does not hold that the duration of the  $n$ th shortest sub-frame is  $(n-1)$  times the duration of the shortest sub-frame.

**Special rules of classification**

This code is not given if for all the sub-frames the ratio of the duration of one sub-frame to the duration of another sub-frame is a binary number, but one or more of the sub-frames are split in two or more time periods, wherein the time periods are still addressed by the same binary bit.

Illustrative examples:

GB2327798 (ratio of the durations of the display period of the fourth shortest sub-frame and the shortest sub-frame is seven, not eight)



**G09G 3/2033**

**{with splitting one or more sub-frames corresponding to the most significant bits into two or more sub-frames}**

**Definition statement**

*This place covers:*

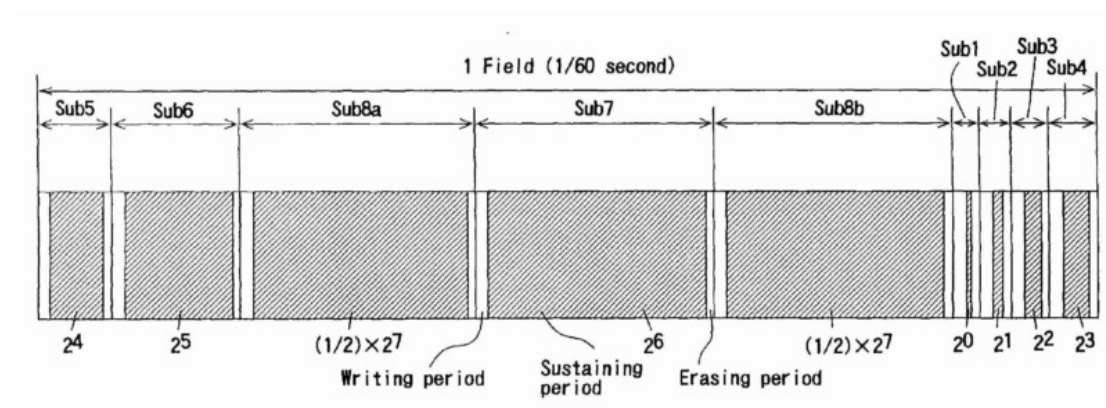
Control of a display for displaying an image having intermediate tones by using sub-frames, wherein one or more sub-frames corresponding to the most significant bits are split into two or more time periods, which are still addressed by the same bit.

**Special rules of classification**

This code is not given if the sub-frame corresponding to the most significant bit is not split, but only other sub-frames corresponding to lower bits are split. This code is also not given if the time periods, into which the sub-frames corresponding to the most significant bits are split, are individually addressed by separate bits, but the code [G09G 3/2029](#) might apply.

Illustrative examples:

EP0774745 (sub-frame with the longest duration and corresponding to the most significant bit is split in two periods controlled by the same most significant bit)

**G09G 3/2037**

**{with specific control of sub-frames corresponding to the least significant bits}**

**Definition statement**

*This place covers:*

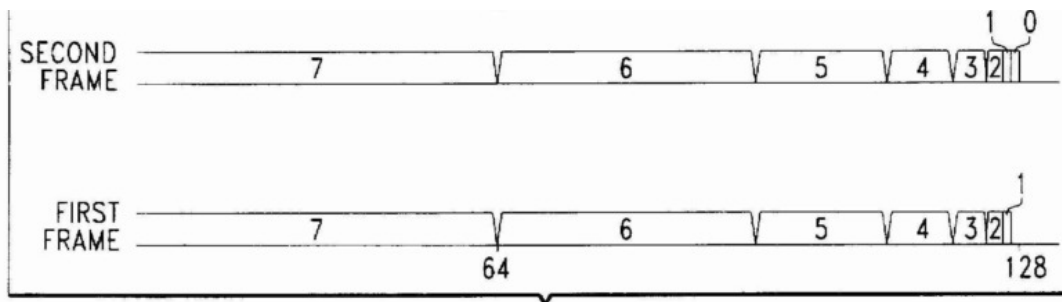
Control of a display for displaying an image having intermediate tones by using sub-frames, wherein one or more sub-frames corresponding to the least significant bits are specifically controlled to increase the number of intermediate tones without applying to narrow pulses.

**Special rules of classification**

This code is not given if the sub-frame corresponding to the least significant bit is not specifically controlled, but only other sub-frames corresponding to higher bits.

Illustrative examples:

US5751379 (sub-frame with the shortest duration and corresponding to the least significant bit is displayed only every second frame)



## G09G 3/204

{the sub-frames being organized in consecutive sub-frame groups}

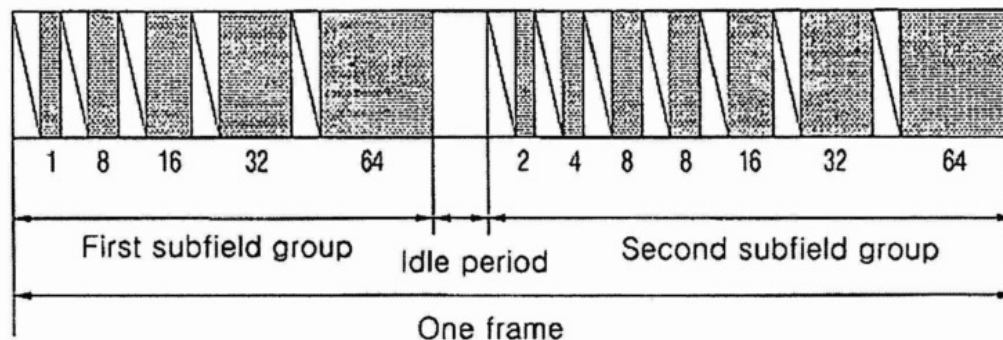
### Definition statement

*This place covers:*

Control of a display for displaying an image having intermediate tones by using sub-frames, wherein the sub-frames are organized in consecutive sub-frame groups, e.g. the groups being separated by a pause period, or the sub-frames within one group having a common addressing scheme, or a specific order with respect to the size of the corresponding bits.

Illustrative examples:

EP1710777 (sub-frames of one frame are arranged in two groups divided by an idle period and with increasing durations within each group)



## G09G 3/2044

{using dithering}

### Definition statement

*This place covers:*

Control of a display for displaying an image having intermediate tones by using dithering, i.e. by adding a noise signal to the image signal or the gradation threshold.

## References

### Limiting references

*This place does not cover:*

Control of a display to display an image having intermediate tones by frame rate control or temporal dithering, i.e. the intermediate tone is generated by selectively activating a display element in a number of frames	<a href="#">G09G 3/2018</a>
Control of a display for displaying an image having intermediate tones by using error diffusion, i.e. distributing the quantization error to neighbouring display elements	<a href="#">G09G 3/2059</a>

## G09G 3/2048

**{with addition of random noise to an image signal or to a gradation threshold}**

### Definition statement

*This place covers:*

Control of a display for displaying an image having intermediate tones by using dithering, wherein the noise signal added to the image signal or the gradation threshold is random noise.

## G09G 3/2051

**{with use of a spatial dither pattern}**

### Definition statement

*This place covers:*

Control of a display for displaying an image having intermediate tones by using dithering, wherein the noise signal added to the image signal or the gradation threshold is a spatial dither pattern applied to the display element and its neighbouring display elements.

## G09G 3/2055

**{the pattern being varied in time}**

### Definition statement

*This place covers:*

Control of a display for displaying an image having intermediate tones by using dithering, wherein the noise signal added to the image signal or the gradation threshold is a spatial dither pattern applied to the display element and its neighbouring display elements, and the spatial dither pattern is varied in time, e.g. from one frame to the next frame, and cyclically, i.e. the same pattern is reused after a certain time period.

## G09G 3/2059

**{using error diffusion}**

### Definition statement

*This place covers:*

Control of a display for displaying an image having intermediate tones by using error diffusion in space, i.e. distributing the quantization error to neighbouring display elements.

Definition statement

Illustrative examples:

EP1587053 (error diffusion in space; sections 0027, 0028).

## G09G 3/2062

{using error diffusion in time}

### Definition statement

*This place covers:*

Control of a display for displaying an image having intermediate tones by using error diffusion in time, i.e. distributing the quantization error to the next frame.

Illustrative examples:

EP1583063 (error diffusion in time; section 0143).

## G09G 3/2066

{with error diffusion in both space and time}

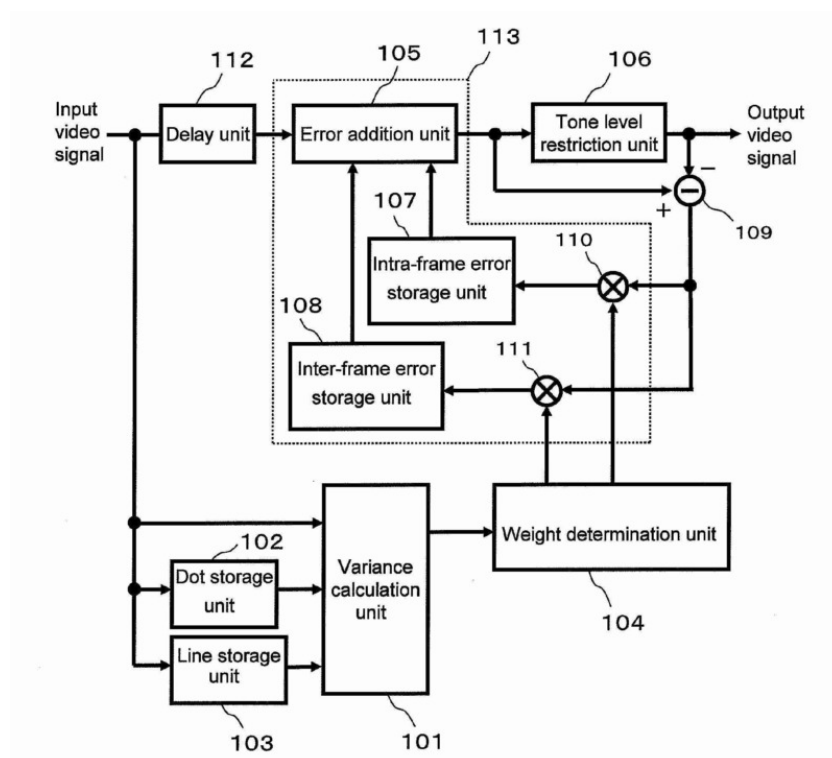
### Definition statement

*This place covers:*

Control of a display for displaying an image having intermediate tones by using error diffusion in space and time, i.e. distributing the quantization error to the neighbouring display elements and the next frame.

Illustrative examples:

US2009/0128693 (quantization error is distributed within the same frame to neighbouring display elements and to the same display element in the next frame)





**G09G 3/207**

{by domain size control ([G09G 3/3637](#) takes precedence)}

**Definition statement**

*This place covers:*

Control of a display to display an image having intermediate tones by varying the area of a display element, which is in one display state, relative to the remaining area of the display element, which is in another display state.

**References****Limiting references**

*This place does not cover:*

Control of a display using liquid crystals having memory effect to display an image having intermediate tones by varying the area of the display element, which is in one display state, relative to the remaining area of the display element, which is in another display state	<a href="#">G09G 3/3637</a>
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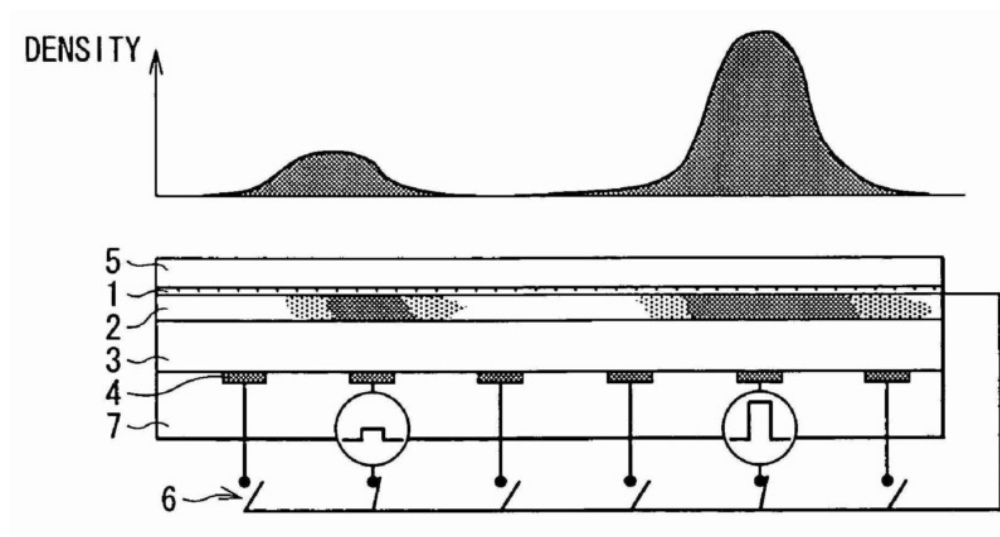
**Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Portions of a pixel that are physically separated or separately controlled are not a case of generating intermediate tones by domain-size control but by using sub-pixels	<a href="#">G09G 3/2074</a>
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Illustrative examples:

US2005174623 (modulation of the intermediate tone displayed by an electrochromic display element by varying its coloration area)





**G09G 3/2074****{using sub-pixels}****Definition statement***This place covers:*

Control of a display to display an image having intermediate tones by display elements (pixel) having two or more physically separated or separately controllable portions (sub-pixels).

**References****Limiting references***This place does not cover:*

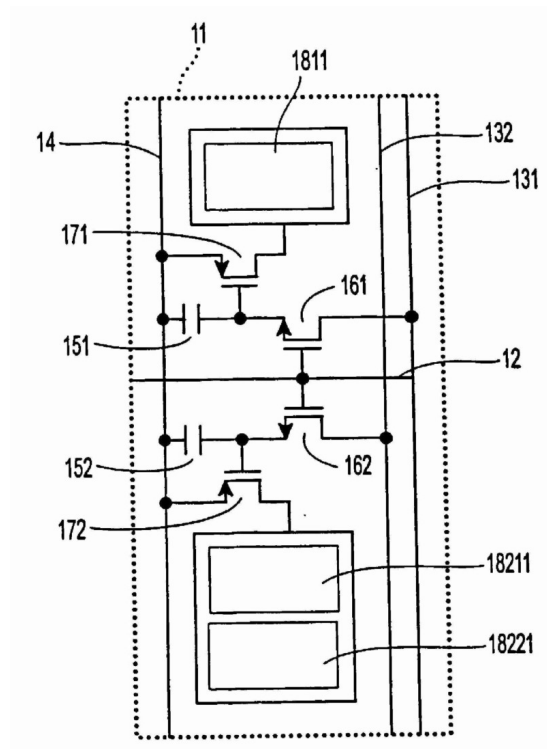
Control of a display using liquid crystals having memory effect to display an image having intermediate tones by display elements (pixels) having two or more separately controllable or physically separated portions (sub-pixels)	<a href="#">G09G 3/364</a>
---	----------------------------

**Informative references***Attention is drawn to the following places, which may be of interest for search:*

Portions of a pixel that are not physically separated and not separately controlled, but exploit instead a stepped variation across the pixel of a physical variable that affects the state of the pixel itself, are not a case of sub-pixels but of domain size control	<a href="#">G09G 3/207</a>
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Illustrative examples:

US2002/0195969 (modulation of the intermediate tone by providing two separately selectable organic electroluminescent display element with different areas for each image pixel)



## G09G 3/2077

{by a combination of two or more gradation control methods}

### Definition statement

*This place covers:*

Control of a display to display an image having intermediate tones by using two or more methods of generating the intermediate tones together, e.g. by using both sub-pixels and error diffusion.

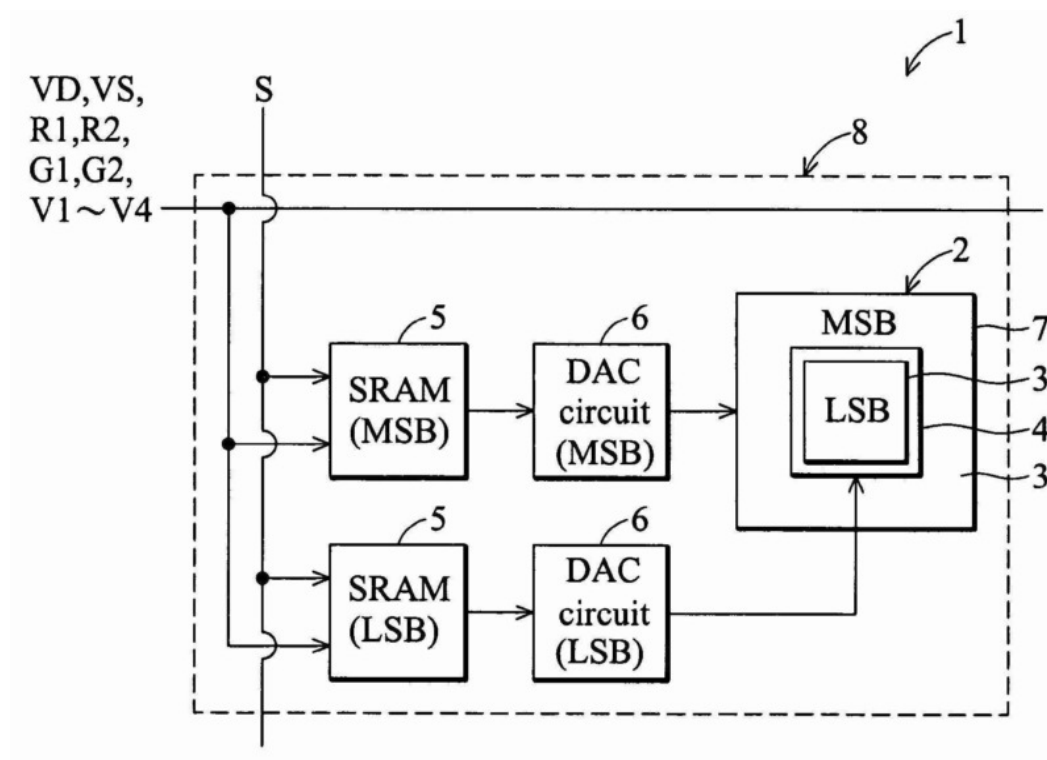
### Special rules of classification

Additional codes within [G09G 3/2007](#) should also be given, to indicate which methods of generating the intermediate tones are combined. Code [G09G 3/2011](#) is only given if specific details of the amplitude modulation are present.

As using sub-fields for the control of a plasma display panel to display an image having intermediate tones is a standard method, this code is not given for the combination of using sub-fields with a single other method of generating the intermediate tones in a plasma display panel.

Illustrative examples:

US2009/0128473 (combination of amplitude modulation with using sub-pixels for generating intermediate tones in an LCD)



## G09G 3/2081

{with combination of amplitude modulation and time modulation (space and time error diffusion [G09G 3/2066](#))}

### Definition statement

*This place covers:*

Control of a display to display an image having intermediate tones by using amplitude modulation and time modulation.

### References

#### Limiting references

*This place does not cover:*

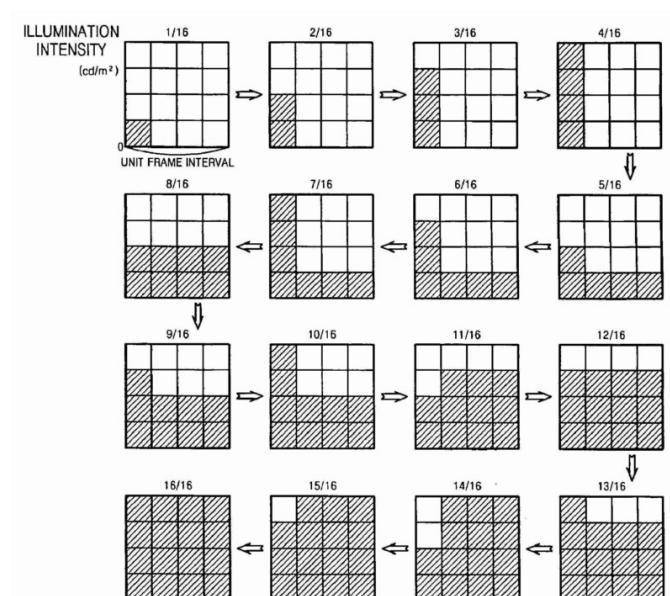
Control of a display for displaying an image having intermediate tones by using error diffusion in space and time	<a href="#">G09G 3/2066</a>
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### Special rules of classification

Additional codes of [G09G 3/2014](#) or within [G09G 3/2018](#) should also be given to indicate which time modulation method of generating the intermediate tones is used, while the code [G09G 3/2011](#) is only given if specific details of the amplitude modulation are present.

Illustrative examples:

US2009/0051708 (combination of amplitude modulation with pulse width modulation for generating intermediate tones in an OLED display)



## G09G 3/2092

{Details of a display terminals using a flat panel, the details relating to the control arrangement of the display terminal and to the interfaces thereto (suitable for both CRT and flat panel [G09G 5/003](#); specific for a CRT [G09G 1/165](#))}

### Definition statement

*This place covers:*

Details of the control of a display terminal in a monitor-architecture using a flat panel display, e.g. arrangements for processing of the image data as an adaption for display on the flat panel, or setting of parameters for a flat panel display.

### References

#### Limiting references

*This place does not cover:*

Details of the control of a display terminal in a monitor-architecture using a CRT	<a href="#">G09G 1/165</a>
Details of the control of a display terminal in a monitor-architecture in general suitable for both CRT and flat panel	<a href="#">G09G 5/003</a>

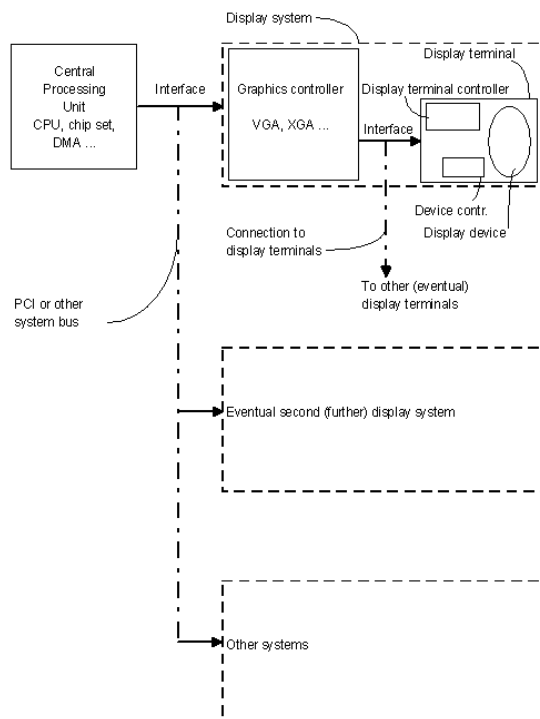
#### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Control of a display for displaying a coloured image in general	<a href="#">G09G 5/02</a>
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## Special rules of classification

Illustrative example of subject matter classified in this group:



## Glossary of terms

*In this place, the following terms or expressions are used with the meaning indicated:*

Display terminal	Means an apparatus connected to a source of display data (usually a graphics controller of a computer, or directly to the computer itself) adapted to display images generated by this source of data. In general a "Display terminal" is an arrangement including a display device (e.g. a CRT with its driving electronic or a flat panel including its row and column drivers), a display device controller (the hardware and software (usually a microprocessor) that controls the display device and that allows its functioning by, for example, generating the signals that are needed to bring the data to the drivers) and a display terminal controller (the hardware and software used to control the display terminal as a whole and to interface the display terminal to the graphics controller, to adapt data and control signals, for example in an LCD driven by a VGA type graphics controller).
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Monitor-architecture	means a source of pixelwise image data (rendered data, e.g. RGB data in a VGA video controller; see "Graphics controller" in below figure), e.g. obtained by transforming high-level image descriptions (e.g. graphics primitives) into pixel-wise image data, or by handling analogue video data, or by decompressing compressed video data, an image display unit, which receives said pixel-wise image data (see "Display terminal" in below figure), and an interface between said source of pixelwise image data and said image display unit (commonly RGB-cable with sync-signals, but also other interfaces like USB-bus). A monitor-architecture cannot be identified, if it is not clear where the processing described is located (that is also outside said image display unit); or if the structure of the display system has to be modified if the technology of the display changes ( e.g. in a mobile telephone, in which the drivers are normally controlled by the main CPU).
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## G09G 3/2096

{Details of the interface to the display terminal specific for a flat panel (suitable for both CRT and flat panel [G09G 5/006](#); specific for a CRT [G09G 1/167](#))}

### Definition statement

*This place covers:*

Details of an interface to a display terminal in a monitor-architecture using a flat panel display, e.g. arrangements for processing of the image data as an adaption for display on the flat panel, or setting of parameters for a flat panel display.

