418	**COMPUTER GRAPHICS PROCESSING**
419	.Three-dimension
420	..Solid modelling
421	..Hidden line/surface determining
422	...Z buffer (depth buffer)
423	..Tessellation
424	..Voxel
426	..Lighting/shading
427	..Space transformation
428	.Adjusting level of detail
581	.Attributes (surface detail or characteristic, display attributes)
582	..Texture
583	...Solid Texture
584	...Bump map
585	...Non-planar surface
586	...Mathematically defined
587	...MIP map
588	...Repeating pattern
589	..Color or intensity
590	...Gamut clipping or adjustment
591	...Color processing in perceptual color space
592	...Transparency (mixing color values)
593	...Color selection
594	....Using GUI
595	....Expert system or AI
596	...Dither or halftone
597	....Color
598	.....Spatial
599	....Spatial
600	...Color bit data modification or conversion
601	....Using look up table
602	.....Plural look up tables
603	....Format change (e.g., NTSC to RGB, RGB to composite, XYZ to RGB)
604	....Color space transformation (e.g., RGB to YUV)
605	....Change in number of bits for a designated color (e.g., 4 bits to 8 bits, 8 bits to 4 bits)
606	..Interpolation of attribute values across object surface
607	...In perspective
608	...Tri-linear
609	...Bi-linear
610	...Linear
611	..Anti-aliasing or image smoothing
612	...Save attributes for each object affecting a given pixel
613	...Subpixel processing
614	...Pixel fragment
615	...Convolving technique
616	...Error diffusion
617	..Contrast
618	..Image with abnormal condition
619	.Graphic manipulation (object processing or display attributes)
620	..Clipping
621	...Based on model of objects
622	....Testing or using bounding shape (e.g., bounding box sphere)
623	....Object clipped to view volume
624	....Object clipped to another object
625	...Based on image data
626	....Masking
627	....Non-rectangular array
628	....Rectangular region
629	..Merge or overlay
630	...Combining model representations
631	...Reducing redundancy
632	...Placing generated data in real scene
633	....Augmented reality (real-time)
634	...Image based
635	....Non-overlapping
636	....Character and graphics
637	....Priority based
638	....Insertion of bitmapped moving picture
639	....Weighted
640	.....Weights vary across image (e.g., transition from foreground to background)
641	....Fixed overlay pattern
642	..Picking
643	..Arithmetic processing of image data
644	...Matrix calculations
645	...Hierarchy of transformations (e.g., hierarchy of global and local coordinate)
646	..Morphing
647	..Distortion
648	..Affine

649	..Rotation
650	...Graphical user interface tools
651	....Alignment functions (e.g., snapping, gravity)
652	....Constrained manipulations (e.g., movement in less than all dimensions)
653	....3D manipulations
654	....2D manipulations
655	...Object based
656	...Image based (addressing)
657	....By arbitrary angle
658	....By 90 degrees increment
659	....Image rotates in response to display device orientation
660	..Scaling
661	...Graphical user interface tools
662	....Alignment functions (e.g., snapping, gravity)
663	....Constrained manipulations (i.e., movement in less than all dimensions)
664	....3D manipulations
665	....2D manipulations
666	...Object based
667	...Image based (addressing)
668	....By arbitrary ratio
669	....By integer multiples
670	....Reduction only
671	....Enlargement only
672	..Translation
673	...Averaging technique
674	...Copying data to create additional rows or columns
676	...Graphical user interface tools
677	....Alignment functions (e.g., snapping, gravity)
678	....Constrained manipulations (i.e., movement in less than all dimensions)
679	....3D manipulations
680	....2D manipulations
681	...Object based
682	...Image based (addressing)
683	....Sprite
684	....Scrolling
685	.....Alphanumeric
686	.....Memory addressing
687	......Smooth or continuous
688	.....Attribute changes during scrolling

689	..Textual entry or display of manipulation information (e.g., enter or display degree of rotation)
440	.Graph generating
440.1	..Real-time waveform display
440.2	..Bar graph
441	.Shape generating
442	..Curve
443	..Straight line
467	.Character generating
468	..Character geometry processing
469	...Character generation using control points or hints
469.1	..Character border
470	..Generating character fill data from outline data
471	..Alteration of stored font
472	...Scaling
472.1	....Reduction only
472.2	....Enlargement only
472.3	..Calligraphic
473	.Animation
474	..Motion planning or control
475	..Temporal interpolation or processing
156	**DISPLAY PERIPHERAL INTERFACE INPUT DEVICE**
157	.Cursor mark position control device
158	..Including orientation sensors (e.g., infrared, ultrasonic, remotely controlled)
159	..Having variable cursor speed
160	..Cursor key
161	..Joystick
162	..Positional storage means
163	..Mouse
164	...Rotatable ball detector
165	....Photosensor encoder
166	...Optical detector
167	..Trackball
168	.Including keyboard
169	..Portable (i.e., handheld, calculator, remote controller)
170	..Light source associated with each key
171	..Having foreign language capability (e.g., Japanese, Chinese)
172	..Having programmable function key
173	.Touch panel