### References

#### Limiting references

*This place does not cover:*

Details of an interface to a display terminal suitable for both CRT and flat panel in a monitor-architecture in general	<a href="#">G09G 5/006</a>
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## G09G 3/22

using controlled light sources

### Definition statement

*This place covers:*

Control of displays using controlled light sources as display elements arranged in a matrix.

### References

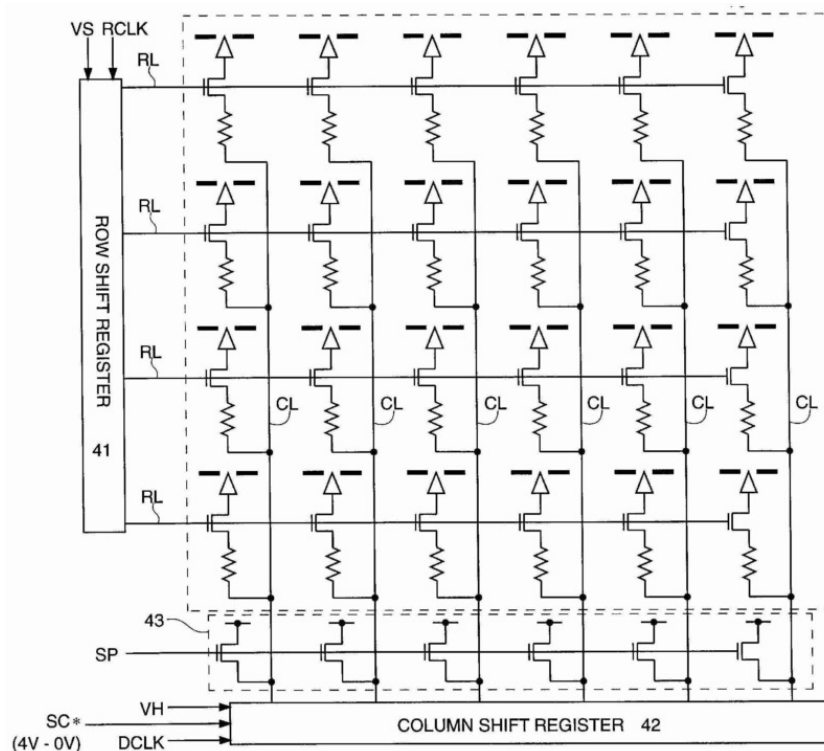
#### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Control of displays using controlled light sources for displaying a character composed by a fixed number of display elements as segments or dots	<a href="#">G09G 3/06</a>
--	---------------------------

Examples:

US5920154 (control of a field emission matrix display)



### Special rules of classification

In this group, documents concerning the control of character displays using controlled light sources not covered by any of the groups [G09G 3/24](#) - [G09G 3/30](#) are classified, e.g. the control of vacuum fluorescent matrix displays or of field emission matrix displays.

## G09G 3/24

### using incandescent filaments

#### Definition statement

*This place covers:*

Control of displays using incandescent filaments, i.e. incandescent light bulbs, as display elements arranged in a matrix.

#### References

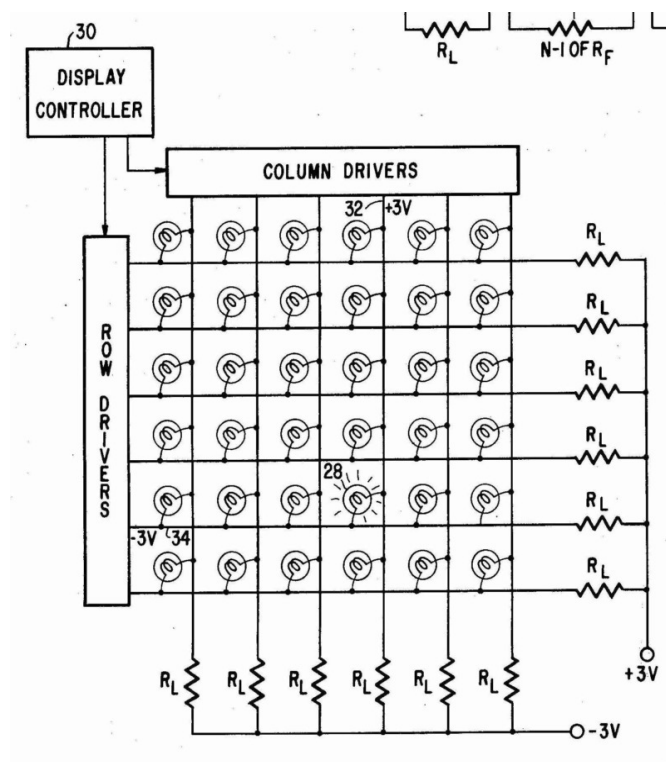
##### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Control of displays using incandescent filaments, i.e. incandescent light bulbs, for displaying a character composed by a fixed number of display elements as segments or dots	<a href="#">G09G 3/08</a>
--	---------------------------

## Special rules of classification

Illustrative example: US5920154 (control of an incandescent lamp matrix display)



## G09G 3/26

to give the appearance of moving signs

### Definition statement

*This place covers:*

Control of displays using incandescent filaments, i.e. incandescent light bulbs, as display elements arranged in a matrix, which are controlled to give the appearance of a moving sign.

### References

#### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Control of flat panel displays to give the appearance of moving signs in general	<a href="#">G09G 3/004</a>
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## G09G 3/28

using luminous gas-discharge panels, e.g. plasma panels

### Definition statement

*This place covers:*

Control of displays using luminous gas-discharge cells, e.g. luminous plasma discharge cells, as display elements arranged in a matrix.



## References

### Informative references

Attention is drawn to the following places, which may be of interest for search:

Control of displays using gas tubes for displaying a character composed by a fixed number of display elements as segments or dots	<a href="#">G09G 3/10</a>
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## G09G 3/2803

{Display of gradations ([G09G 3/288](#) takes precedence)}

### Definition statement

*This place covers:*

Control of displays using luminous gas-discharge cells having intermediate tones with aspects specific for displays using luminous gas-discharge cells.

## References

### Limiting references

*This place does not cover:*

Using alternating current (AC) panels	<a href="#">G09G 3/288</a>
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### Informative references

Attention is drawn to the following places, which may be of interest for search:

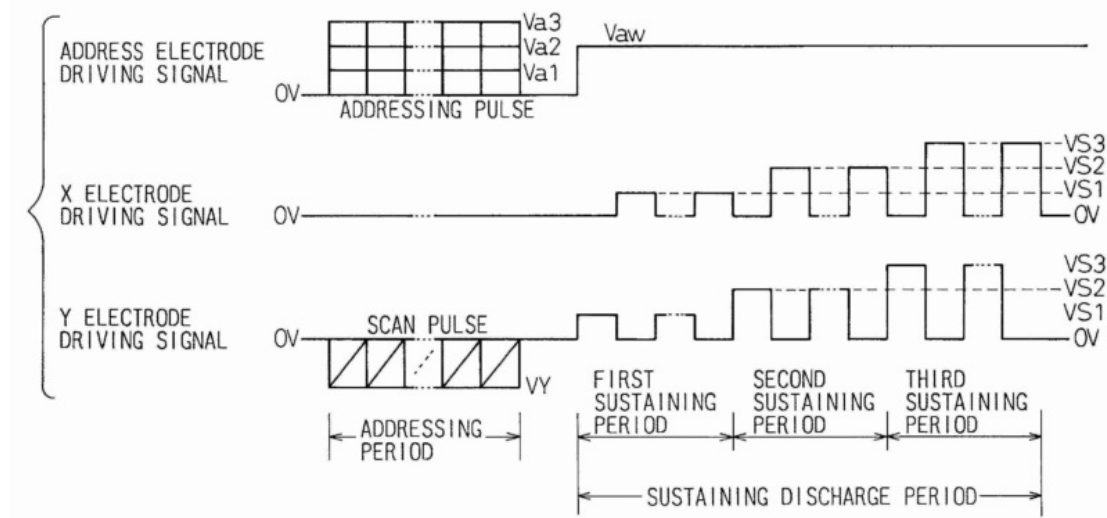
Control of a display to display an image having intermediate tones with aspects specific for flat panel displays in general	<a href="#">G09G 3/2007</a>
---	-----------------------------

## Special rules of classification

For a control of the brightness of a display as a whole, the Indexing Code [G09G 2320/0626](#) should be given in addition.

Illustrative examples:

US5835072 (different intermediate tones are generated in a plasma display panel by varying the value of the voltage applied to the address electrodes during the addressing phase, and a subsequent sustain phase with the application of sustain pulses having different values)



## G09G 3/2807

with discharge activated by high-frequency signals specially adapted therefor

### Definition statement

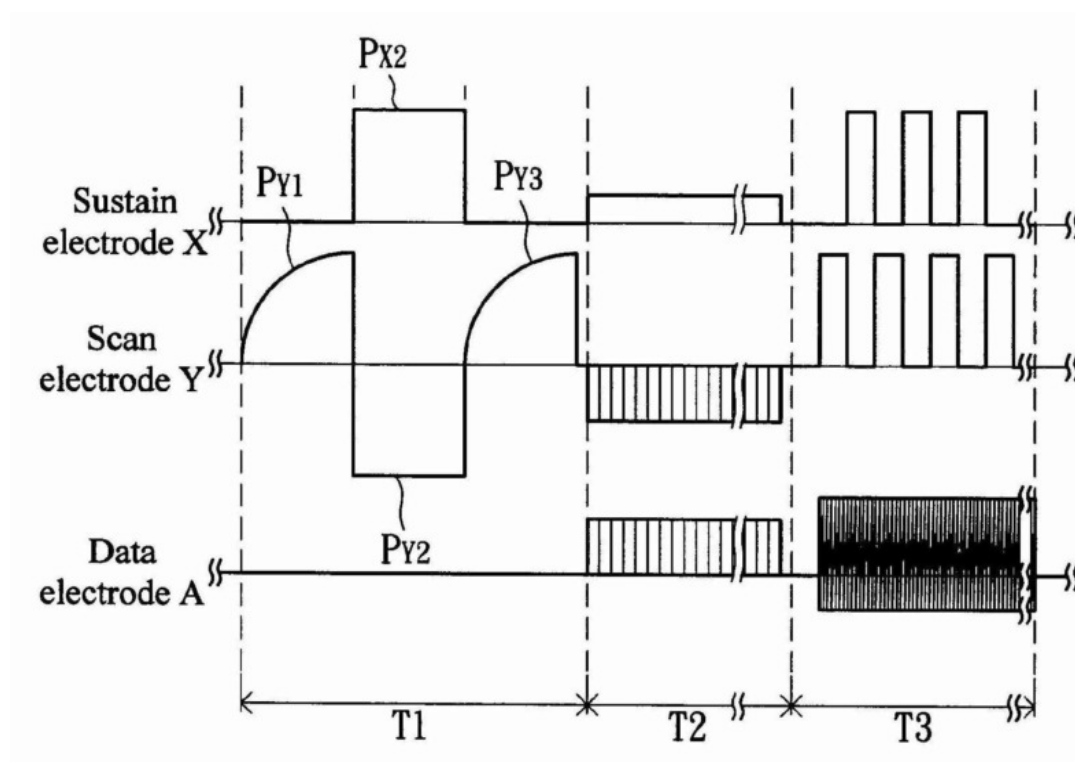
*This place covers:*

Control of displays using luminous gas-discharge cells as display elements arranged in a matrix, wherein the discharge is caused by the application of signals to the gas-discharge cell having a particular high frequency, i.e. significantly higher than known from other displays using luminous gas-discharge cells as display elements arranged in a matrix.

Illustrative examples:

## Definition statement

US2004/0056827 (application of pulses with a frequency of 1MHz to the address electrodes during the sustaining phase)



## G09G 3/2813

using alternating current [AC] - direct current [DC] hybrid-type panels

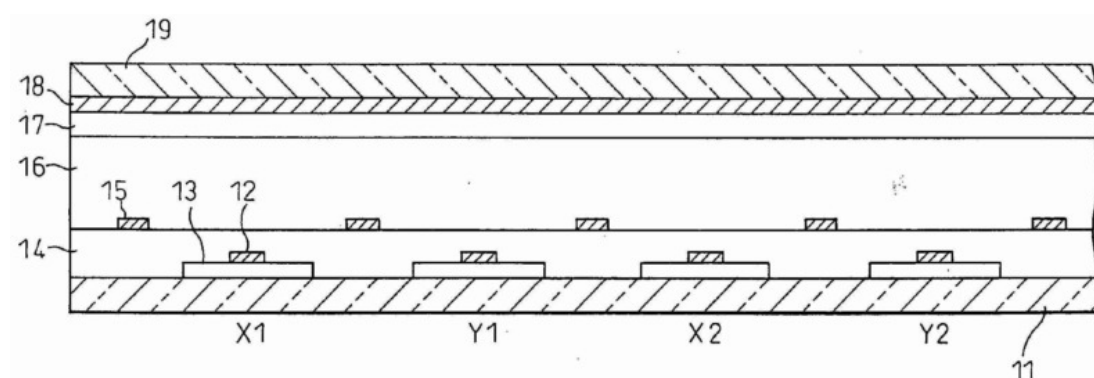
## Definition statement

*This place covers:*

Control of displays using luminous gas-discharge cells as display elements arranged in a matrix, wherein in a discharge cell, some of the electrodes that play a role during the discharge are in contact with the ionized gas (as in DC type panels), some are not (as in AC type panels).

Illustrative examples:

US2004/0207572 (control of a plasma display panel with scan, sustain, and address electrodes not in contact with the ionized gas, and further electrodes in contact with the ionized gas)

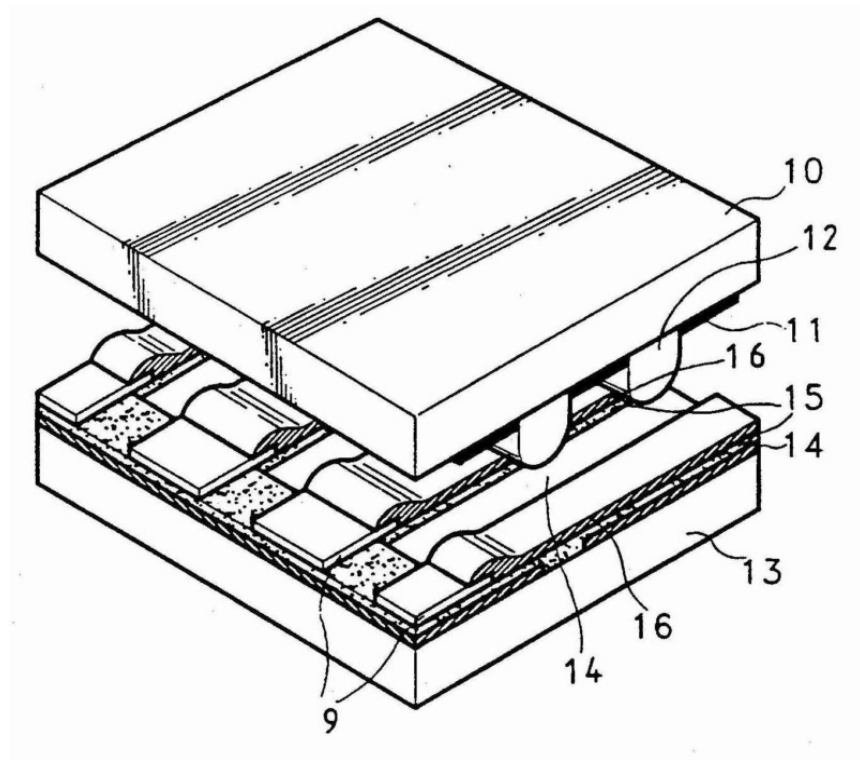


**G09G 3/282****using DC panels****Definition statement***This place covers:*

Control of displays using luminous gas-discharge cells as display elements arranged in a matrix, wherein in a discharge cell, the electrodes that play a role during the discharge are in contact with the ionized gas.

*Illustrative examples:*

US5332949 (control of a plasma display panel with scan, sustain, and address electrodes in contact with the ionized gas)

**G09G 3/285****using self-scanning****Definition statement***This place covers:*

Control of displays using luminous gas-discharge cells as display elements arranged in a matrix in a DC panel, wherein the discharge is sequential transferred from an input position to a further display position.

**G09G 3/288**

using AC panels

**Definition statement**

*This place covers:*

Control of displays using luminous gas-discharge cells as display elements arranged in a matrix in an AC panel, wherein in a discharge cell the electrodes that play a role during the discharge are not in contact with the ionized gas.

**Special rules of classification**

Only to be given in exceptional cases, when none of the subgroups of [G09G 3/288](#) applies.

**G09G 3/29**

using self-shift panels {with sequential transfer of the discharges from an input position to a further display position}

**Definition statement**

*This place covers:*

Control of displays using luminous gas-discharge cells as display elements arranged in a matrix, wherein the discharge is sequentially transferred from an input position to a further display position.

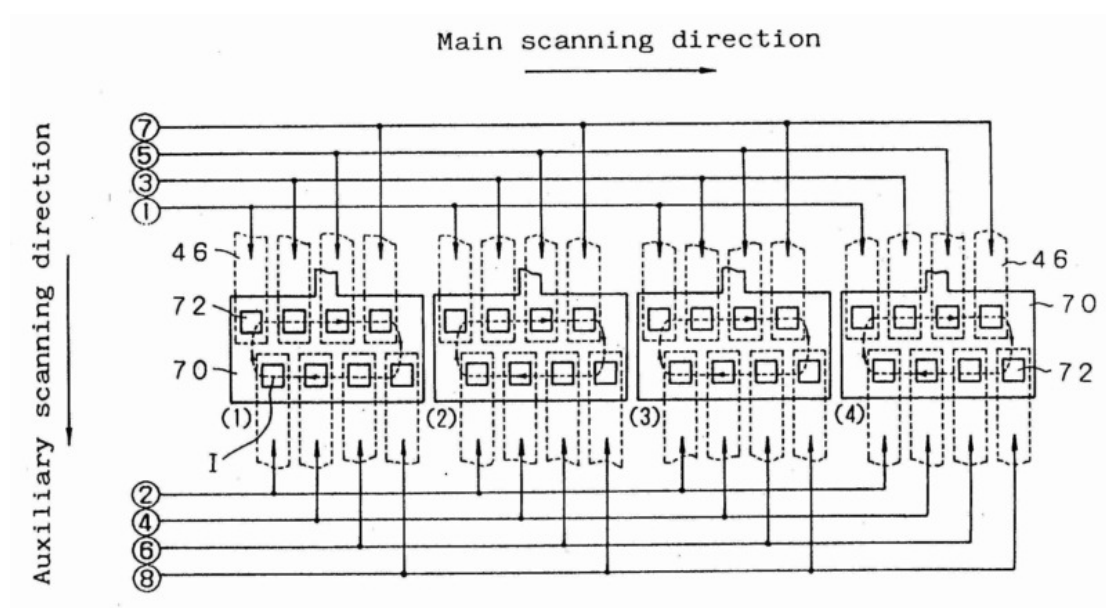
**References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

Display panels with cold-cathode tubes	<a href="#">H01J 17/49</a>
--	----------------------------

Examples:

US5212472 (discharge is sequentially transferred, as discharge in the previous cell generates charges to enable a discharge in the adjacent next cells)



**G09G 3/291**

controlling the gas discharge to control a cell condition, e.g. by means of specific pulse shapes

**Definition statement**

*This place covers:*

Control of displays using luminous gas-discharge cells as display elements arranged in a matrix in an AC panel with details of the control of the gas-discharge cell or the shape of the pulses applied to the electrodes of the gas-discharge cell.

**G09G 3/292**

for reset discharge, priming discharge or erase discharge occurring in a phase other than addressing

**Definition statement**

*This place covers:*

Control of displays using luminous gas-discharge cells as display elements arranged in a matrix in an AC panel with details of the control of the gas-discharge cell or the shape of the pulses applied to the electrodes of the gas-discharge cell for generating an erase discharge outside the addressing phase, a reset discharge, or a priming discharge.

**G09G 3/2922**

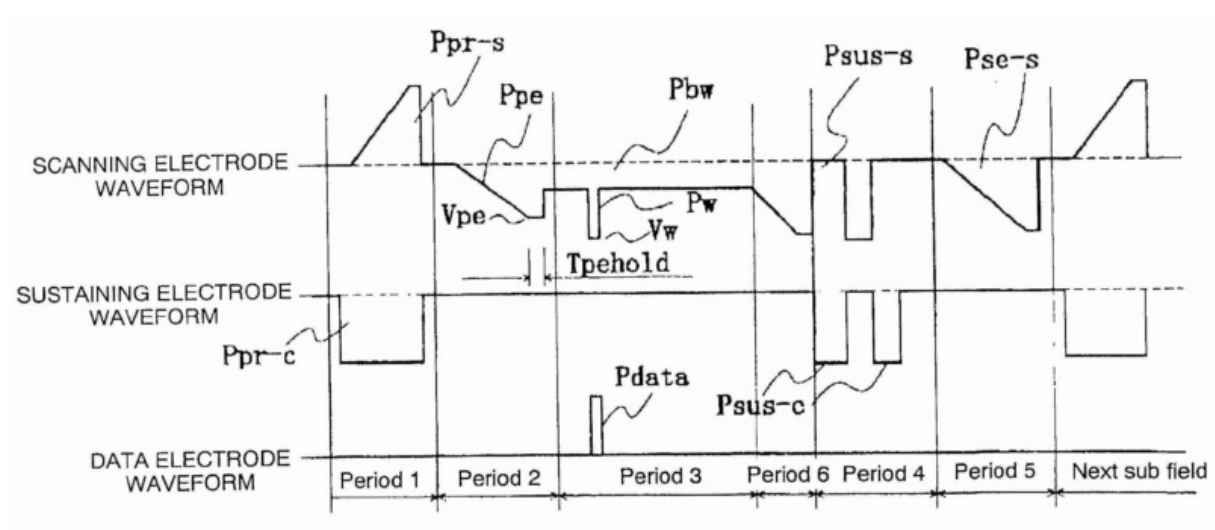
{Details of erasing}

**Definition statement**

*This place covers:*

Control of displays using luminous gas-discharge cells as display elements arranged in a matrix in an AC panel with details of the control of the gas-discharge cell or the shape of the pulses applied to the electrodes of the gas-discharge cell for generating an erase discharge outside the addressing phase and outside the reset phase at least once per frame.

Illustrative example of subject matter classified in this place:



## Definition statement

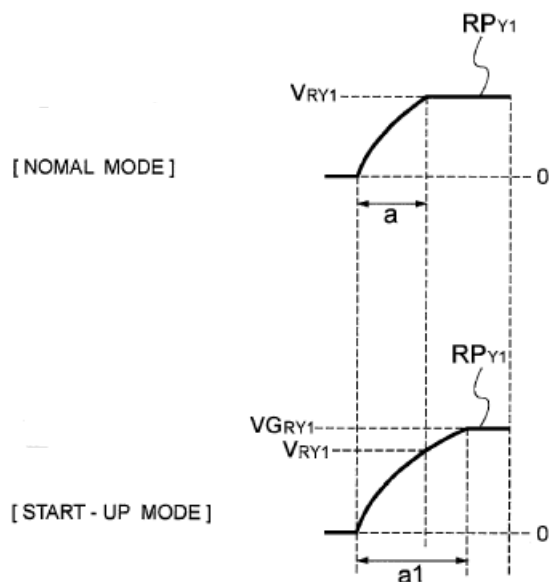
The Figure illustrates an erasing discharge that is generated to remove charges in those discharge cells, in which no address discharge is generated in the preceding addressing phase in order to avoid an erroneous discharge in the subsequent sustaining phase.

**G09G 3/2925****{Details of priming}****Definition statement**

*This place covers:*

Control of displays using luminous gas-discharge cells as display elements arranged in a matrix in an AC panel with details of the control of the gas-discharge cell or the shape of the pulses applied to the electrodes of the gas-discharge cell for generating a priming discharge at the time of powering up the display or at regular intervals.

Illustrative example of subject matter classified in this place:



The Figure illustrates the application of a pulse with larger maximum value during the initialising phase in a start-up mode after the powering on of a plasma display panel than in a normal mode.

**Special rules of classification**

Classification is to be made in this group if a discharge for priming, i.e. for generating charges in the discharge cell, is generated at the time of powering up the display or at regular intervals.

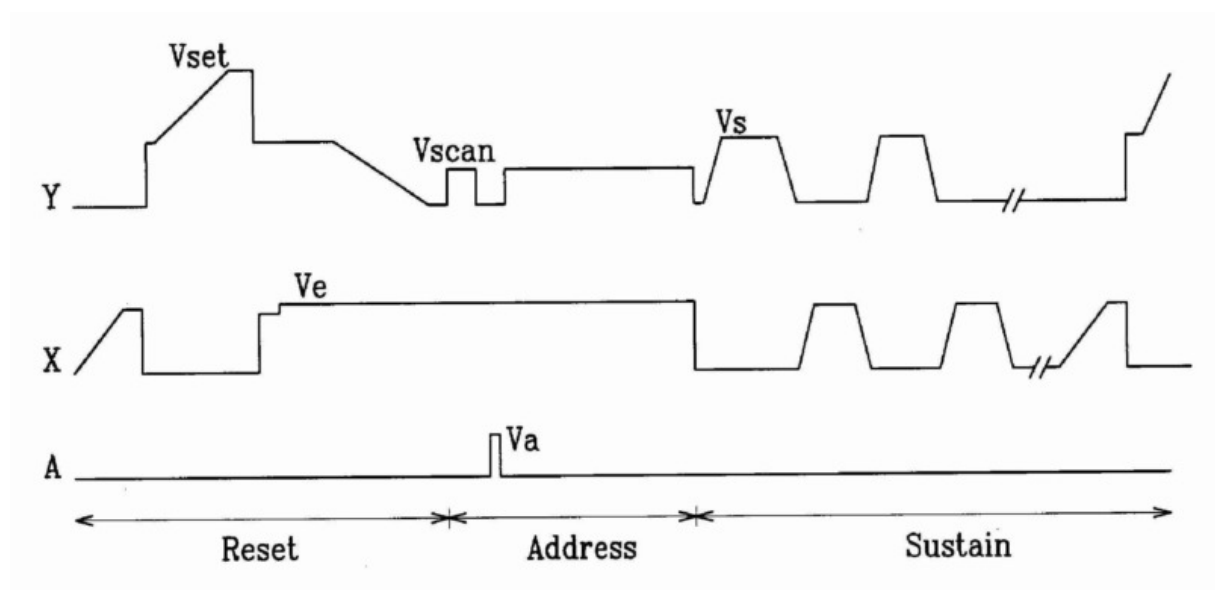
**G09G 3/2927****{Details of initialising}****Definition statement**

*This place covers:*

Control of displays using luminous gas-discharge cells as display elements arranged in a matrix in an AC panel with details of the control of the gas-discharge cell or the shape of the pulses applied to the electrodes of the gas-discharge cell for generating a reset discharge, i.e. for initialising the gas-discharge cell as a preparation of the subsequent addressing phase.

## Definition statement

Illustrative example of subject matter classified in this place:



The Figure illustrates the application of pulses with rising and falling slope to the scan and sustain electrode during a reset phase for generating discharges in order to provide the same wall charge conditions in all the discharge cells as a preparation for the subsequent addressing phase.

### Special rules of classification

Classification is to be made in this group if a reset discharge, i.e. for initialising the gas-discharge cell as a preparation of the subsequent addressing phase, is generated during every sub-frame, every frame or every multiple frames.

## G09G 3/293

### for address discharge

#### Definition statement

*This place covers:*

Control of displays using luminous gas-discharge cells as display elements arranged in a matrix in an AC panel with details of the control of the gas-discharge cell or the shape of the pulses applied to the electrodes of the gas-discharge cell for generating an address discharge, i.e. an discharge for selecting the discharge cell according to the display data so that a sustain discharge with light emission takes place in the subsequent sustain phase corresponding to the selection in the addressing phase.

### Special rules of classification

Different control or pulse shapes for different sub-frames are to be indicated by the code

[G09G 3/2022](#).



**G09G 3/2932****{Addressed by writing selected cells that are in an OFF state}****Definition statement***This place covers:*

Control of displays using luminous gas-discharge cells as display elements arranged in a matrix in an AC panel with details of the control of the gas-discharge cell or the shape of the pulses applied to the electrodes of the gas-discharge cell for generating an address discharge, wherein the generation of the address discharge generates sufficient wall charges in the addressed cell so that a sustain discharge with light emission takes place in the subsequent sustain phase.

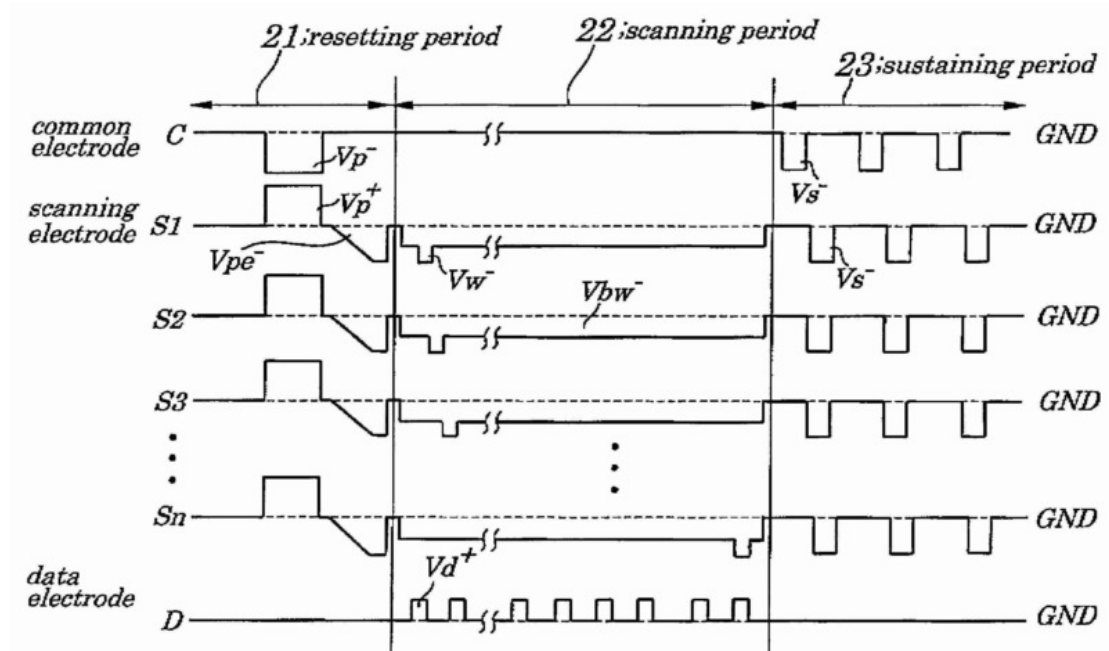
**Special rules of classification**

Different control or pulse shapes for different sub-frames are to be indicated by the code

[G09G 3/2022](#).

Illustrative examples:

US2003/0102814 (a discharge generated selectively only in those discharge cells during an addressing phase having a pulse applied to the address electrode together with a pulse applied to the scanning electrode generates wall charges, which enable a lighting discharge in these selected cells during the subsequent sustaining phase)

**G09G 3/2935****{Addressed by erasing selected cells that are in an ON state}****Definition statement***This place covers:*

Control of displays using luminous gas-discharge cells as display elements arranged in a matrix in an AC panel with details of the control of the gas-discharge cell or the shape of the pulses applied to the electrodes of the gas-discharge cell for generating an address discharge, wherein the generation

## Definition statement

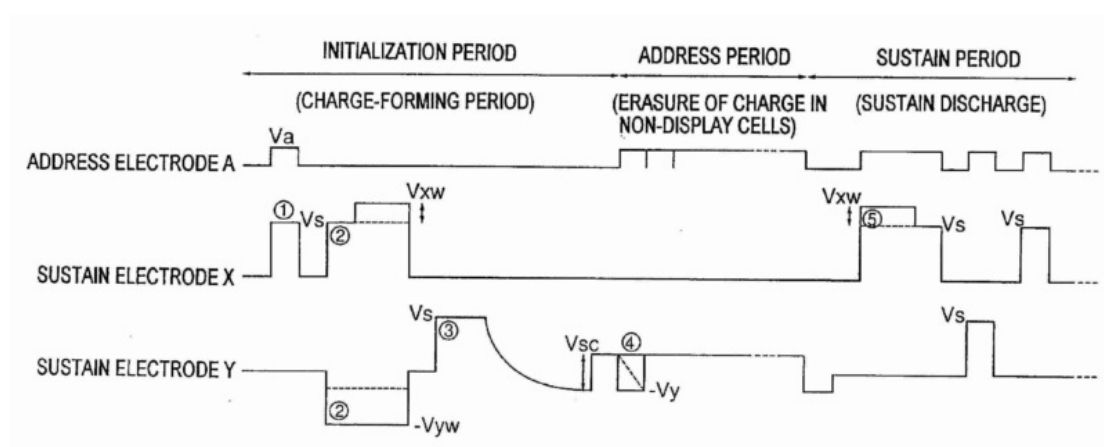
of the address discharge reduces or erases the wall charges in the addressed cell so that no sustain discharge with light emission takes place in the subsequent sustain phase.

**Special rules of classification**

Different control or pulse shapes for different sub-frames are to be indicated by the code [G09G 3/2022](#).

Illustrative examples:

EP0866439 (after generating wall charges in all the discharge cells during the initialisation phase, a discharge erases the wall charges selectively only in those discharge cells during an addressing phase having a pulse applied to the address electrode together with a pulse applied to the scanning electrode, which disables a lighting discharge in these selected cells during the subsequent sustaining phase)

**G09G 3/2937**

{being addressed only once per frame}

**Definition statement**

*This place covers:*

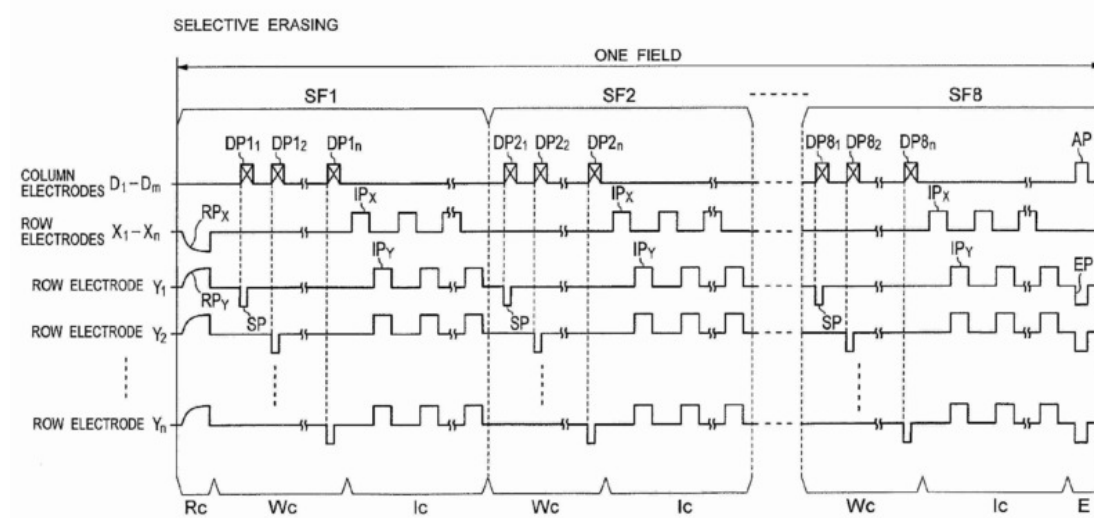
Control of displays using luminous gas-discharge cells as display elements arranged in a matrix in an AC panel with details of the control of the gas-discharge cell or the shape of the pulses applied to the electrodes of the gas-discharge cell for generating an address discharge, wherein the generation of the address discharge takes place only in one sub-frame of a frame

Illustrative examples:

US2002/0036603 (as the resetting operation is performed only in the first sub-frame, in the following sub-frames only discharge cells not addressed by erasing in the preceding sub-frames can be

## Definition statement

selected in the addressing phase of a sub-frame by erasing to no longer emit light in the sustaining phase of the sub-frame and all the further sub-frames of the frame)



## G09G 3/294

for lighting or sustain discharge

## Definition statement

*This place covers:*

Control of displays using luminous gas-discharge cells as display elements arranged in a matrix in an AC panel with details of the control of the gas-discharge cell or the shape of the pulses applied to the electrodes of the gas-discharge cell for generating an lighting or sustain discharge, i.e. a discharge for lighting the discharge cells selected during the addressing phase, wherein after the discharge enough charges remain in the cell to generate a further discharge with the next pulse of the same shape, and wherein, if an image having intermediate tones is generated by using sub-frames, the number of lighting discharges corresponds to the grey scale bit of the sub-frame.

## Special rules of classification

Different control or pulse shapes for different sub-frames are to be indicated by the code

[G09G 3/2022](#).

## G09G 3/2942

{with special waveforms to increase luminous efficiency}

## Definition statement

*This place covers:*

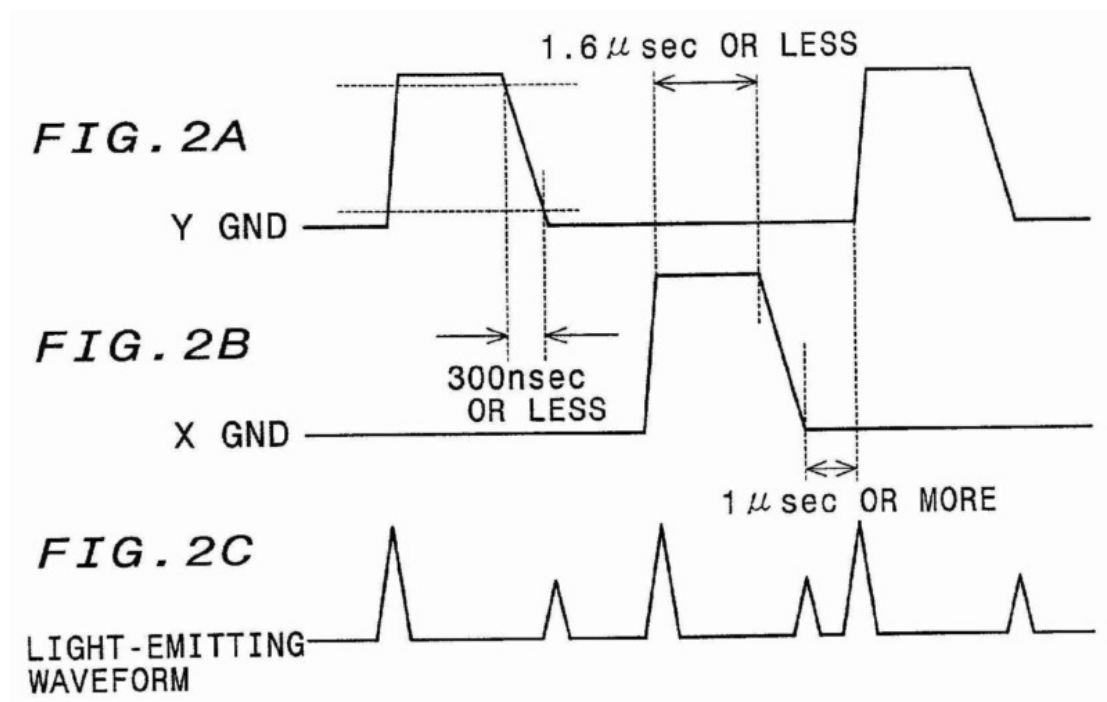
Control of displays using luminous gas-discharge cells as display elements arranged in a matrix in an AC panel with details of the control of the gas-discharge cell or the shape of the pulses applied to the electrodes of the gas-discharge cell for generating an lighting or sustain discharge, wherein the luminous efficiency of the panel is increased by applying special waveforms, for instance by waveforms generate two luminous discharges with a single pulse.

## Special rules of classification

Different control or pulse shapes for different sub-frames are indicated by the code [G09G 3/2022](#).

Illustrative examples:

US2002/0008680 (increase of the luminous efficiency by generating a light emitting discharge with the rising and the falling slope of each sustaining pulse)



## G09G 3/2944

{by varying the frequency of sustain pulses or the number of sustain pulses proportionally in each subfield of the whole frame}

### Definition statement

*This place covers:*

Control of displays using luminous gas-discharge cells as display elements arranged in a matrix in an AC panel with details of the control of the gas-discharge cell or the shape of the pulses applied to the electrodes of the gas-discharge cell for generating an lighting or sustain discharge, wherein the frequency of the sustain pulses or the number of sustain pulses is varied by the same factor for each subfield of a frame.

Illustrative examples:

EP1065645 (variation of the sustain pulse number with the same factor for all the sub-frames)

		SUSTAINING PULSE NUMBERS OF RESPECTIVE SF				
		SF1	SF2	SF3	SF4	SF5
TOTAL SUSTAINING PULSE NUMBER	31	1	2	4	8	16
	93	3	6	12	24	48
	158	5	11	21	40	81
	248	8	16	32	64	128
	312	10	21	40	81	160

## G09G 3/2946

{by introducing variations of the frequency of sustain pulses within a frame or non-proportional variations of the number of sustain pulses in each subfield}

### Definition statement

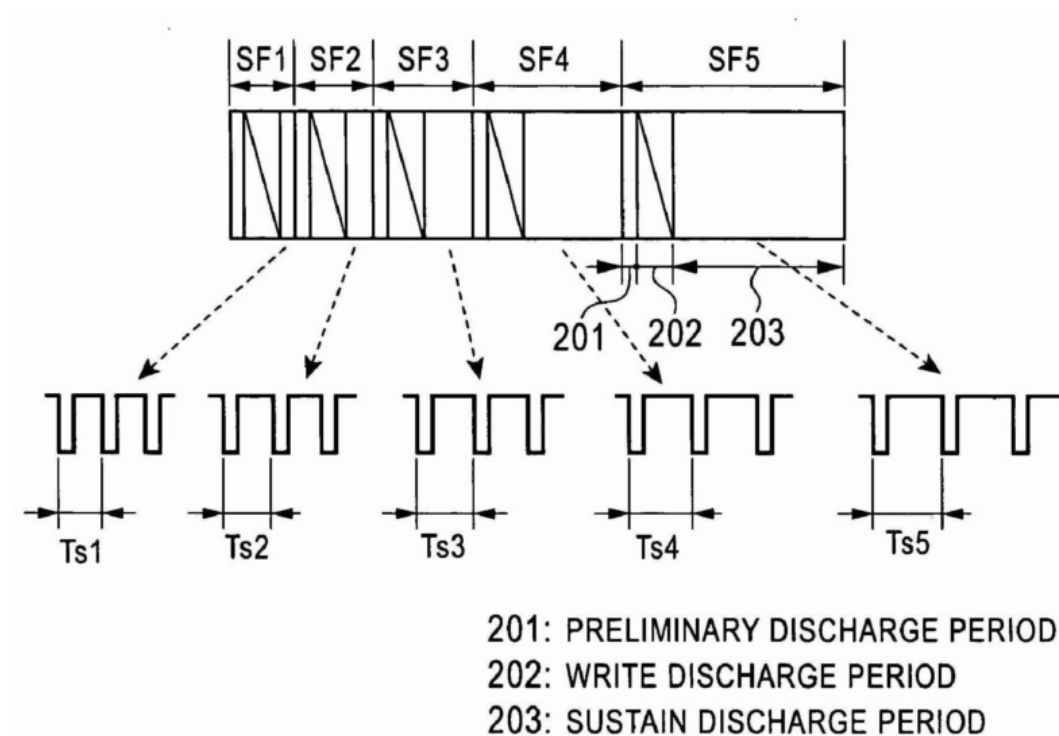
*This place covers:*

Control of displays using luminous gas-discharge cells as display elements arranged in a matrix in an AC panel with details of the control of the gas-discharge cell or the shape of the pulses applied to the electrodes of the gas-discharge cell for generating an lighting or sustain discharge, wherein the frequency of the sustain pulses or the number of sustain pulses is varied for at least one subfield of a frame differently from the other subfields of the frame.

Illustrative examples:

## Definition statement

US2005/0219158 (variation of the sustain frequency for a sub-frame according to the display load of the sub-frame, i.e. the number of cells to emit light during the sub-frame)



## G09G 3/2948

{by increasing the total sustaining time with respect to other times in the frame}

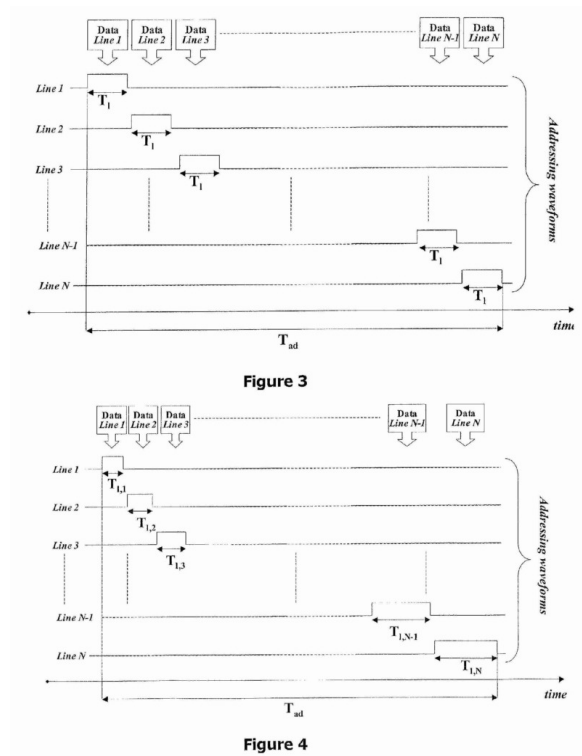
## Definition statement

*This place covers:*

Control of displays using luminous gas-discharge cells as display elements arranged in a matrix in an AC panel with details of the control of the gas-discharge cell or the shape of the pulses applied to the electrodes of the gas-discharge cell for generating an lighting or sustain discharge, wherein the time period available for the sustaining phase is increased with respect to other time periods in the frame, e.g. pulses in the initialising phase or the addressing phase are modified in order to shorten the time periods needed for these phases and thus enable an increase in light emission by a longer time period for the sustain phase.

Illustrative examples:

EP1365382 (shorter addressing and scanning pulses for addressing the upper scanning lines saves time available for the sustain phase)



## G09G 3/296

Driving circuits for producing the waveforms applied to the driving electrodes

### Definition statement

*This place covers:*

Details of a drive circuit for applying pulses to the electrodes of displays using luminous gas-discharge cells as display elements arranged in a matrix in an AC panel.

## G09G 3/2965

{using inductors for energy recovery}

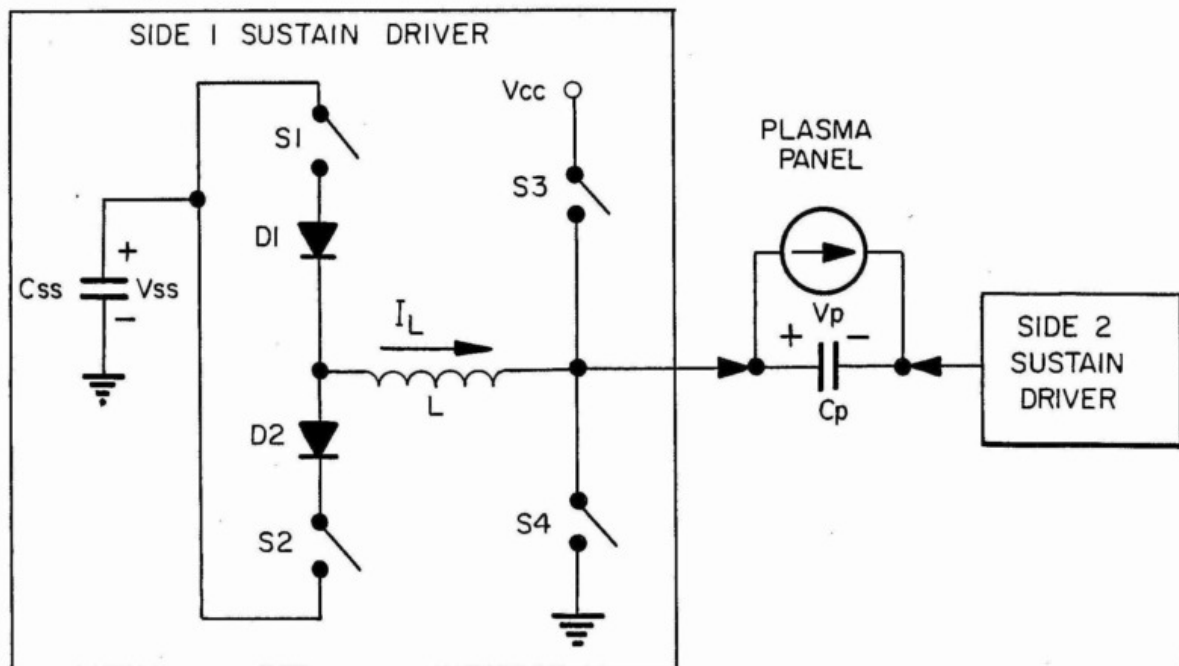
### Definition statement

*This place covers:*

Details of a drive circuit for applying pulses to the electrodes of displays using luminous gas-discharge cells as display elements arranged in a matrix in an AC panel, which uses inductors in a circuit for recovering the energy from the electrodes of the display.

Definition statement

Illustrative example of subject matter classified in this place:



The Figure illustrates a sustain electrode drive circuit with energy recovery circuit using an inductor.

## G09G 3/297

using opposed discharge type panels

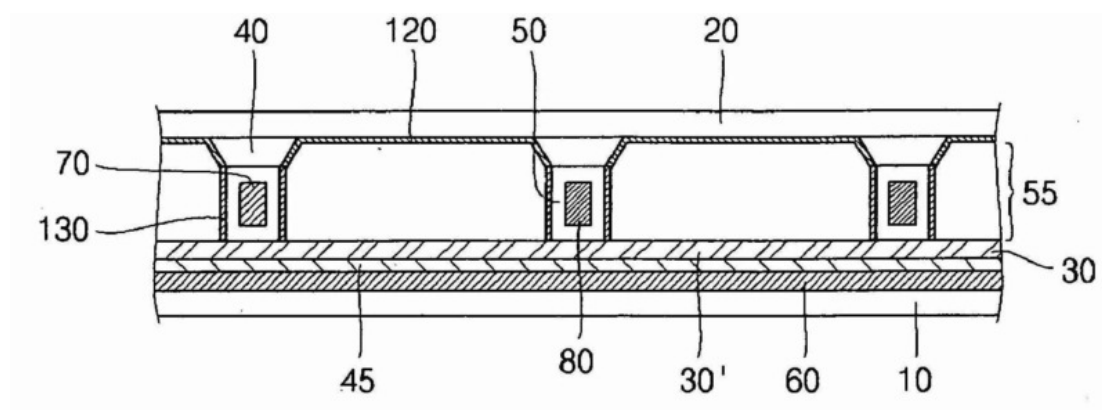
### Definition statement

*This place covers:*

Control of displays using luminous gas-discharge cells as display elements arranged in a matrix in an AC panel, wherein in a discharge cell the electrodes that play a role during the sustain discharge are opposite to each other.

Illustrative examples:

US2007/0171174 (control of AC plasma display panel with address electrodes on a substrate as well as scan and sustain electrodes in the cell walls and opposite to each other)





**G09G 3/298****using surface discharge panels****Definition statement**

*This place covers:*

Control of displays using luminous gas-discharge cells as display elements arranged in a matrix in an AC panel, wherein in a discharge cell the electrodes that play a role during the sustain discharge are on the same surface.

**Special rules of classification**

For documents published after 1997 this code is only to be given if no other class under [G09G 3/288](#) is given for a surface discharge panel, as most of the documents after 1997 concern surface discharge panels anyway.

**G09G 3/2983****{using non-standard pixel electrode arrangements}****Definition statement**

*This place covers:*

Control of displays using luminous gas-discharge cells as display elements arranged in a matrix in an AC panel, wherein in a discharge cell the electrodes that play a role during the sustain discharge are on the same surface, and the discharge cell electrodes have a non-standard arrangement.

**G09G 3/2986****{with more than 3 electrodes involved in the operation}****Definition statement**

*This place covers:*

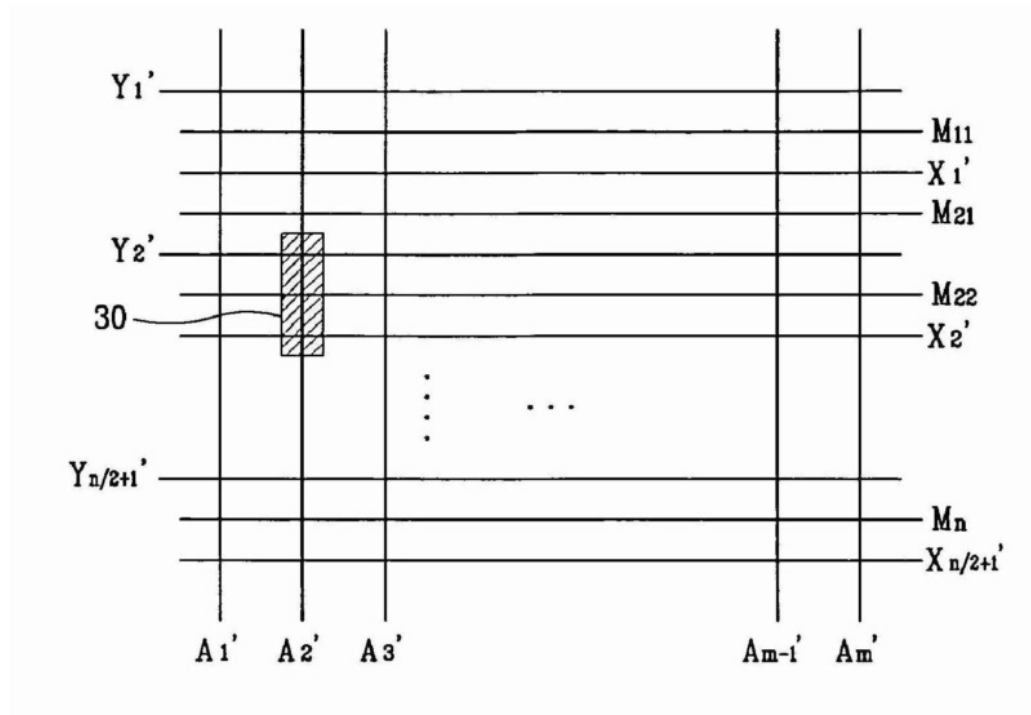
Control of displays using luminous gas-discharge cells as display elements arranged in a matrix in an AC panel, wherein in a discharge cell the electrodes that play a role during the sustain discharge are on the same surface, and with more than three electrodes involved in the operation of the discharge cell.

**Special rules of classification**

Also if a neighbouring electrode is involved in the operation of the discharge cell beside the three electrodes corresponding to the discharge cell, such a document is to be classified in this group.

Illustrative examples:

US2005/0116899 (operation of the discharge cell by signals applied to four electrodes, A, M, X, Y)



## G09G 3/299

using alternate lighting of surface-type panels

### Definition statement

*This place covers:*

Control of displays using luminous gas-discharge cells as display elements arranged in a matrix in an AC panel, wherein in a discharge cell the electrodes that play a role during the sustain discharge are on the same surface, and with alternate lighting of the cells of one row and in even columns, and an adjacent other row and in odd columns.

Illustrative examples:

## Definition statement

EP1199701 (using all the discharge gaps between the scan and sustain electrodes enables a reduction of the number of electrodes and thus a cost reduction, but requires alternate lighting of the odd and even lines)

FIG. 7

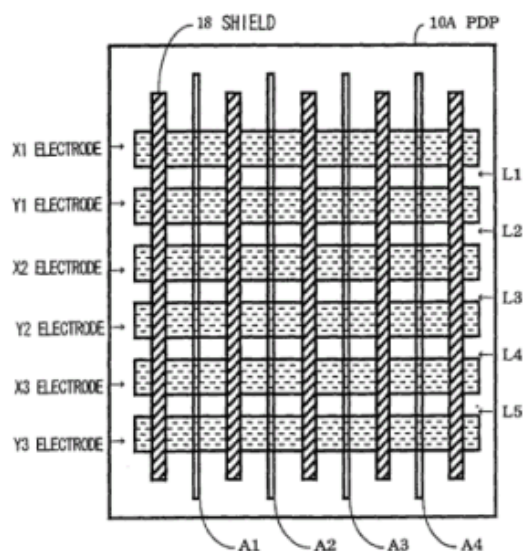
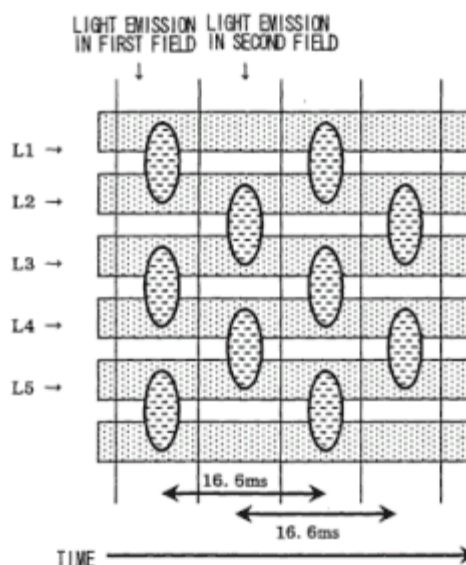


FIG. 8



## G09G 3/30

## using electroluminescent panels

## Definition statement

*This place covers:*

Control of displays using electroluminescent display elements arranged in a matrix.

## References

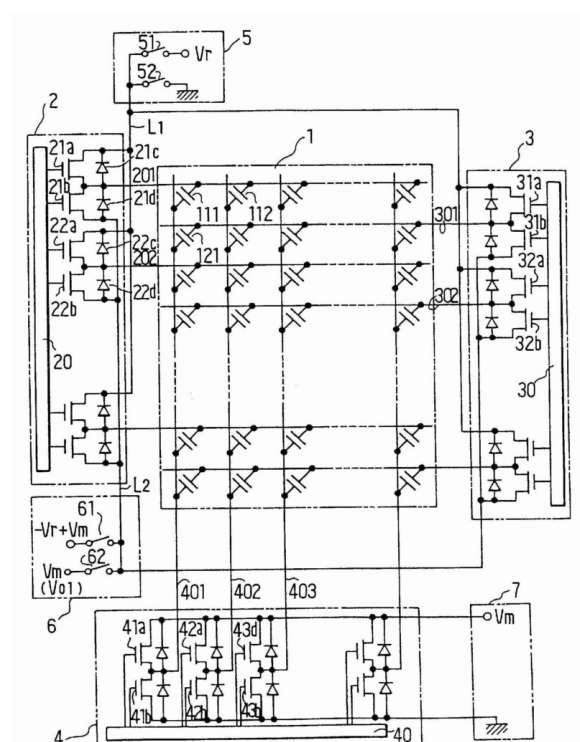
## Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Control of displays using electroluminescent display elements for displaying a character composed by a fixed number of display elements as segments or dots	<a href="#">G09G 3/12</a>
---	---------------------------

Examples:

US5973456 (application of AC signal generates light in electroluminescent display elements)



## G09G 3/32

semiconductive, e.g. using light-emitting diodes [LED]

### Definition statement

*This place covers:*

- Control of displays using electroluminescent display elements, which are semiconductor devices, e.g. diodes or transistors, arranged in a matrix without details of the semiconductive material.
- Control of displays using electroluminescent display elements, which are semiconductor devices, e.g. diodes or transistors, arranged in a matrix, wherein the semiconductive material is inorganic.

### References

#### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Control of displays using electroluminescent display elements, which are semiconductor devices, e.g. diodes or transistors, for displaying a character composed by a fixed number of display elements as segments or dots	<a href="#">G09G 3/14</a>
---	---------------------------

**G09G 3/3208****organic, e.g. using organic light-emitting diodes [OLED]****Definition statement***This place covers:*

Control of displays using organic electroluminescent display elements, which are semiconductor devices, e.g. diodes or transistors, arranged in a matrix, wherein the semiconductive material is organic.

**References****Informative references***Attention is drawn to the following places, which may be of interest for search:*

Control of displays using electroluminescent display elements, which are semiconductor devices, e.g. diodes or transistors, for displaying a character composed by a fixed number of display elements as segments or dots	<a href="#">G09G 3/14</a>
Details of the drive circuits for applying the scan signals to the scan electrodes of an organic electroluminescent matrix display	<a href="#">G09G 3/3266</a>
Details of the drive circuits for applying the data signals to the data electrodes of an organic electroluminescent matrix display	<a href="#">G09G 3/3275</a>
Organic light-emitting devices [OLED]	<a href="#">H10K 50/00</a>
Integrated devices, or assemblies of multiple devices, comprising at least one organic light-emitting element	<a href="#">H10K 59/00</a>
Integrated devices, or assemblies of multiple devices, comprising at least one organic light-emitting element and at least one organic radiation-sensitive element	<a href="#">H10K 65/00</a>

**Special rules of classification**

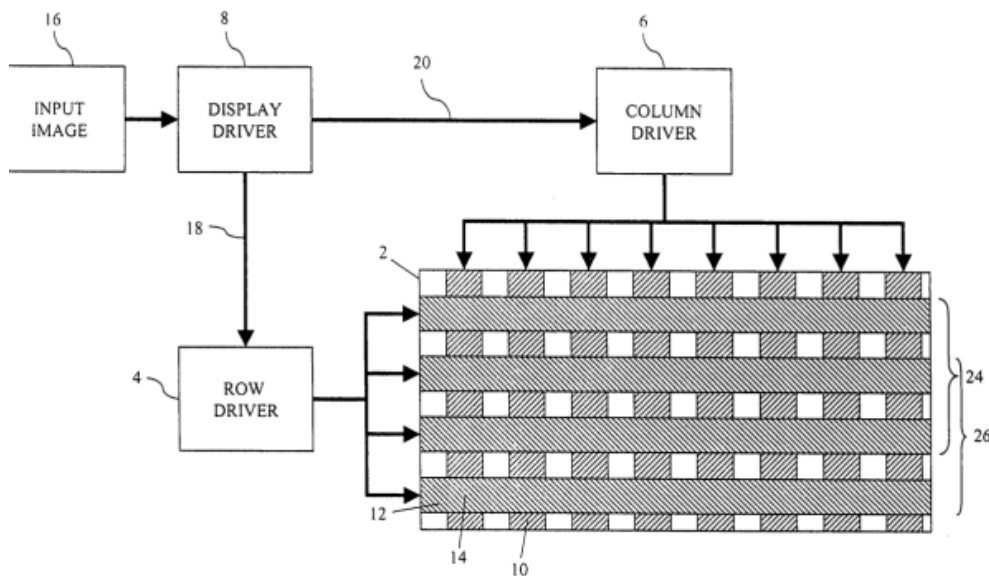
This code is to be given only if no details of the control of the display elements are specified, otherwise the codes of [G09G 3/3216](#) for a passive matrix, or within [G09G 3/3225](#) for an active matrix apply.

**G09G 3/3216****using a passive matrix****Definition statement***This place covers:*

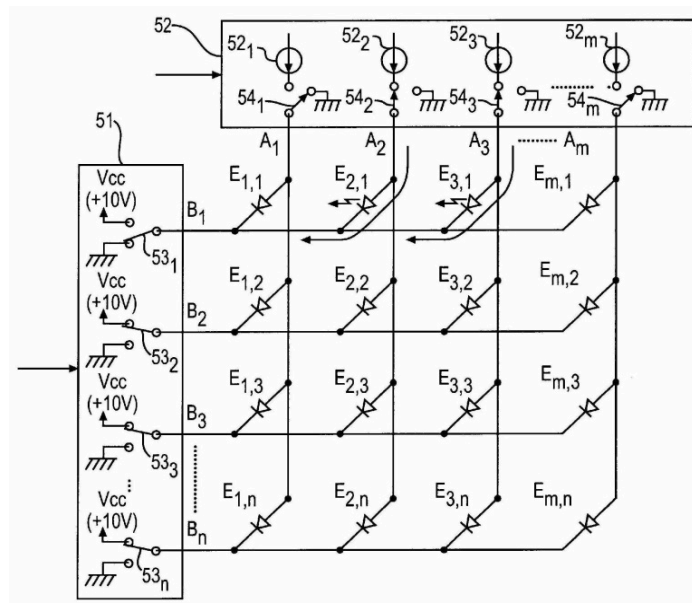
Control of displays using organic electroluminescent display elements arranged in a matrix, wherein each display element is located at the intersection of a scan and a data electrode, and directly controlled by the scan and data signal supplied to the scan and data electrode, respectively, i.e. without an active element such as a diode (other than the light-emitting one), or a transistor at the intersection being involved.

## Definition statement

The figure below is an example of a passive matrix. In the figure, passive matrix is characterized as having a line driving method which lights all light-emitting devices of the line at once, and a matrix is a 2-dimensional arrangement, comprising cathode and anode strips.



The figure below is an example of selective application of a current to the anodes of OLED display elements as data signal via data electrodes  $A_k$  while a voltage is supplied to the cathodes of the display elements as scan signal via scan electrodes.



## References

## Informative references

Attention is drawn to the following places, which may be of interest for search:

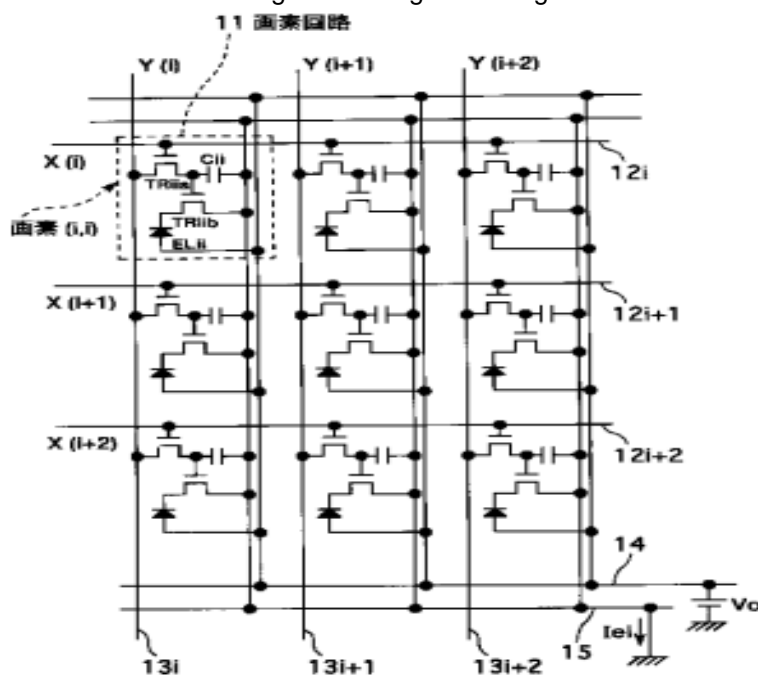
Details of the drive circuits for applying the scan signals to the scan electrodes of an organic electroluminescent matrix display	<a href="#">G09G 3/3266</a>
Details of the drive circuits for applying the data signals to the data electrodes of an organic electroluminescent matrix display	<a href="#">G09G 3/3275</a>

**G09G 3/3225****using an active matrix****Definition statement**

*This place covers:*

Control of displays using organic electroluminescent display elements arranged in a matrix, wherein each display element is located together with an active element such as a transistor or a diode, other than the light-emitting one, at the intersection of a scan electrode and a data electrode. The active element has to be enabled by the application of a scan signal to the scan electrode so that the display element receives the data signal.

The figure below is an example of an active-matrix. In the figure, active-matrix is an individual driving method where light-emitting devices are turned on by each film transistor (TFT), and a matrix is an arrangement of light-emitting devices or TFTs or their combinations.

**References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Details of the drive circuits for applying the scan signals to the scan electrodes of an organic electroluminescent matrix display	<a href="#">G09G 3/3266</a>
Details of the drive circuits for applying the data signals to the data electrodes of an organic electroluminescent matrix display	<a href="#">G09G 3/3275</a>

**G09G 3/3233**

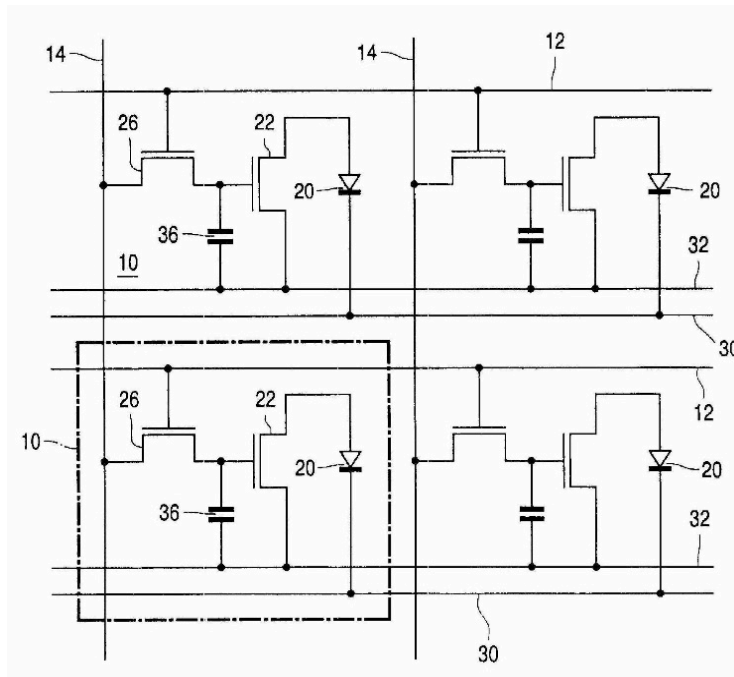
**with pixel circuitry controlling the current through the light-emitting element**

**Definition statement**

*This place covers:*

Control of displays using organic electroluminescent display elements arranged in a matrix together with active elements, wherein each active element enables a driving current flowing through a display element corresponding to a data signal supplied to a data electrode. The corresponding active element must concurrently be selected by a scan signal supplied to its scan electrode.

The figure below is an example of data voltage signal supplied to the data line (14), which controls the driving current flowing through the organic electroluminescent display element.

**References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Details of the drive circuits for applying the scan signals to the scan electrodes of an organic electroluminescent matrix display	<a href="#">G09G 3/3266</a>
Details of the drive circuits for applying the data signals to the data electrodes of an organic electroluminescent matrix display	<a href="#">G09G 3/3275</a>

**G09G 3/3241**

**the current through the light-emitting element being set using a data current provided by the data driver, e.g. by using a two-transistor current mirror**

**Definition statement**

*This place covers:*

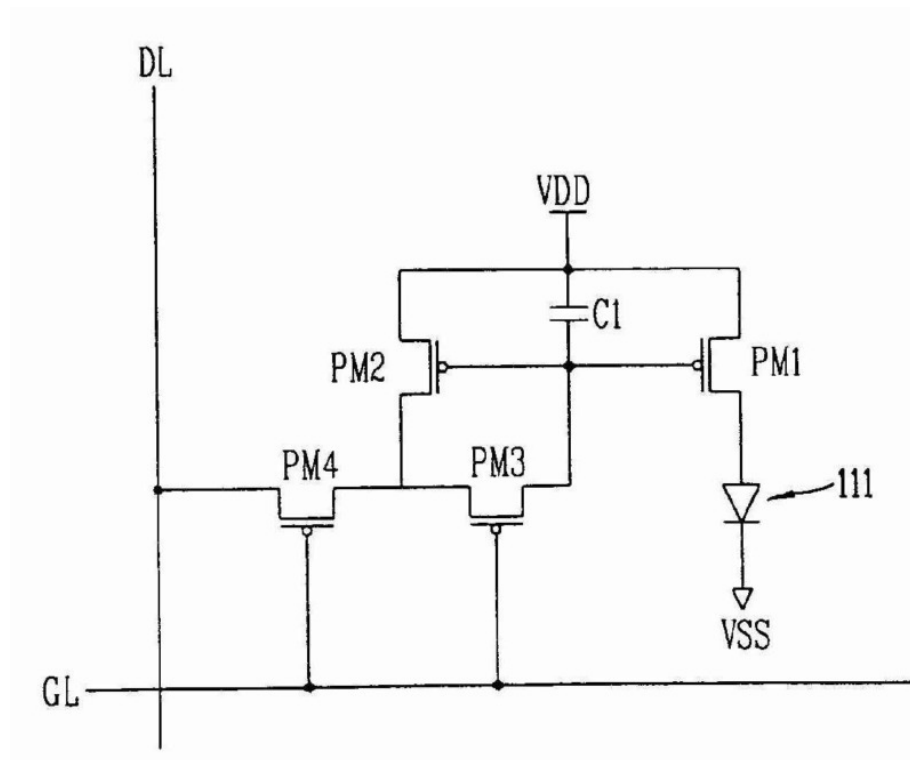
Control of displays using organic electroluminescent display elements arranged in a matrix together with active elements, wherein each active element enables a driving current flowing through a display



## Definition statement

element corresponding to a data current supplied to a data electrode, which is supplied when the active element is activated by a scan signal supplied to a scan electrode, e.g. by a current mirror having the data current flowing through the data electrode as an input current, and the driving current flowing through the display element as an output current.

The figure below is an example of data current signal supplied to the data line DL and flowing through the input part PM2 of a current mirror circuit, which controls the driving current flowing through the output part PM1 of the current mirror circuit and the organic electroluminescent display element)

**G09G 3/325**

the data current flowing through the driving transistor during a setting phase, e.g. by using a switch for connecting the driving transistor to the data driver

**Definition statement**

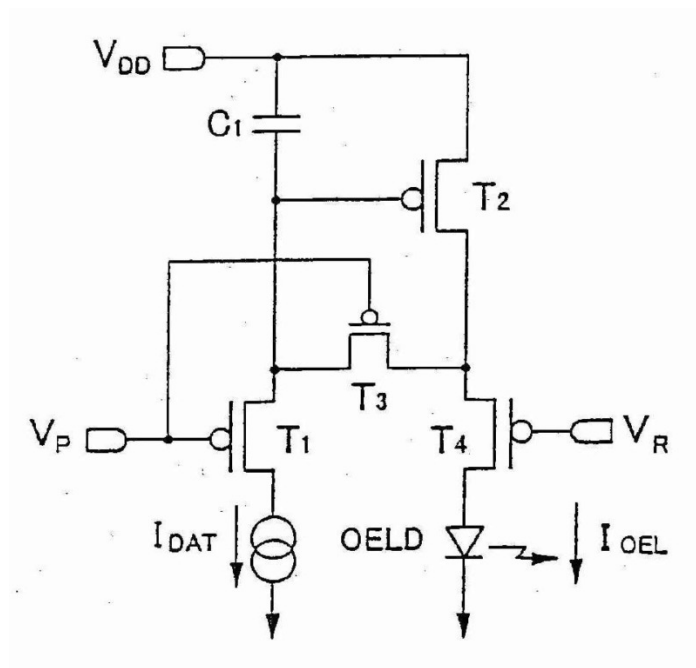
*This place covers:*

Control of displays using organic electroluminescent display elements arranged in a matrix together with active elements, wherein each active element enables a driving current flowing through a display element corresponding to a data current flowing through a data electrode and through a driving transistor, but not through the display element connected in series with the driving transistor, during a first period when the active element is activated by a scan signal supplied to a scan electrode, and with the driving current flowing through the driving transistor and the display element during a second period when the scan signal is not supplied to the scan electrode, e.g. by a first switch connecting the driving transistor to the data electrode during the first period, and a second switch connecting the driving transistor to the display element during the second period.

The figure below is an example where the data current signal  $I_{dat}$  is applied to the data line and flows only through the driving transistor T2 during the scan period (T1 and T3 ON, T4 OFF), and through the

## Definition statement

driving transistor and the organic electroluminescent display element after the scan period (T1 and T3 OFF, T4 ON).

**G09G 3/3258**

with pixel circuitry controlling the voltage across the light-emitting element

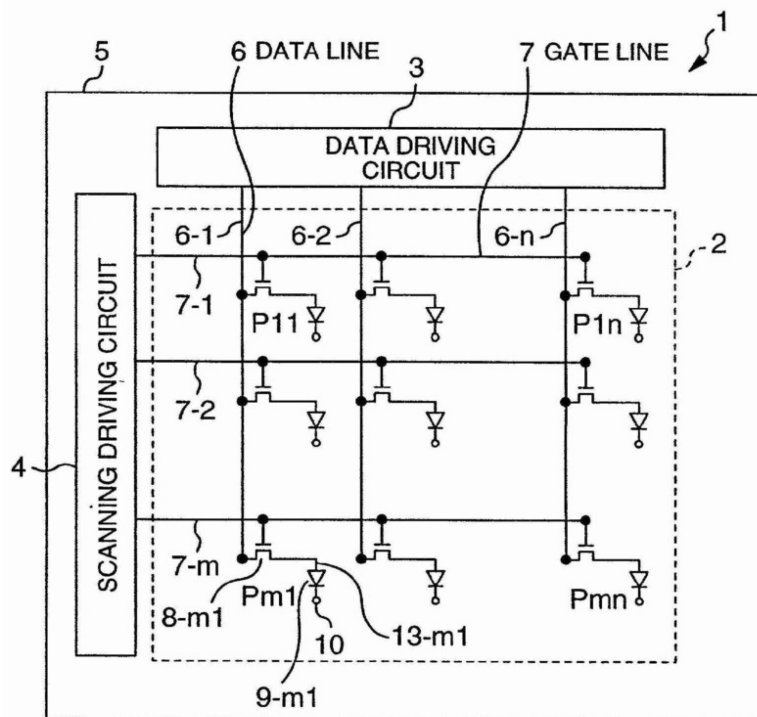
**Definition statement**

*This place covers:*

Control of displays using organic electroluminescent display elements arranged in a matrix together with active elements, wherein each active element enables the application of a voltage across a display element corresponding to a data signal supplied to a data electrode. The corresponding active element must concurrently be selected by a scan signal supplied to a scan electrode.

## Definition statement

The figure below is an example where the application of a scan signal on a line, 7-j ( $1 \leq j \leq m$ ), enables the transistors of pixels belonging to that line. The light-emitting diodes of the line can then receive data by supplying a data signal on column 6-k ( $1 \leq k \leq n$ ).



## G09G 3/3266

## Details of drivers for scan electrodes

## Definition statement

*This place covers:*

Details of a drive circuit for supplying scan signals to scan electrodes of an organic electroluminescent matrix display.

## G09G 3/3275

## Details of drivers for data electrodes

## Definition statement

*This place covers:*

Details of a drive circuit for supplying data signals to data electrodes of an organic electroluminescent matrix display.

**G09G 3/3283**

**in which the data driver supplies a variable data current for setting the current through, or the voltage across, the light-emitting elements**

**Definition statement**

*This place covers:*

Details of a drive circuit for supplying data signals to data electrodes of an organic electroluminescent matrix display, the data signals being in the form of a variable data current value according to the data to be displayed.

**G09G 3/3291**

**in which the data driver supplies a variable data voltage for setting the current through, or the voltage across, the light-emitting elements**

**Definition statement**

*This place covers:*

Details of a drive circuit for supplying data signals to data electrodes of an organic electroluminescent matrix display, the data signals being in the form of variable data voltage value according to the data to be displayed.

**G09G 3/34**

**by control of light from an independent source**

**Definition statement**

*This place covers:*

- Passive displays reflecting or modulating the incident light.
- Displays comprising a passive and an active panel.

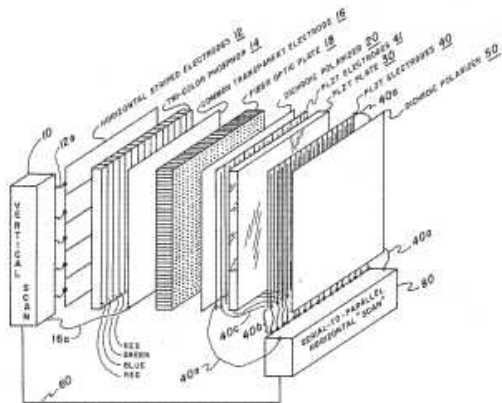
**References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

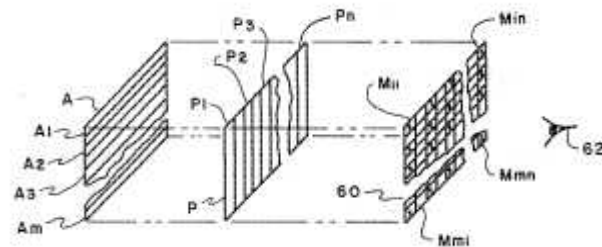
Indicating arrangements for variable information in which the information is built-up on a support by selection or combination of individual elements	<a href="#">G09F 9/30</a>
Characterised by the form or geometrical disposition of the individual elements, i.e. of the multi- segment-display	<a href="#">G09F 9/302</a>
Being the ends of optical fibres	<a href="#">G09F 9/305</a>
Being LCDs	<a href="#">G09F 9/35</a>
Being movable elements	<a href="#">G09F 9/37</a>

Examples:

US4170772



US4170771



## G09G 3/3406

{Control of illumination source (illumination devices structurally associated with liquid crystal cells [G02F 1/1336](#))}

### Definition statement

*This place covers:*

- Control of the independent light source illumination the matrix display (front and backlight).
- Standard field sequential colour displays without specific details.
- One or more separately controlled illumination sources, without correspondence to different display areas.

Illustrative examples of subject matter classified in this place:

1.

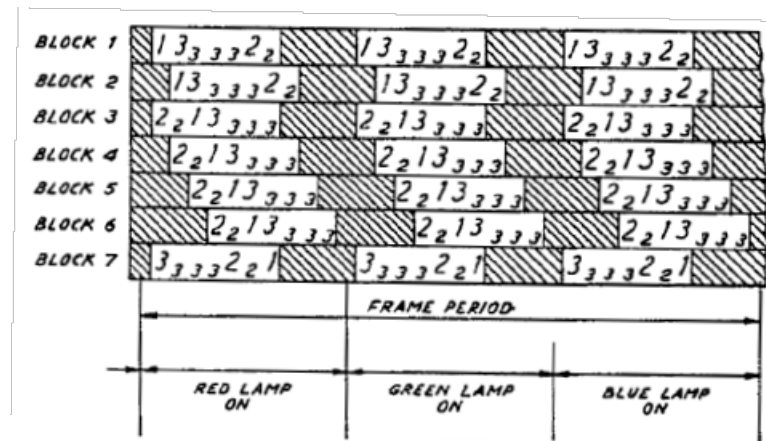
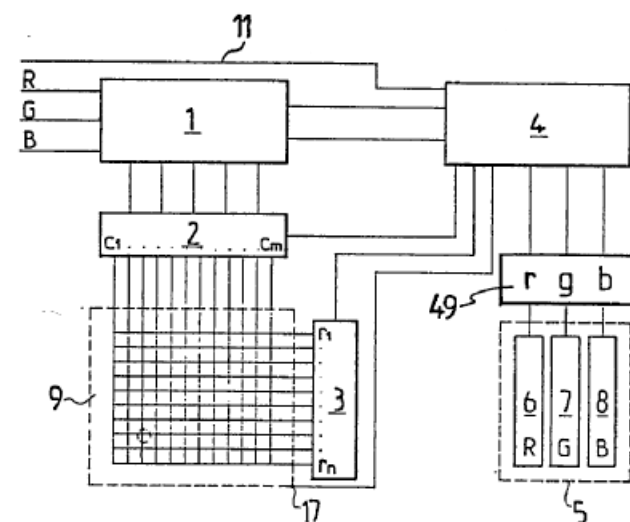


Figure 1 illustrates a standard field sequential display without specific details.

2.



3.

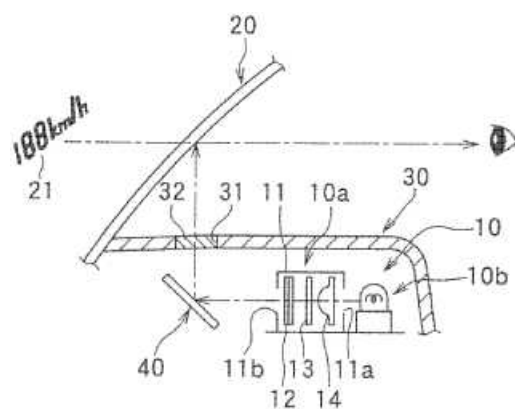


Figure 3 illustrates two illumination sources without corresponding display areas.

## References

### Limiting references

*This place does not cover:*

Illumination devices structurally associated with liquid crystal cells	<a href="#">G02F 1/1336</a>
--	-----------------------------

### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Light sources using semiconductor devices as light-generating elements, e.g. using light-emitting diodes [LED] or lasers	<a href="#">F21K 9/00</a>
Light guides specially adapted for lighting devices or systems.	<a href="#">G02B 6/0001</a>
Inverters for backlight units: conversion of DC power input into DC power output.	<a href="#">H02M 3/00</a>
Inverters for backlight units: conversion of AC power input into DC power output.	<a href="#">H02M 7/00</a>
Constructional details of illumination within telephone sets.	<a href="#">H04M 1/22</a>
Projection devices for colour picture display in colour television systems using light modulating optical valves.	<a href="#">H04N 9/31</a>
Control of light sources in general (i.e., not specifically related to a display device).	<a href="#">H05B 44/00</a> , <a href="#">H05B 47/00</a>
Circuit arrangements for operating light sources in general, i.e. where the type of light source is not relevant	<a href="#">H05B 47/00</a>

## Special rules of classification

Classification as additional information is obligatory in the following indexing codes: [G09G 2310/0235](#), [G09G 2310/024](#), [G09G 2320/06](#), [G09G 2320/0613](#), [G09G 2320/062](#), [G09G 2320/0626](#), [G09G 2320/0633](#), [G09G 2320/064](#), [G09G 2320/0646](#), [G09G 2360/14](#), [G09G 2360/144](#), [G09G 2360/145](#) or [G09G 2360/16](#).

## G09G 3/3413

### {Details of control of colour illumination sources}

#### Definition statement

*This place covers:*

- Control of backlight arrangements with more than one colour.
- Specific details of control of sequential colour displays.

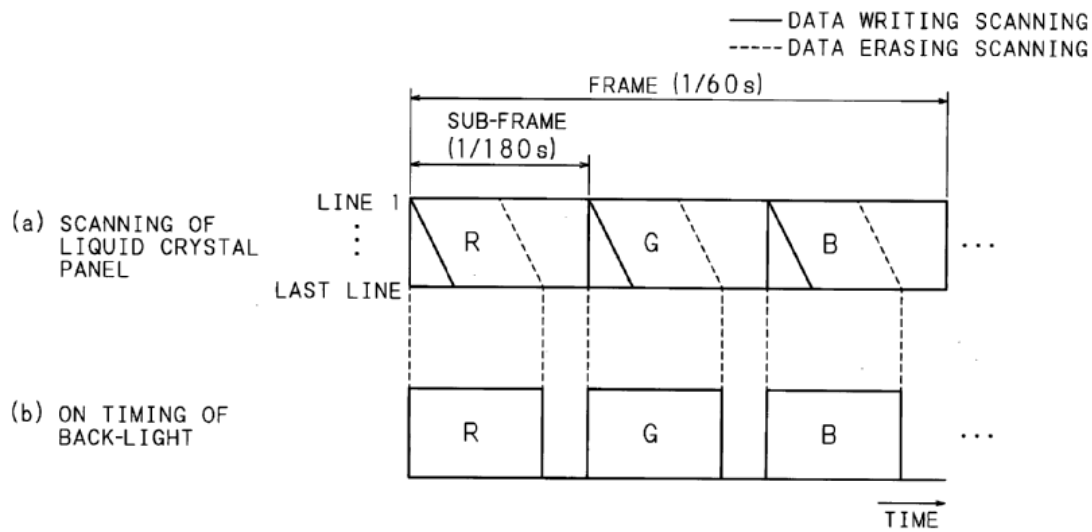
## Special rules of classification

Further detail is covered by the Indexing Code symbols listed below. Classification is obligatory.

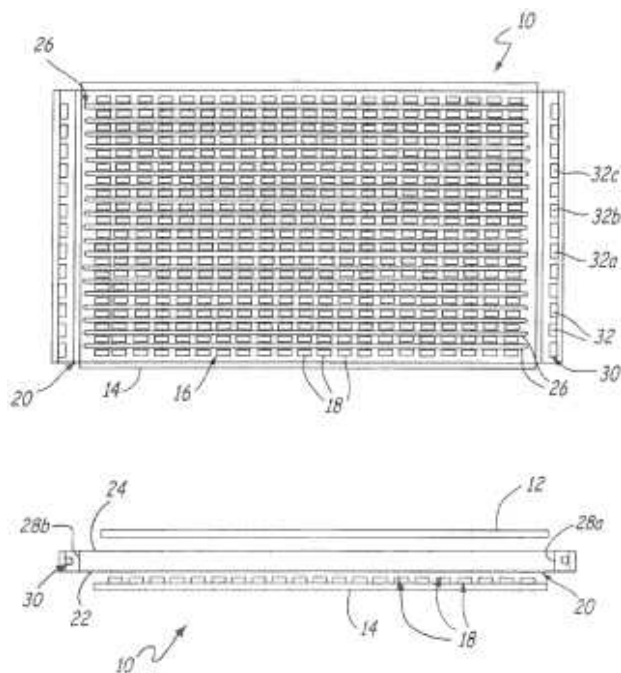
To indicate details of the colour setup of elements in an array of light emitting elements forming the illumination source: [G09G 2300/0452](#)

Example:

US2004246275 (Filed sequential display with specific details)



US6608614 (Automatic adjustment of colour parameters)



**G09G 3/342**

**{using several illumination sources separately controlled corresponding to different display panel areas, e.g. along one dimension such as lines}**

### Definition statement

*This place covers:*

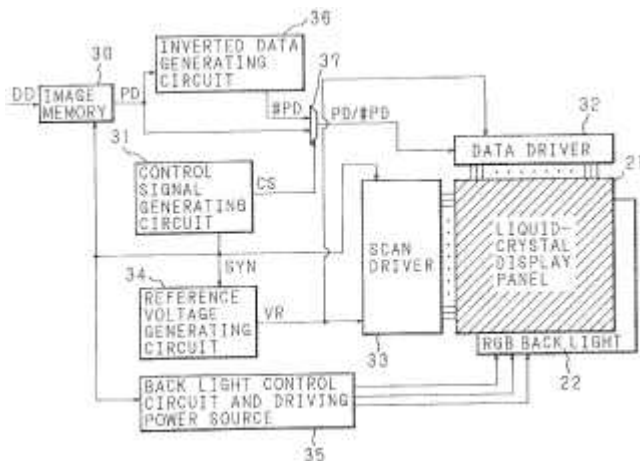
Documents disclosing horizontal stripes or rows of pixel, each lit by a separate illumination source, each illumination source being independently controlled from the other illumination sources.

Illustrative examples:

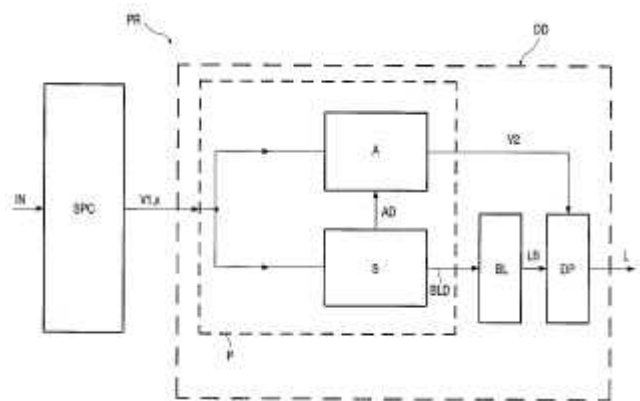


## Definition statement

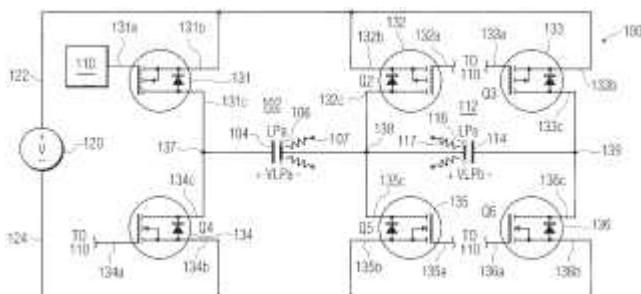
US2002000960 (Backlight with scanning of illumination source)



WO2005093703 (Backlight without scanning of illumination source)



US6563271 (Backlight having separate light sources for different panel regions)



## G09G 3/3426

{the different display panel areas being distributed in two dimensions, e.g. matrix}

## Definition statement

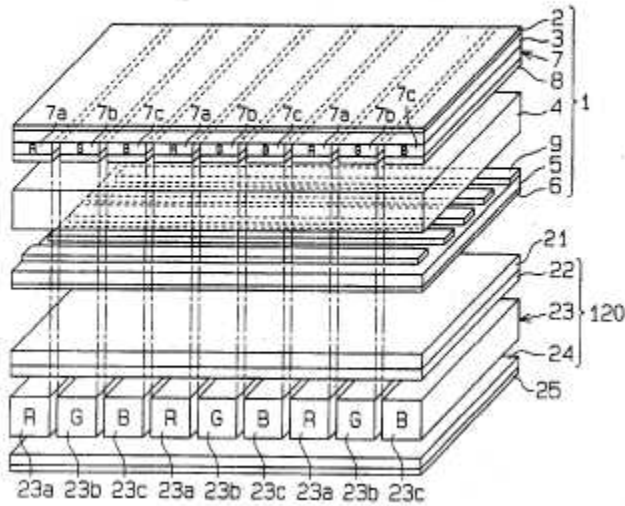
*This place covers:*

Documents disclosing a backlight unit usually comprising a matrix of pixel blocks or single pixels which are each lit by an separate illumination source, each illumination source being independently controlled from the other illumination sources.

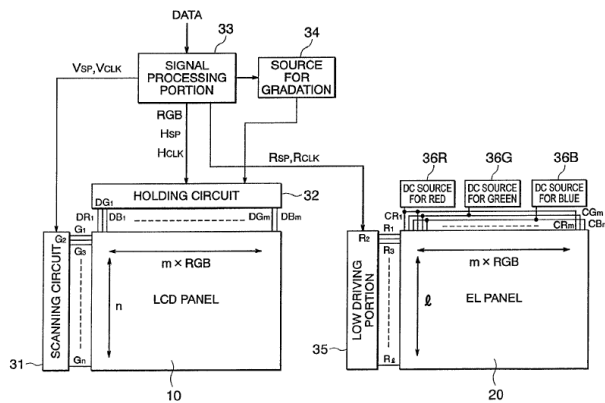
Illustrative examples:

EP1380876 (Backlight unit with scanning of illumination sources)

**Fig.1**



US2001028335 (Backlight unit without scanning of illumination source, with S09206/02 Indexing Code)



EP1496497 (Display comprising stacked panels, with S09206/02 Indexing Code)

Fig.2

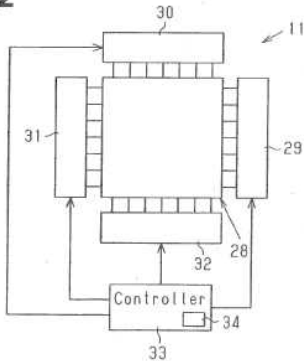
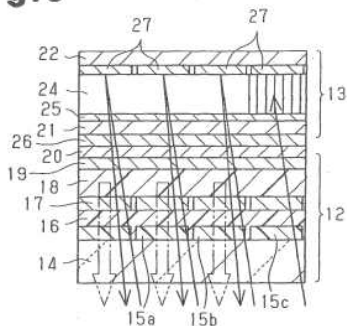


Fig.5



G09G 3/3433

{using light modulating elements actuated by an electric field and being other than liquid crystal devices and electrochromic devices (using liquid crystal devices [G09G 3/36](#); using electrochromic devices [G09G 3/38](#))}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Control arrangements for presentation of an assembly of a number of characters, e.g. a page, by composing the assembly by combination of individual elements arranged in a matrix, by control of light from an independent source, using liquid crystals	<a href="#">G09G 3/36</a>
Control arrangements for presentation of an assembly of a number of characters, e.g. a page, by composing the assembly by combination of individual elements arranged in a matrix, by control of light from an independent source, using electrochromic devices	<a href="#">G09G 3/38</a>

Illustrative examples:



EP0153178 (Electrostatic display)

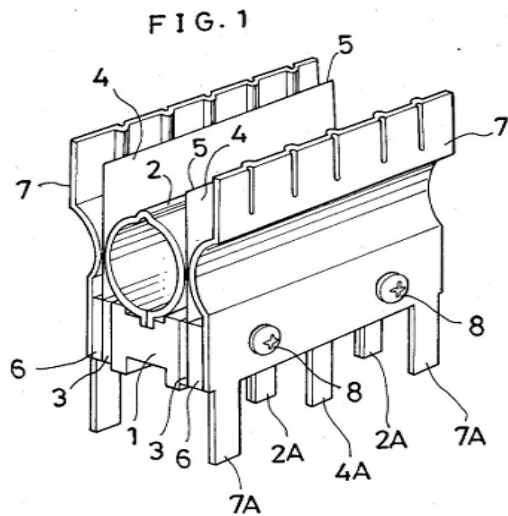
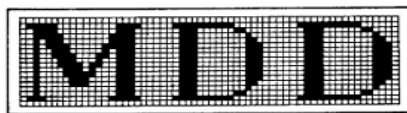


FIG. 2



WO2006091738 (Electrostatic display)

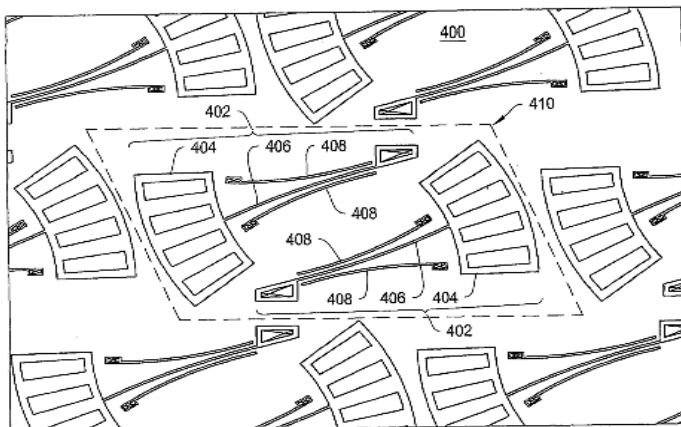


Figure 4

## G09G 3/344

{based on particles moving in a fluid or in a gas, e.g. electrophoretic devices  
(electrophoretic devices per se [G02F 1/167](#))}

### Definition statement

*This place covers:*

Control of display devices wherein the visual effect is obtained by controlling the displacement of microparticles in fluid or gas.

## References

### Limiting references

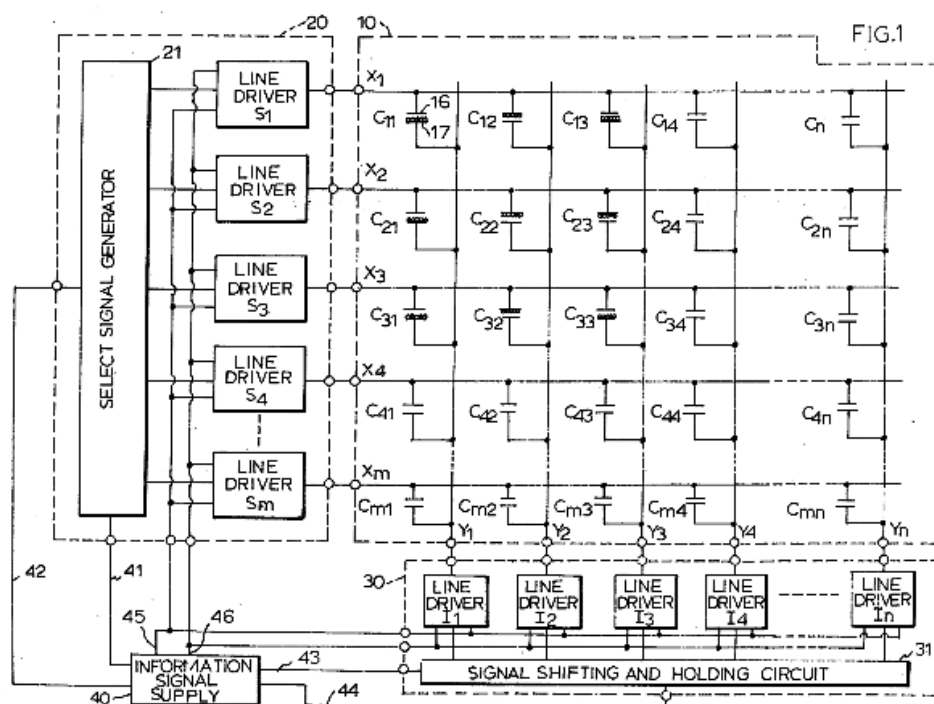
This place does not cover:

Electrophoretic devices per se

[G02F 1/167](#)

Example:

US4041481 (Electrophoretic display device)



## G09G 3/3446

{with more than two electrodes controlling the modulating element}

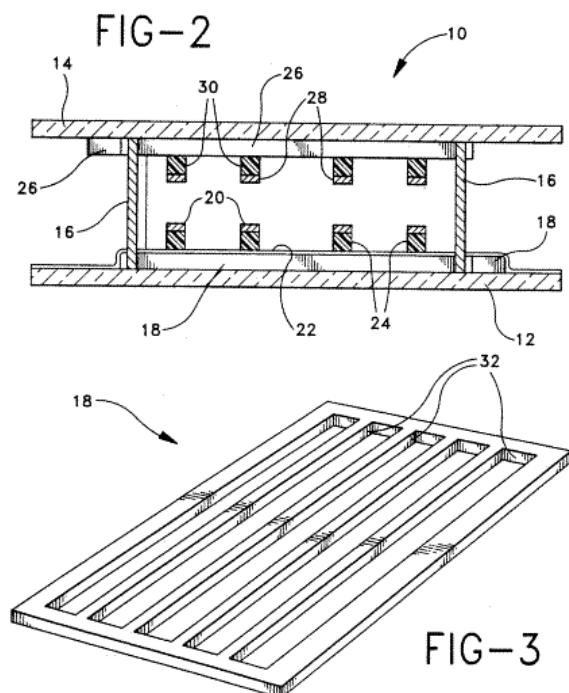
### Definition statement

This place covers:

Documents in which the displacement of the microparticles is obtained with a cell electrode structure comprising more than two electrodes.

Illustrative example:

US5223115 (item 26: cathode, item 18: anode, item 28: grid)



**G09G 3/3453**

**{based on rotating particles or microelements}**

## Definition statement

*This place covers:*

Control of display devices with rotating elements ("particles") that are encapsulated and suspended in a fluid and controlled by electrostatic operation.

Also control of displays wherein each pixel contains a plurality of "particles" (e.g. "Gyricon®" from Xerox).

## References

### **Informative references**

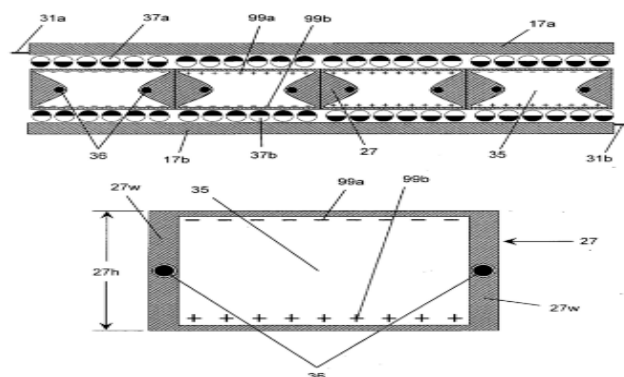
*Attention is drawn to the following places, which may be of interest for search:*

Optical devices or arrangements using movable or deformable optical elements for controlling the intensity, colour, phase, polarisation or direction of light (e.g. switching, gating, modulating)	<a href="#">G02B 26/00</a>
For controlling the intensity of light based on the rotation of particles under the influence of an external field.	<a href="#">G02B 26/026</a>
Macro displays	<a href="#">G09F 9/37</a>

## Special rules of classification

Illustrative example of subject matter classified in this group:

US2006214880



## Glossary of terms

*In this place, the following terms or expressions are used with the meaning indicated:*

E-Paper	Electric(al) or electronic (reusable) paper
---------	---

## Synonyms and Keywords

*In patent documents, the following words/expressions are often used as synonyms:*

- "Gyricon® ", "rotating ball", "twisting ball", "rotating particle" and "twisting particle"

**G09G 3/346**

**{based on modulation of the reflection angle, e.g. micromirrors (micromirrors devices per se [G02B 26/0833](#))}**

### Definition statement

*This place covers:*

- Electrostatically controlled micromirrors.
- Rocking DMD.
- Bending reflective "tongues").

## References

### Limiting references

*This place does not cover:*

Micromirrors devices per se	<a href="#">G02B 26/0833</a>
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### **Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

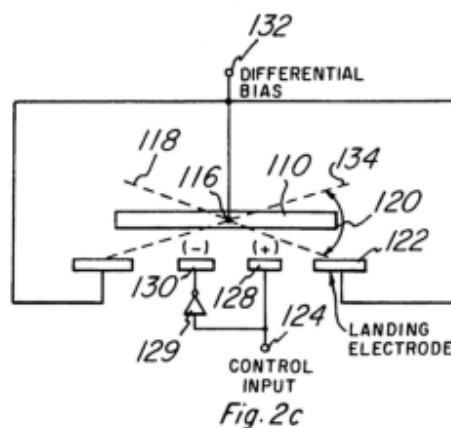
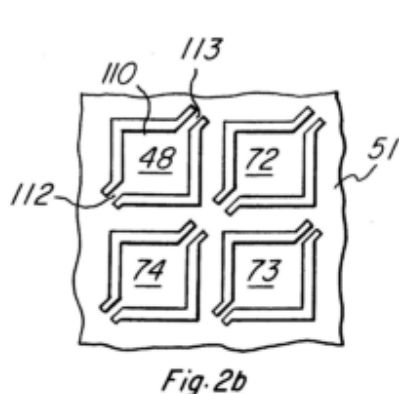
Micromechanical (e.g. MEMS) devices comprising elements which are flexible, deformable or movable (e.g. slidable or rotatable) in relation to each other	<a href="#">B81B 3/00</a>
Piezoelectric, electrostrictive or magnetostrictive elements per se	<a href="#">H10N 30/00</a>



## Special rules of classification

Illustrative examples of subject matter classified in this group:

US5214419



## Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

MEMS	Microelectromechanical system
NEMS	Nanoelectromechanical system
DMD	Deformable Mirror device - Digital mirror device
DMM	Digital micromirrors
DLP	Digital light processing

## G09G 3/3466

{based on interferometric effect}

### Definition statement

This place covers:

Control of electrically switched displays composed of miniature interferometers (etalons) that are switched on and off with microelectromechanical systems. An etalon reflects light at a specific wavelength and gives pure, bright colours while consuming no power.

## References

### Informative references

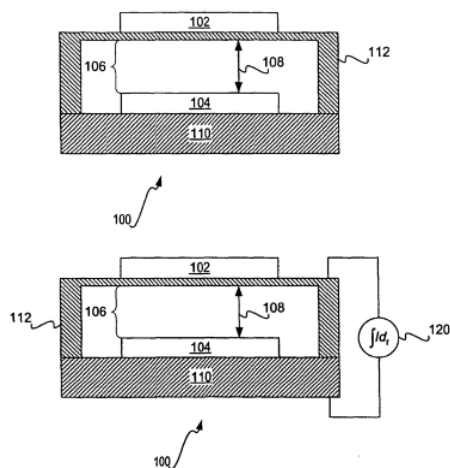
Attention is drawn to the following places, which may be of interest for search:

Devices or arrangements using multiple reflections in spectrometry or monochromators (Fabry-Perot interferometers)	<a href="#">G01J 3/26</a>
Interference filters	<a href="#">G02B 5/28</a>
Optical modulators based on interference in an adjustable optical cavity	<a href="#">G02B 26/001</a>

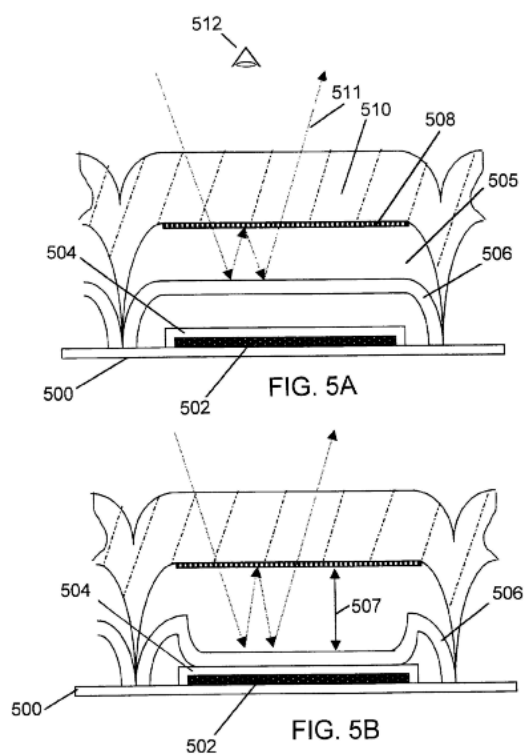
## Special rules of classification

Illustrative examples of subject matter classified in this group:

EP1473581



US2002054424



## Synonyms and Keywords

Interferometric modulator [IMOD], Diffractive light device [DLD].

**G09G 3/3473**

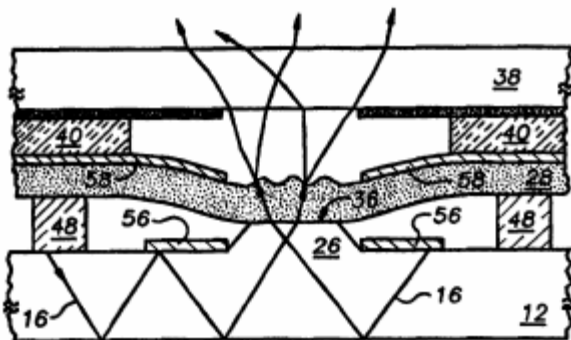
{based on light coupled out of a light guide, e.g. due to scattering, by contracting the light guide with external means}

**Definition statement**

*This place covers:*

Illustrative example of subject matter classified in this group:

WO9731288

**G09G 3/3486**

{using light modulating elements actuated by a magnetic field}

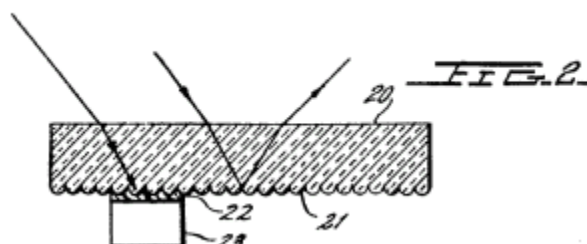
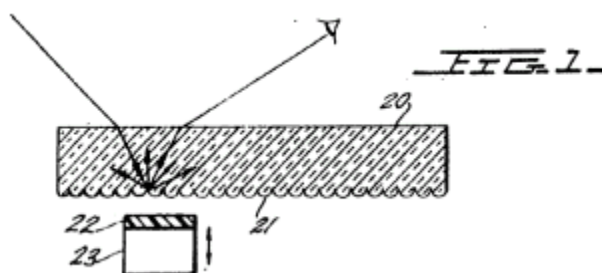
**Definition statement**

*This place covers:*

Movable elements controlled electromagnetically (also: magnetostrictive effect used in "foil" display).

Illustrative example:

DE2133121



**G09G 3/3493**

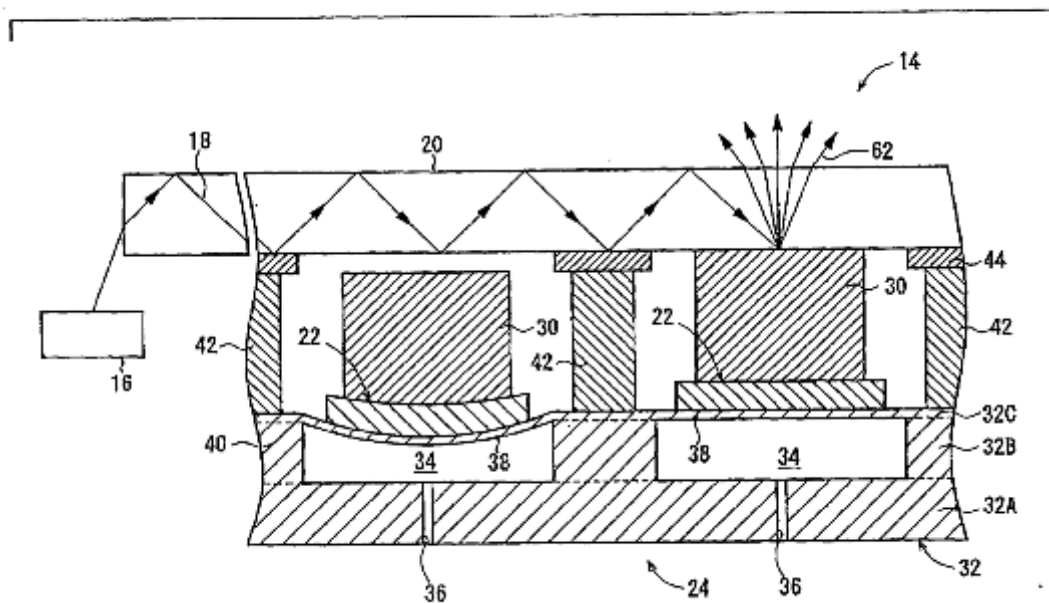
**{using light modulating elements actuated by a piezoelectric effect}**

**Definition statement**

*This place covers:*

Illustrative example of subject matter classified in this group:

EP1369844 (Piezoelectric actuator in combination with scattering of light from a waveguide. In this case the document was allocated both [G09G 3/3493](#) and [G09G 3/3473](#) symbols)

**FIG. 2****G09G 3/36**

**using liquid crystals**

**Definition statement**

*This place covers:*

Control of discrete pixel electrodes on one substrate without row and column selection.

Control of a plurality of display modules combined to result in a bigger matrix.

Address matrix for selecting a row or column.

Specific circuits for crosstalk compensation (e.g. with extra electrode carrying an additional signal).

Circuit for temperature compensation in LC displays.

Control of stacked LC panels.

## References

### Informative references

Attention is drawn to the following places, which may be of interest for search:

Chemical composition of LCD	<a href="#">C09K 19/00</a>
Constructional arrangements; Operation of LCD; (arrangements or circuits for control of liquid crystal elements in a segment display or a matrix )	<a href="#">G02F 1/13</a>

## G09G 3/3603

{with thermally addressed liquid crystals}

## References

### Informative references

Attention is drawn to the following places, which may be of interest for search:

Multi colour thermography	<a href="#">B41M 5/34</a>
Liquid crystal cells exhibiting a thermo-optical effect	<a href="#">G02F 1/132</a>

## G09G 3/3607

{for displaying colours or for displaying grey scales with a specific pixel layout, e.g. using sub-pixels (display of colours in flat matrix panels other than liquid crystal displays [G09G 3/2003](#); grey scales specific for television [H04N 3/127](#))}

## Definition statement

This place covers:

Control of subpixels in liquid crystal displays.

## References

### Limiting references

This place does not cover:

Display of colours in flat matrix panels other than liquid crystal displays.	<a href="#">G09G 3/2003</a>
Gray scales specific for television systems	<a href="#">H04N 3/127</a>

## G09G 3/3611

{Control of matrices with row and column drivers}

## Definition statement

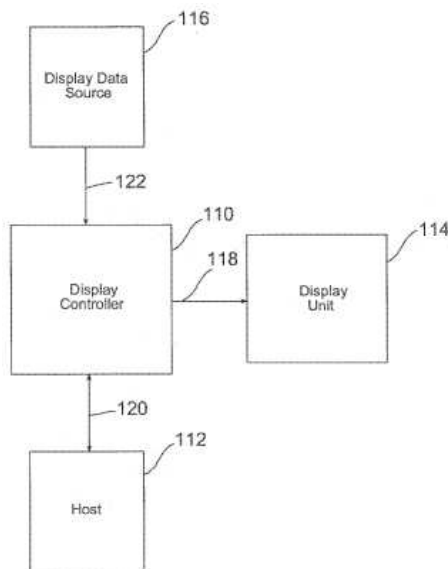
This place covers:

- Control of liquid crystal displays wherein the type of matrix (active, passive) is not defined.
- Addressing of liquid crystal matrices in general (e.g. without specifying waveforms, information transfer computer ==> memory ==> panel, driver circuits).
- Control of a liquid crystal panel by computer signals or composite signals.

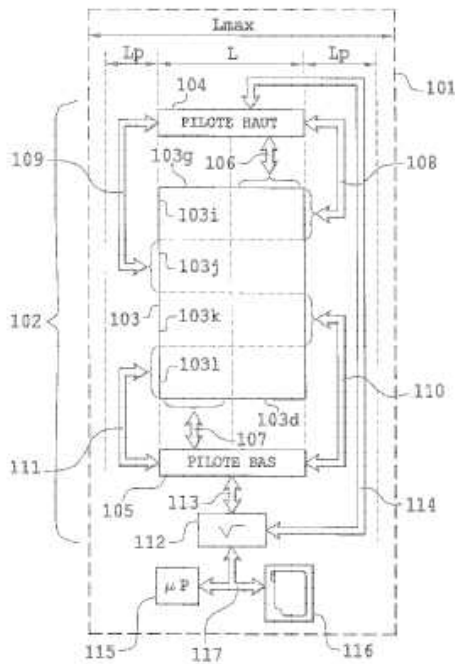
## Definition statement

- Overview articles.
- Timing circuits.
- Black on white or white on black displays.

Illustrative examples: US2005174456 (Interface from external camera or host to a LCD, wherein the display data are stored in the display driver. The display controller communicates with the display unit sending RGB-data and the LCD-clock. Because no hsync / vsync are transmitted, this interface does not form a monitor\_architecture)



FR2808113 (Details of wiring between drivers and rows and columns)



## G09G 3/3614

{Control of polarity reversal in general}

### Definition statement

*This place covers:*

- Specific control circuits for polarity inversion in LCD display devices.
- Inversion sequences (row-, column-, field-, dot-inversion).

### References

#### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Control of polarity inversion for display devices other than LCD devices	<a href="#">G09G 2310/0254</a>
--	--------------------------------

## G09G 3/3622

{using a passive matrix ([G09G 3/3674](#) - [G09G 3/3696](#) take precedence)}

### Definition statement

*This place covers:*

Control of passive matrix devices. Passive matrix means that there are no active elements (transistor, diode, MIM, ...) in the display cell at the crosspoint of a row and column.

### References

#### Limiting references

*This place does not cover:*

Detail of drivers for scan electrodes	<a href="#">G09G 3/3674</a>
Detail of drivers for data electrodes	<a href="#">G09G 3/3685</a>
Generation of voltages supplied to electrode drivers	<a href="#">G09G 3/3696</a>

## G09G 3/3625

{using active addressing}

### Definition statement

*This place covers:*

In traditional multiplexing, the rows are addressed in sequence and only one at a time. The voltages set on the columns correspond to the pixel values in the row being addressed. This scheme leads to very low voltage selection ratios and, consequently, low contrast.

In the Active Addressing scheme, several rows are addressed simultaneously in different patterns corresponding to orthogonal functions. A set of functions is orthogonal over a certain interval if the integral of the product of any two of the functions is 0 if the functions are different, and a constant if they are the same function. From signal processing theory, we can represent a given signal as a sum of differing amounts of these orthogonal functions. If we suppose the signal we wish to represent is the sequence of pixel values in a particular column of a display, then we can create that signal by applying the correct orthogonal functions to the row lines and certain voltages on the column line that correspond to the amounts of those functions we want. If we use the same functions to represent the

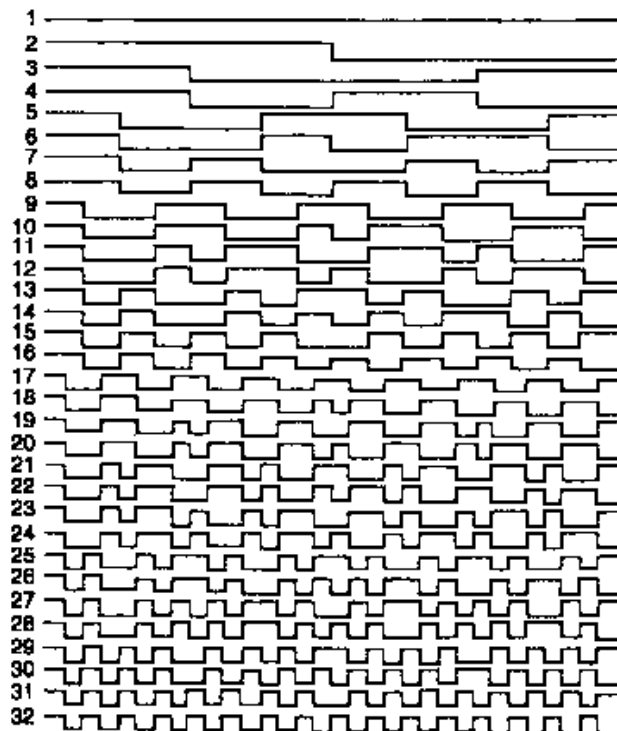
## Definition statement

signals in the other columns, then we can create a whole display by applying the correct voltages to all of the column lines in parallel.

**Special rules of classification**

Documents classified in [G09G 3/3625](#) shall not receive an Indexing Code for active addressing ([G09G 2310/0208](#)).

Illustrative example:



Order 32 Walsh functions. These kinds of functions serve as the voltage settings for the row lines in active addressing.

**G09G 3/3629**

{using liquid crystals having memory effects, e.g. ferroelectric liquid crystals}

**Definition statement**

*This place covers:*

Control of:

- ferroelectric LCDs, i.e. LCs having a polarization vector, that causes an inherent memory effect, shown in a single memory loop in the transmission/voltage characteristic has, such as chiral smectic LCs.
- Nematic LCDs (chiral nematic) where two metastable states are obtained by others means.
- LCDs using a "type" transition to obtain memory effects (nematic - cholesteric).

**References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

Details of waveforms for flat panels	<a href="#">G09G 2230/00</a>
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Partial updating	<a href="#">G09G 2310/04</a>
Chemical composition of ferroelectric liquid crystals	<a href="#">C09K 19/42</a>
Physics and structure of LCDs	<a href="#">G02F</a>

Examples:

US4793693

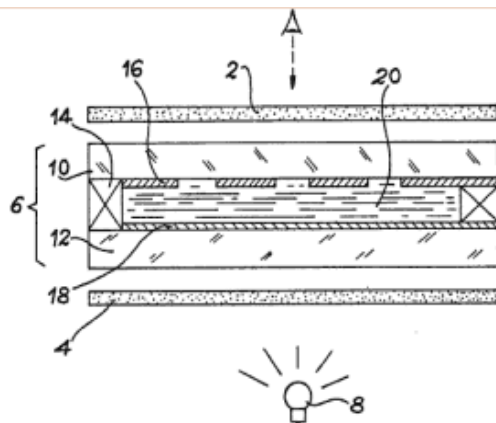


FIG. 1

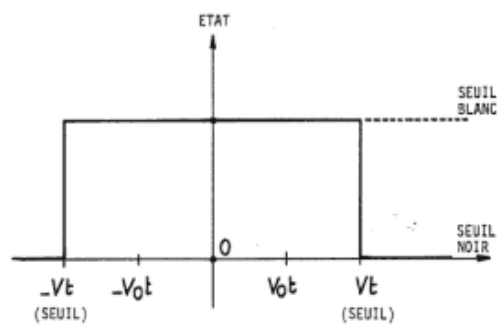
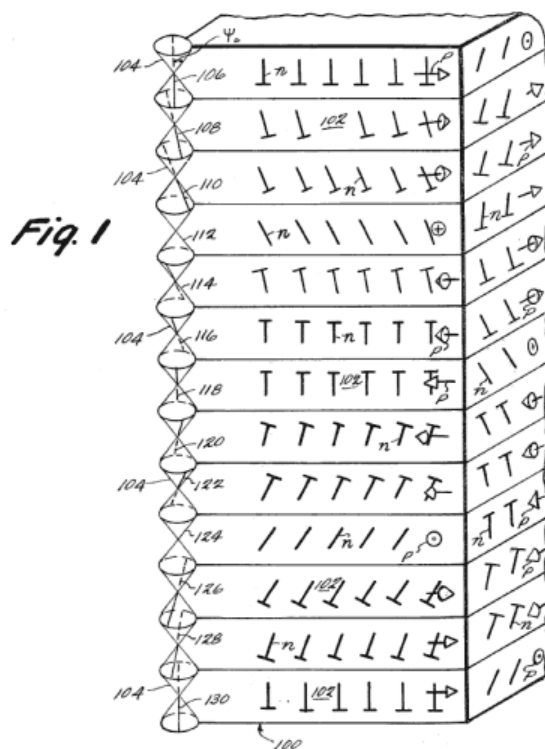


FIG. 2

US4367924



*Fig. 1*

The diagram shows the timing relationships for a three-phase inverter. The top horizontal axis marks time intervals:  $t_1'$ ,  $t_0$ ,  $t_1$ , and  $t_0'$ . Below this, specific switching times are indicated:  $t_{01}$ ,  $t_{02}$ ,  $t_{11}$ ,  $t_{12}$ , and  $t_{13}$ . A label  $t_{03}$  points to a vertical dashed line.

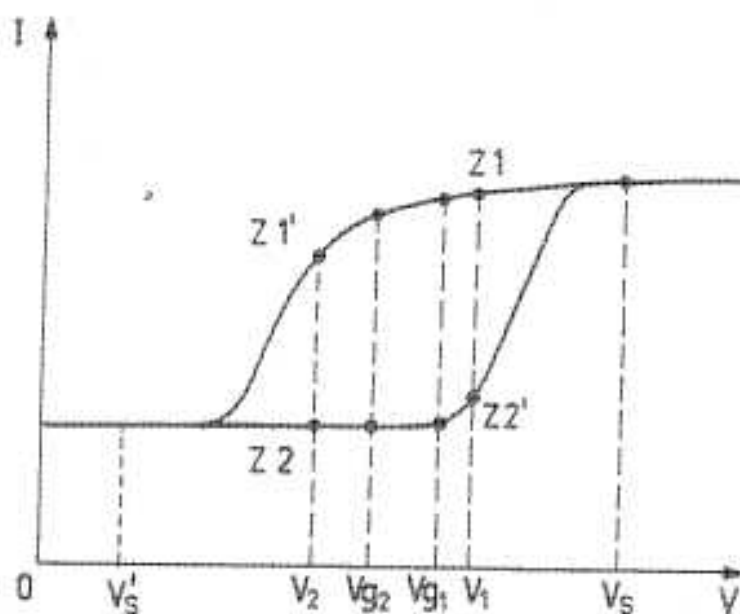
Three voltage waveforms are shown:

- 301**: Phase voltage  $V_1$  (positive) and  $-V_2$  (negative).
- 302**: Phase voltage  $V_2$  (positive) and  $-V_2$  (negative).
- 303**: Phase voltage  $V_1$  (positive),  $-V_1$  (negative),  $V_1 - V_2$  (positive), and  $-V_1 + V_2$  (negative).

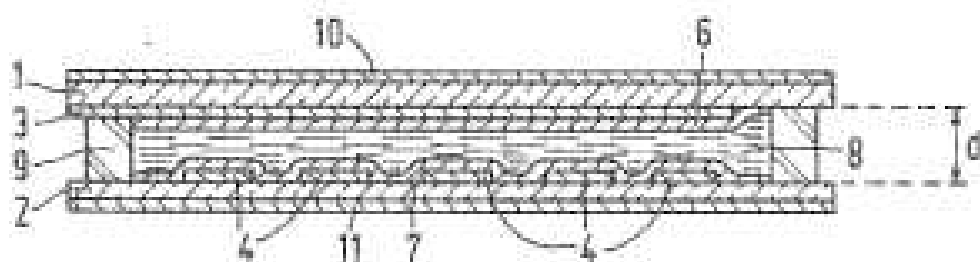
The bottom waveform, labeled **304**, represents the current  $I$ , showing two pulses during the active periods.

The block diagram illustrates the architecture of a matrix-type liquid crystal display system. Key components and their interconnections are as follows:

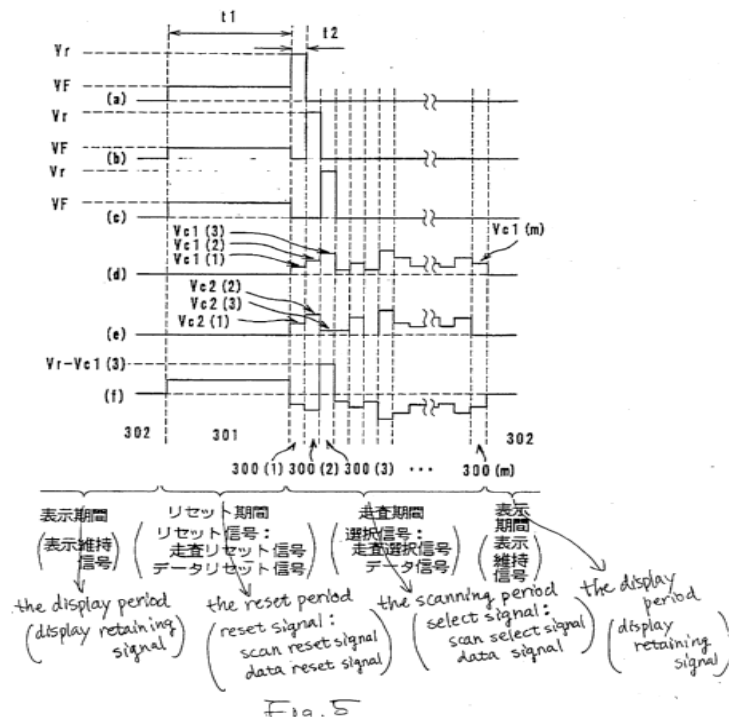
- KEY BOARD (32)**: Connected to the **REFRESH MEMORY (22)** and the **CLOCK SIGNAL GENERATOR (10)**.
- REFRESH MEMORY (22)**: Connected to the **DISPLAY PATTERN GENERATOR (23)**, **CURSOR COUNTER (34)**, and the **CLOCK SIGNAL GENERATOR (10)**.
- DISPLAY PATTERN GENERATOR (23)**: Connected to the **SHIFT REGISTER (24)** and the **DRIVING WAVEFORM GENERATOR CIRCUIT (15)**.
- SHIFT REGISTER (24)**: Connected to the **LINE MEMORY (26)**.
- CURSOR COUNTER (34)**: Connected to the **DRIVING WAVEFORM GENERATOR CIRCUIT (15)** and the **DESIGNATING CIRCUIT (14)**.
- DRIVING WAVEFORM GENERATOR CIRCUIT (15)**: Outputs  $V_{DS}$  to the **Y ELECTRODE DRIVING CIRCUIT (27)** and  $V_{GS}$  to the **X ELECTRODE DRIVING CIRCUIT (12a)**. It also receives  $V_{DS}$  and  $V_{GS}$  feedback signals.
- Y ELECTRODE DRIVING CIRCUIT (27)**: Connected to the **LINE MEMORY (26)** and the **MATRIX-TYPE LIQUID CRYSTAL DISPLAY PANEL (11)**.
- X ELECTRODE DRIVING CIRCUIT (12a)**: Receives  $V_{GS}$  from the waveform generator and outputs to the **MATRIX-TYPE LIQUID CRYSTAL DISPLAY PANEL (11)**. Other X-driving circuits (12n) are also shown.
- DESIGNATING CIRCUIT (14)**: Receives signals from the **CLOCK SIGNAL GENERATOR (10)**, **TIMING CIRCUIT (20)**, and **CURSOR COUNTER (34)**. It outputs to the **SIGNAL GENERATOR (13)**.
- CLOCK SIGNAL GENERATOR (10)** and **TIMING CIRCUIT (20)**: Both provide clock signals to the **DESIGNATING CIRCUIT (14)**.
- SIGNAL GENERATOR (13)**: Outputs to the **MATRIX-TYPE LIQUID CRYSTAL DISPLAY PANEL (11)**.
- MATRIX-TYPE LIQUID CRYSTAL DISPLAY PANEL (11)**: The final output device, receiving signals from the Y and X electrode driving circuits and the signal generator.



US4902105 (Dynamic scattering smectic LC of positive dielectric anisotropy)



EP957394 (nematic-cholesteric LCDs with planar and focal conic states)



## G09G 3/3633

{with transmission/voltage characteristic comprising multiple loops, e.g. antiferroelectric liquid crystals}

### Definition statement

This place covers:

Control of:

- Antiferroelectric LCDs having two antiferroelectric states for positive and negative pixel voltages and a ferroelectric state without pixel voltage, both with symmetric or asymmetric loops, where memory effects are desired and used.
- Short pitch ferroelectric LCDs [SBF LCDs] where the helix pitch is shorter than the pixel cell thickness.

## G09G 3/3637

{with intermediate tones displayed by domain size control (domain size control in flat matrix panels other than liquid crystal displays having memory effects [G09G 3/207](#))}

### Definition statement

This place covers:

- Control of LCDs having memory effect (e.g. ferroelectric) where gradation is obtained by varying the extension of the pixel area where switching from one memory state (e.g. ferroelectric state) to the other takes place, e.g. by.
- Arranging the electrodes such to vary the applied voltage across the pixel, so that a gradient in the LC electric field is obtained.
- Varying the thickness of the LC cell across the pixel.

- Simply using unevenness in the LC cell structure.

## References

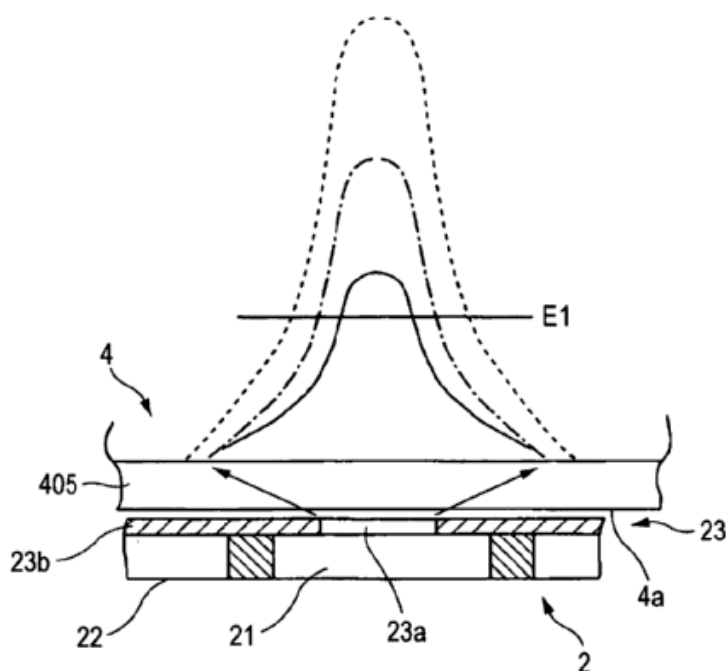
## Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Domain size control in flat matrix panels other than liquid crystal displays having memory effects	<a href="#">G09G 3/207</a>
--	----------------------------

Example:

US2006244698



**G09G 3/364**

**{with use of subpixels}**

### Definition statement

*This place covers:*

Using subpixels in memory effect LCDs for displaying gradations (common solution, together with subframe modulation, since the memory effect LCDs are normally binary devices) or for other purposes.

## References

### **Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Gradation display by the use of subpixels in general (in all sorts of matrix displays beside passive matrix LCDs)	<a href="#">G09G 3/2074</a>
Layout of subpixels used for reasons other than gradation display	<a href="#">G09G 2300/0443</a>

Details of colour pixel setup, e.g. pixel composed of a red, a blue and two green components	<a href="#">G09G 2300/0452</a>
--	--------------------------------

### Special rules of classification

Documents classified in [G09G 3/364](#) shall not receive an Indexing Code for subpixels addressing ([G09G 2300/0439](#) and subgroups).

## G09G 3/3644

**{with the matrix divided into sections}**

### Relationships with other classification places

Video-walls, which consist out of modules, meant to be flexibly combined into a bigger size display, e.g. for installation or configuration purposes (see [G06F 3/1446](#) and [G09G 2300/026](#)).

Matrices where the split has no impact on the driving, i.e. it is just a convenient constructional measure or it serves other purposes (heat dispersion etc.). Possible classifications for such cases are again in [G06F 30/00](#), [H10D 86/60](#), or in groups related to the physical structure of specific display technologies (e.g. [G02F 1/13](#) for LCDs).

Splitting of matrices in a way that the resulting structure cannot be driven independently from each other, e.g. driving odd lines from one driver and even lines from another driver.

## G09G 3/3648

**{using an active matrix ([G09G 3/367](#) - [G09G 3/3696](#) take precedence)}**

### Definition statement

*This place covers:*

Control of image refresh frequency in LC displays, wherein the displays comprise a switching element (e.g. a transistor) in series with the liquid crystal cell at each matrix point.

### References

#### Limiting references

*This place does not cover:*

Control of matrices with row and column drivers, with a nonlinear element in series with the liquid crystal cell, e.g. a diode, or M.I.M. element	<a href="#">G09G 3/367</a>
Detail of drivers for scan electrodes	<a href="#">G09G 3/3674</a>
Detail of drivers for data electrodes	<a href="#">G09G 3/3685</a>
Generation of voltages supplied to electrode drivers	<a href="#">G09G 3/3696</a>

## G09G 3/3655

**{Details of drivers for counter electrodes, e.g. common electrodes for pixel capacitors or supplementary storage capacitors}**

### Definition statement

*This place covers:*

- Driving circuits for common electrodes of:

## Definition statement

- pixels;
- supplementary-capacitors (in this case consider Indexing Code [G09G 2300/0876](#) as well).
- Striped or segmented common electrodes.
- Driving of electrode groups.
- Driving with additional line selector (shift register).
- Use of common electrodes as additional selection line.
- Problems related to resistance or capacity of common electrodes (if compensated via the same).
- Pixel voltage manipulation via common electrode(s).
- Increase pixel voltage (by modifying counter electrode voltage at appropriate time).
- Application of compensation voltages (e.g.: feedthrough, crosstalk, view angle, temperature) via the counter electrodes.

**G09G 3/3659**

**{the addressing of the pixel involving the control of two or more scan electrodes or two or more data electrodes, e.g. pixel voltage dependant on signal of two data electrodes}**

**Definition statement**

*This place covers:*

- Pixel selection or control:
- logical AND/OR (in connection with several pixel TFTs)
- via additional gate lines (two per pixel)
- via adjacent gate lines (each gate line used for two pixels)
- Control of D/A converter in pixel (via additional lines)
- Control of variable capacitor in pixel
- Pixel voltage manipulation
- pixel capacitor or supplementary capacitor connected to (or adjacent to)
- GATE line (first gate line selects TFT, second manipulates pixel voltage)
- DATA line (voltage difference on data lines defines pixel voltage)
- pixel voltage defined by voltage between a gate line and a data line
- Redundancy in the driving, precharging or symmetry
- pixel driven twice, once via a first TFT and a first data line, then via second TFT and second data line
- structures with multiple TFTs (multiple redundant selection or data paths).

**G09G 3/3662**

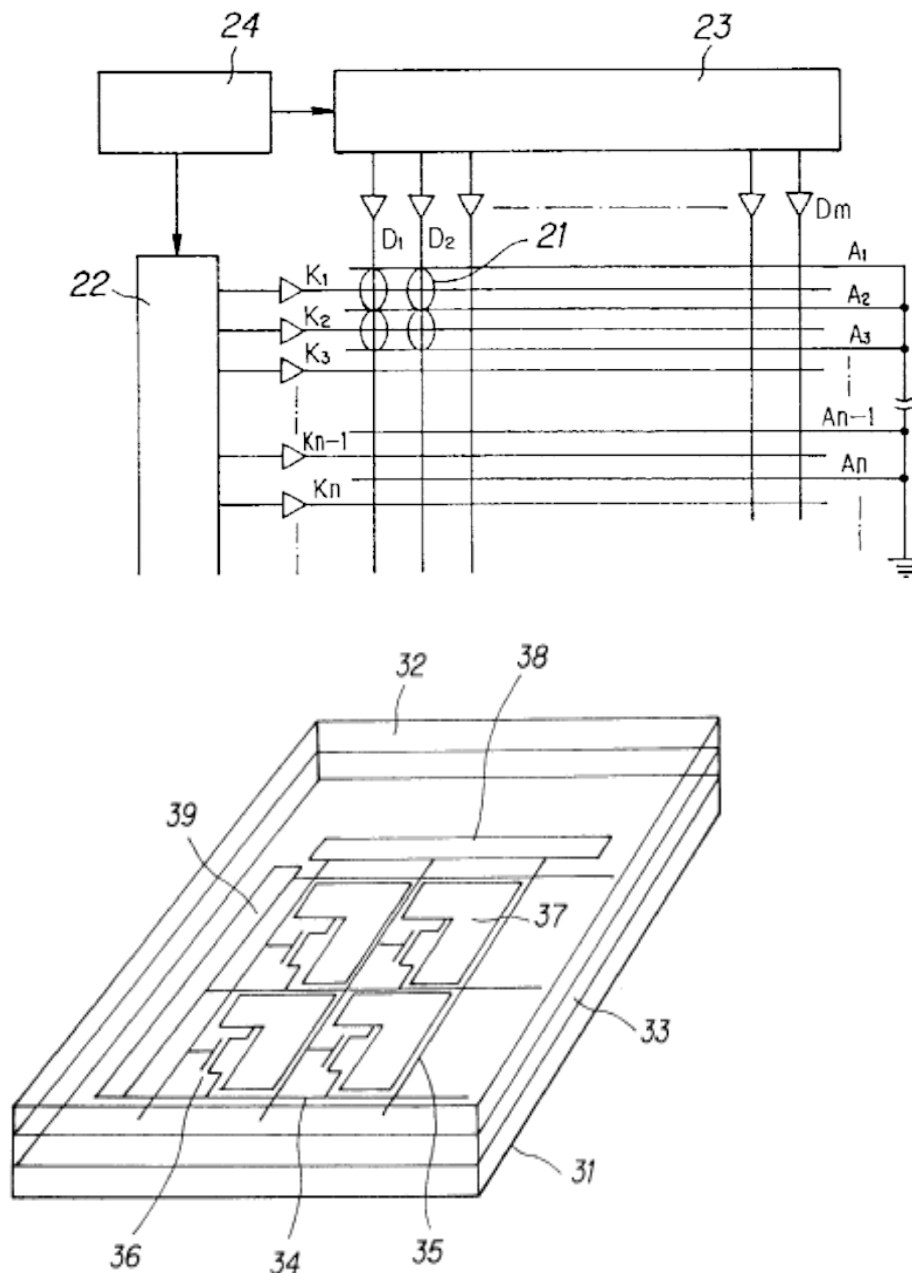
**{using plasma-addressed liquid crystal displays}**

**Definition statement**

*This place covers:*

Illustrative example of subject matter classified in this group:

EP0651368



## G09G 3/3666

{with the matrix divided into sections}

### Relationships with other classification places

Video-walls, which consist out of modules, meant to be flexibly combined into a bigger size display, e.g. for installation or configuration purposes (see [G06F 3/1446](#) and [G09G 2300/026](#)).

Matrices where the split has no impact on the driving, i.e. it is just a convenient constructional measure or it serves other purposes (heat dispersion etc.). Possible classifications for such cases are again in [G06F 30/00](#), [H10D 86/60](#), or in groups related to the physical structure of specific display technologies (e.g. [G02F 1/13](#) for LCDs).



Splitting of matrices in a way that the resulting structure cannot be driven independently from each other, e.g. driving odd lines from one driver and even lines from another driver.

## G09G 3/367

{with a nonlinear element in series with the liquid crystal cell, e.g. a diode, or M.I.M. element}

### Definition statement

*This place covers:*

Control of pixel circuits wherein a diode string or a variable resistor is connected in series with the LC cell.

## G09G 3/3674

{Details of drivers for scan electrodes}

### References

#### Informative references

Attention is drawn to the following places, which may be of interest for search:

Scan driver details for non-LCD panels	<a href="#">G09G 2310/0267</a>
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## G09G 3/3685

{Details of drivers for data electrodes}

### References

#### Informative references

Attention is drawn to the following places, which may be of interest for search:

Details of drivers for data electrodes, other than drivers for liquid crystal, plasma or OLED displays	<a href="#">G09G 2310/0275</a>
--	--------------------------------

### Special rules of classification

Documents receiving this code usually do not receive [G09G 2310/0275](#) .

However, documents should be given the following codes in addition to [G09G 3/3685](#), if applicable when they contain the corresponding details:

- Digital gray scale data driver in matrix panels, e.g. including D/A converter [G09G 2310/027](#)
- The data driver communicating data to the pixels by means of a current [G09G 2310/0272](#) .

## G09G 3/3696

{Generation of voltages supplied to electrode drivers}

### Definition statement

*This place covers:*

Generation of driving voltages, as distinguished from power supply voltages, to be used by the drivers for the generation of waveforms applied to the electrodes.

## Definition statement

Although some of the driving voltages may possibly be coincident with the power supply voltages (normally the extreme voltage values), driving voltages serve the purpose of composing an electrode addressing waveform, rather than supplying power to a functional unit; driving voltages may be representative of gradation levels (AM gradations) or may merely be levels required by a complex waveform (e.g. in the addressing of passive matrix LCDs, FLCDS, electrophoretic panels etc).

The lines/electrodes to which driving voltages are applied may or may not draw power from the generating circuit; driving voltages may normally be regarded as reference voltages, and normally for them only very small fluctuations are tolerated.

The generation of voltages is different than the generation of signals applied to the electrodes.

Illustrative examples:

- US2007046600 (Generation, by means of an arrangement of resistor ladders and selectors of voltages corresponding to gradation levels for an active matrix LCD, that take into account also the required gamma correction; the generated voltages are then selectively applied to the signal lines by the corresponding driver)
- US2008007502 (Charge pumps are used to generate voltage levels used for driving an LCD; not necessarily corresponding to the power supply level of the circuitry, possibly higher)
- WO9100588 (Generation by means of arrangements of resistor ladders, buffers etc., of voltages used in the composition of (possibly) complex waveforms driving rows and columns in a passive LCD)

## G09G 3/38

### using electrochromic devices

#### References

##### Informative references

Attention is drawn to the following places, which may be of interest for search:

Control of e.g. intensity or colour of light based on electrochromic elements	<a href="#">G02F 1/15</a>
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#### Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Electrochromic devices	Comprise one or more electrochromic matrix-elements named cells or pixels or dots, etc, such as information displays. Each element is composed of at least two electrodes that are electrically connected via an ion-conducting medium, i. e. an electrolyte. The elements may change colour if the potential difference between the electrodes is changed. This colour change is caused by redox reactions, i. e. changes in the distribution of electric charge within the element. The colour changes are caused by changes in the spectral absorption and/or emission properties of electromagnetic radiation. With 'colour' we mean also the spectral properties outside the visible region, e.g. in the infrared and the ultraviolet regions.
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## G09G 5/00

**Control arrangements or circuits for visual indicators common to cathode-ray tube indicators and other visual indicators (image data processing or generation, in general [G06T](#))**

### Definition statement

*This place covers:*

Applicable when common to all display technology. By example when display technologies are not specific to LCD but to LCD, Plasma and OLEDs. (also CRTs but it is no more relevant in 2011).

### Special rules of classification

See also image data processing or generation, in general [G06T](#).

## G09G 5/001

**{Arbitration of resources in a display system, e.g. control of access to frame buffer by video controller and/or main processor}**

### Definition statement

*This place covers:*

Resolving memory contention by CRT controller and the CPU, eventually combined with refresh of the dynamic memory.

Illustrative examples of subject matter classified in this place:

1.

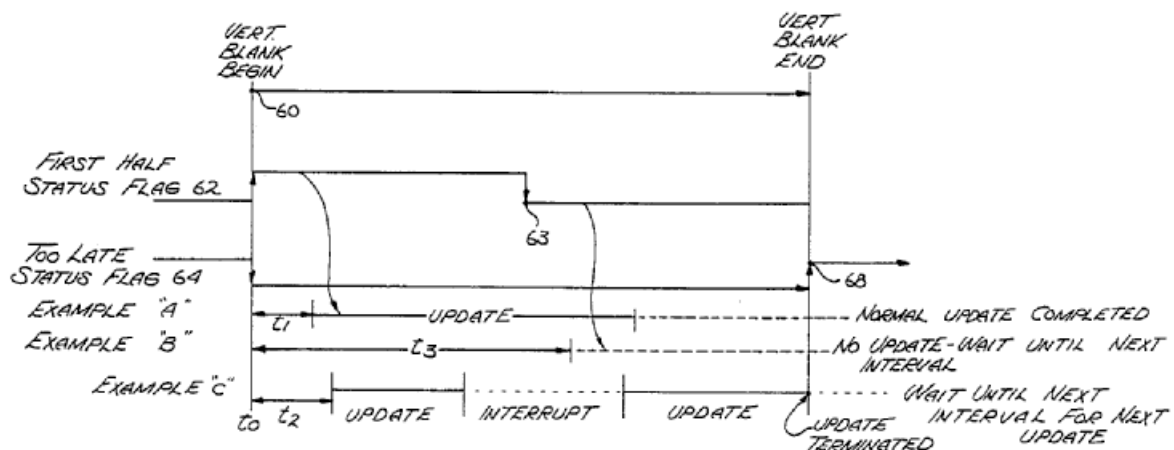


Figure 1 illustrates a bit-map based display system.

2.

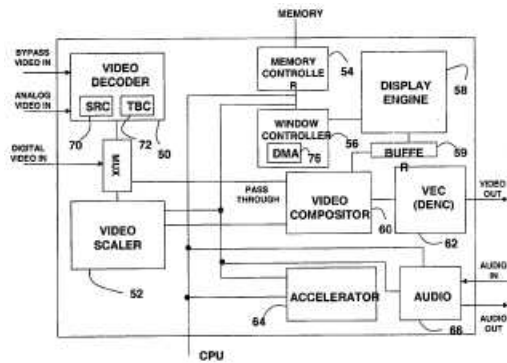


Figure 2 illustrates a display system with video synchronization.

3.

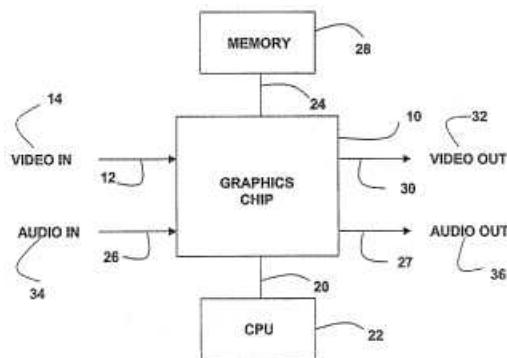


Figure 3 illustrates a display system with blending graphics and video surfaces.

4.

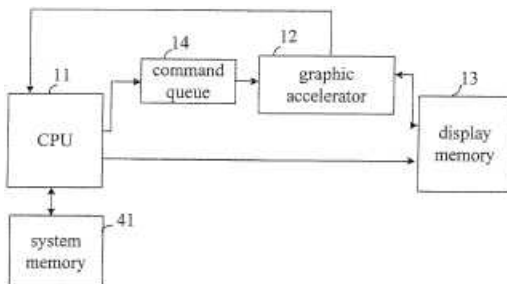


Figure 4 illustrates a method for bitmapping and synchronization.

## Definition statement

5.

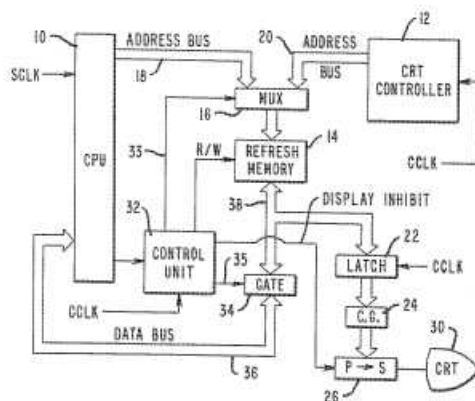


Figure 5 illustrates a character-based display system.

6.

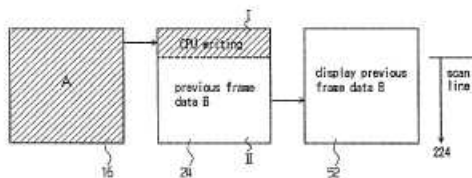
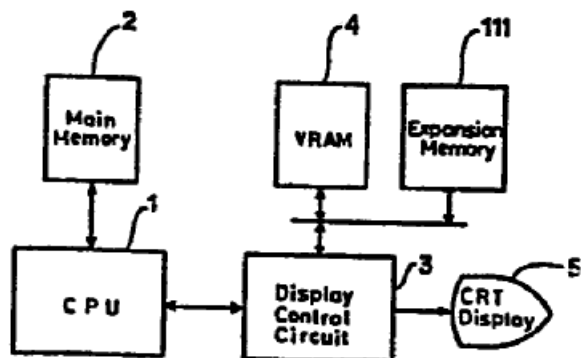
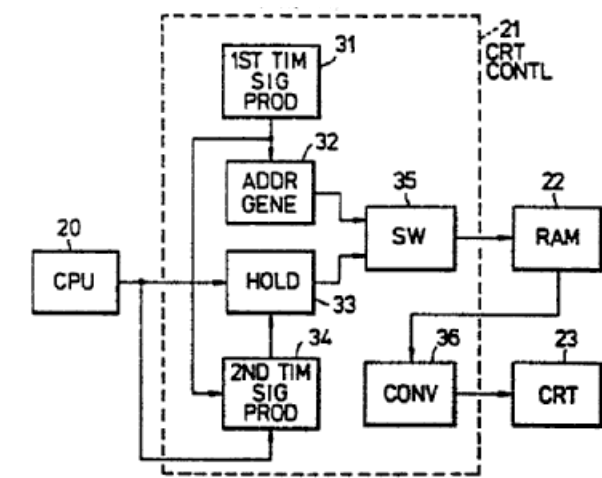


Figure 6 illustrates a display control unit that is both bit-map and character-based.

7a.



7b.



Figures 7a and 7b illustrate a generic display control unit.

## References

### Informative references

Attention is drawn to the following places, which may be of interest for search:

Control of the character-code memory	<a href="#">G09G 5/222</a>
Control of the bit-mapped memory	<a href="#">G09G 5/39</a>
Addressing or allocation within memory systems or architectures	<a href="#">G06F 12/02</a>

## G09G 5/003

{Details of a display terminal, the details relating to the control arrangement of the display terminal and to the interfaces thereto (specific for a CRT [G09G 1/165](#); for a flat panel [G09G 3/2092](#))}

## Definition statement

This place covers:

Details of a display terminal (\*1), e.g. details of the display terminal controller, interconnection and interface between display terminal controller and display device controller, buffering of image data, calibration, on-screen display of menu data for setting of parameters, data processing independent of the type of display device.

## References

### Limiting references

This place does not cover:

Colour circuits specific for CRT	<a href="#">G09G 1/28</a>
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## Special rules of classification

Even though the groups [G09G 1/165](#) and [G09G 3/2092](#) still exist, they should be used in very special cases only in which the connection with the technology of the display unit (CRT or flat panel) determines the content of the document.

The codes [G09G 5/003](#) and below apply only if a monitor-architecture can be identified (the same rule applies for [G09G 3/2092](#) and [G09G 1/165](#)).

The following groups should also be searched, because they have not yet been purged of documents for [G09G 5/003](#)

[G09G 3/3611](#): control of matrices with row and column drivers

[G06F 3/147](#): using display panels

[G06F 3/153](#): using cathode-ray tubes

[G09G 1/285](#): interfacing with colour displays

## Glossary of terms

*In this place, the following terms or expressions are used with the meaning indicated:*

Display terminal	an apparatus connected to a source of display data (usually a graphics controller of a computer, or directly to the computer itself) adapted to display images generated by this source of data. In general a "display terminal" is an arrangement including a display device (e.g. a CRT with its driving electronic or a flat panel including its row and column drivers), a display device controller (the hardware and software (usually a microprocessor) that controls the display device and that allows its functioning by, for example, generating the signals that are needed to bring the data to the drivers) and a display terminal controller (the hardware and software used to control the display terminal as a whole and to interface the display terminal to the graphics controller, to adapt data and control signals, for example in an LCD driven by a VGA type graphics controller).
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## G09G 5/005

**{Adapting incoming signals to the display format of the display terminal}**

## References

### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Scaling the whole image or part thereof	<a href="#">G06T 3/40</a>
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## Special rules of classification

The codes [G09G 5/003](#) and below (thus including [G09G 5/005](#)) apply only if a monitor-architecture can be identified (the same rule applies for [G09G 3/2092](#) and [G09G 1/165](#)).

Used to be a subgroup of [G09G 5/006](#) (now [G09G 5/006](#)), this code applies independently of where the adaptation is done, in the interface or in the controller of the terminal. Most of the documents in this group will relate to flat panels, since a CRT does not need, in general, any adaptation. It was decided, however, to have a single classification for all the documents dealing with this problem.

The output of the interface usually will be a frame or a line buffer, the latter may well be included in the data driver of the visualization unit.

The following groups should also be searched, because they have not yet been purged of documents for [G09G 5/005](#):

[G09G 3/3611](#): control of matrices with row and column drivers

[G06F 3/147](#): using display panels

[G06F 3/153](#): using cathode-ray tubes

[G09G 1/285](#): interfacing with colour displays

Notes on new groups:

[G09G 5/006](#) is former [G09G 5/006](#) and [G09G 5/006](#)

[G09G 5/005](#) is former [G09G 5/005](#)

[G09G 5/008](#) is former [G09G 5/008](#)

## **G09G 5/006**

**{Details of the interface to the display terminal (specific for a display terminal using a CRT [G09G 1/167](#); using a flat panel [G09G 3/2096](#); circuits for interfacing with colour displays [G09G 5/04](#))}**

### **Definition statement**

*This place covers:*

Interface between a graphics controller and a display terminal

Illustrative examples:

US2003033417 - A special interface usable with everything, especially to transmit video (and audio) data to be visualized on a display unit. It includes USB, but a lot more; it can also transmit graphic primitives. Two classes were given, [G09G 5/006](#) and [G06F 3/14](#).

### **References**

#### **Limiting references**

*This place does not cover:*

Circuits for interfacing with colour displays	<a href="#">G09G 5/04</a>
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#### **References out of a residual place**

*Examples of places in relation to which this place is residual:*

Specific for a display terminal using a CRT	<a href="#">G09G 1/167</a>
Specific for a display terminal using a flat panel	<a href="#">G09G 3/2096</a>

#### **Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Interconnection of, or transfer of information or other signals, between memories, I/O devices, or CPUs	<a href="#">G06F 13/00</a>
Real-time session management in data packet switching networks	<a href="#">H04L 65/1066</a>



Session management in data packet switching networks	<a href="#">H04L 67/14</a>
Interface between a recording apparatus and a television receiver.	<a href="#">H04N 5/775</a>

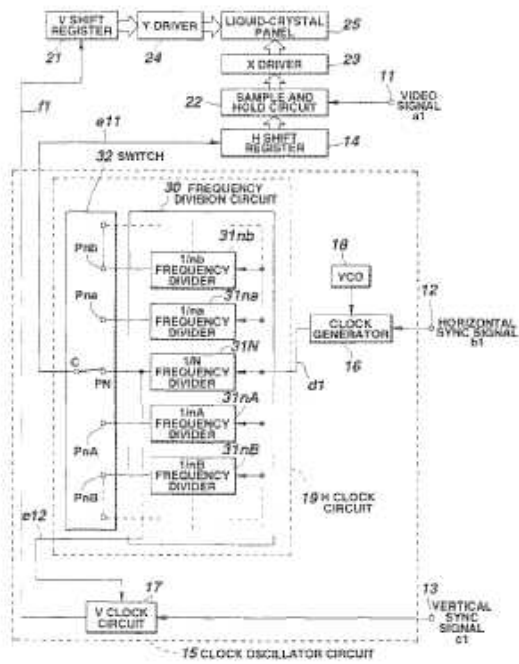
### **Special rules of classification**

Documents with interfaces to terminals will be classified in this group unless the structure of the interface is very much tied to the technology of the display (exceptional cases).

The codes [G09G 5/003](#) and below (thus including [G09G 5/006](#)) apply only if a monitor-architecture can be identified (click to see definition; the same rule applies for [G09G 3/2092](#) and [G09G 1/165](#)).

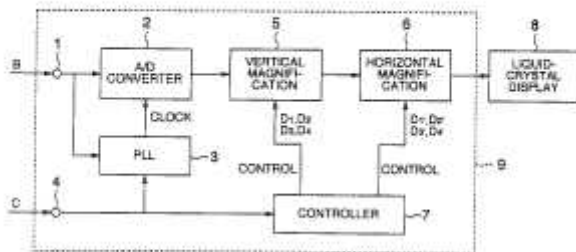
G09G 5/005 is applied

FIG.1



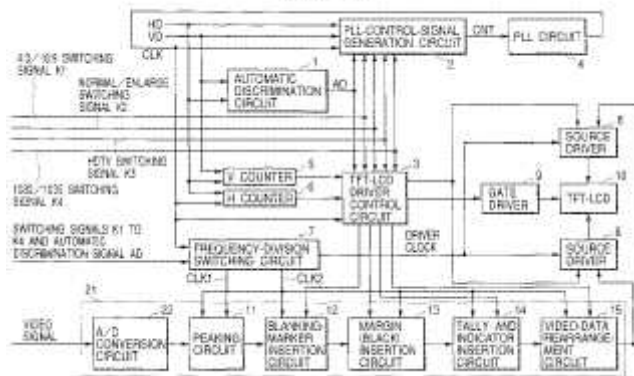
EP0765078

FIG.1



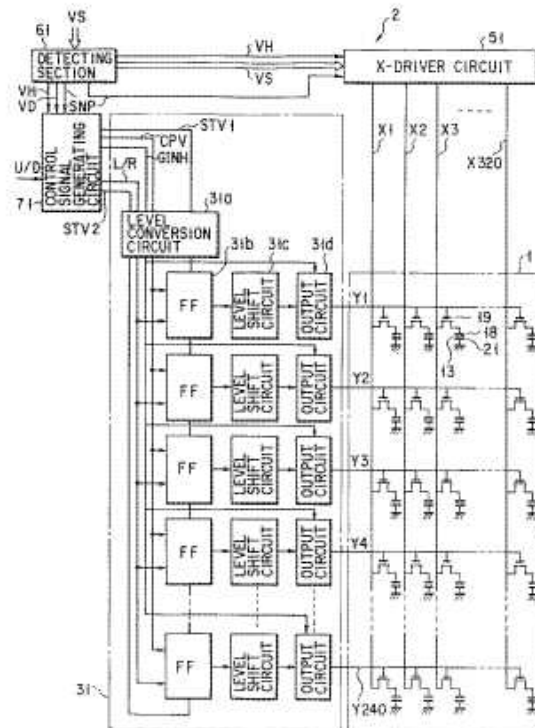
EP0821340

FIG. 1



EP1056285

For clock generation (typically by PLL) [G09G 5/008](#) (former [G09G 5/008](#) ) is applied



US6049318

Notes on new groups:

[G09G 5/006](#) is former [G09G 5/006](#) and [G09G 5/006](#)

[G09G 5/005](#) is former [G09G 5/005](#)

[G09G 5/008](#) is former [G09G 5/008](#)

The following groups should also be searched, because they have not yet been purged of documents for [G09G 5/005](#):

[G09G 3/3611](#): control of matrices with row and column drivers

[G06F 3/147](#): using display panels

[G06F 3/153](#): using cathode-ray tubes

[G09G 1/285](#): interfacing with colour displays

## **G09G 5/008**

### **{Clock recovery}**

#### **Definition statement**

*This place covers:*

Some digital data streams, especially high-speed serial data streams (also for analog signal with hsync and vsync synchro decoding to recreate the pixel clock) are sent without an accompanying clock signal. The receiver generates a clock from an approximate frequency reference, and then phase-aligns to the transitions in the data stream with a phase-locked loop (PLL). This process is commonly known as clock and data recovery (CDR).

In order for this scheme to work, a data stream must transition frequently enough to correct for any drift in the PLL's oscillator. The limit for how long a clock recovery unit can operate without a transition is known as its maximum consecutive identical digits (CID) specification. To ensure frequent transitions, some sort of encoding is used; 8B/10B encoding is very common, while Manchester encoding serves the same purpose.

### Special rules of classification

This group used to be a subgroup of [G09G 5/006](#) (now [G09G 5/006](#); see notes there), this code applies if the clock recovery is performed within the display interface of a monitor-architecture. Most of the documents in this group will relate to flat panels, since a CRT does not need, in general, any adaptation. It was decided, however, to have a single classification for all the documents dealing with this problem.

Notes on new groups:

[G09G 5/006](#) is former [G09G 5/006](#) and [G09G 5/006](#)

[G09G 5/005](#) is former [G09G 5/005](#)

[G09G 5/008](#) is former [G09G 5/008](#)

The following groups should also be searched, because they have not yet been purged of documents for [G09G 5/005](#):

[G09G 3/3611](#): control of matrices with row and column drivers

[G06F 3/147](#): using display panels

[G06F 3/153](#): using cathode-ray tubes

[G09G 1/285](#): interfacing with colour displays