174	..Including impedance detection
175	..Including optical detection
176	..Transparent substrate having light entrapment capability (i.e., waveguides)
177	..Including surface acoustic detection
178	..With alignment or calibration capability (i.e., parallax problem)
179	.Stylus
180	.Light pen for CRT display
181	..CRT having tracking capability
182	.Light pen for fluid matrix display panel
183	.Light pen for controlling plural light-emitting display elements (e.g., LED, lamps)
184	.Mechanical control (e.g., rotatable knob, slider)
501	**COMPUTER GRAPHIC PROCESSING SYSTEM**
502	.Plural graphics processors
503	..Coprocessor (e.g., graphic accelerator)
504	..Master-slave processors
505	..Parallel processors (e.g., identical processors)
506	..Pipeline processors
519	.Integrated circuit (e.g., single chip semiconductor device)
520	.Interface (e.g., controller)
522	.Graphic command processing
530	**COMPUTER GRAPHICS DISPLAY MEMORY SYSTEM**
531	.Graphic display memory controller
532	..Plural memory controllers
533	..Using different access modes
534	..Memory access timing signals
535	..Memory arbitration
536	.Plural storage devices
537	..Data transfer between memories
538	...Data transfer between system memory display memory
539	..Double buffered
540	..Interleaved
541	.Shared memory
542	..Unified memory architecture (e.g., UMA)
543	.Memory allocation
544	.Memory partitioning
545	.Frame buffer
546	..Multi-format frame buffer
547	..Memory for storing video data
548	..Off-screen memory
549	..Color memory
550	...Multiple planes
551	..Character memory
552	.Texture memory
553	.Display list memory
554	.Multi-port memory
555	.For storing compressed data
556	.For storing condition code, flag or status
557	.Cache
558	.First in first out (i.e., FIFO)
559	.Register
560	.Row buffer (e.g., line memory)
561	.Logical operations
562	..Bit block transfer
563	..Mask data operation
564	.Addressing
565	..Using memory for storing address information
566	..Address manipulation
567	...Using decoding
568	...Address translation (e.g., between virtual and physical addresses)
569	..For 2D coordinate to linear address conversion
570	..Page mode
571	..Memory addresses arranged in matrix row and column addresses)
572	..Address generator
573	...Plural address generators
574	...Read/Write address generator
204	**DISPLAY DRIVING CONTROL CIRCUITRY**
205	.Physically integral with display elements
206	..Having common base or substrate
207	.Light detection means (e.g., with photodetector)
690	.Intensity or color driving control (e.g., gray scale)
691	..Temporal processing (e.g., pulse width variation over time
692	...Binary weighted
693	...Non-binary weighted
694	..Spatial processing (e.g., patterns or subpixel configuration)
695	...Subpixels have different shapes
696	...Changing of subpixel location over time
697	..Including optical means

698	.Adjusting display pixel size or pixels per given area (i.e., resolution)
699	..Controller automatically senses monitor resolution
208	.Waveform generator coupled to display elements
209	..Field period polarity reversal
210	..Having three or more voltage levels
211	.Display power source
212	..Regulating means
213	..Synchronizing means
214	.Controlling the condition of display elements
215	..Including priming means
1.1	**PLURAL DISPLAY SYSTEMS**
1.2	.Data transmitted or received at surface of display
1.3	.Tiling or modular adjacent displays
2.1	.Remotely located
2.2	..Presentation of similar images
2.3	..Wireless connection
3.1	.Diverse systems (e.g., CRT or LCD interface)
3.2	..Frame, field or scan rate conversion
3.3	..Number of pixels per row or column conversion (i.e., resolution conversion)
3.4	...Controller automatically senses monitor resolution
4	**SINGLE DISPLAY SYSTEM HAVING STACKED SUPERIMPOSED DISPLAY DEVICES (E.G., TANDEM)**
5	.Diverse display devices
6	.Three-dimensional arrays
7	**IMAGE SUPERPOSITION BY OPTICAL MEANS (E.G., HEADS-UP DISPLAY)**
8	.Operator body-mounted heads-up display (e.g., helmet mounted display)
9	.Plural image superposition
10	**DATA RESPONSIVE CRT DISPLAY CONTROL**
11	.CRT provides display control
12	.Data responsive deflection and intensity control
13	.Data responsive deflection control
14	..X and Y axis deflection control
15	..Curvilinear deflection control (e.g., lissajous)
16	..Stroke or vector
17	...Strokes for forming characters
18	...Up/down counter
19	..Impedance Array
20	.Data responsive intensity control
21	..Magnetic element array
22	.Color display
23	.Graphic and alphanumeric display
24	.Graphic display
25	.Alphanumeric display
26	..Character generator
27	.Combined with storage means
28	..Addressing
29	.Delay line
30	**PLURAL PHYSICAL DISPLAY ELEMENT CONTROL SYSTEM (E.G., NON-CRT)**
31	.Physically movable array
32	.Optical means interposed in viewing path (e.g., filters, lens, etc.)
33	.Segmented display elements
34	..Seven segment display
35	..Bar graph
36	...Electroluminescent display elements
37	...Gas discharge display segments (e.g., plasma)
38	...Liquid crystal display segments
39	...Light-emitting diode segments (LEDS)
40	...Plural (e.g., stacked, adjacent)
41	..Fluid light-emitting display elements (e.g., gas, plasma)
42	...Controlling circuitry
43	..Mask or electrode shape
44	..Solid light-emitting display elements
45	...Electroluminescent
46	...Light-emitting diodes
47	..Fluorescent elements
48	..Light-controlling display elements
49	...Electrochromic elements
50	...Liquid crystal elements
51	....Display element selection circuitry
52	....Power supply generating circuitry
53	....Specific waveform (e.g., square waveforms, sinusoidal)
54	.....Field period polarity reversal

55	.Display elements arranged in matrix (e.g., rows and columns)
56	..Image shifting means (i.e., traveling message)
57	...Having endless belt or tape reader
58	..Crosstalk elimination
59	..Matrix for conveying alphanumeric data
60	..Fluid light emitter (e.g., gas, liquid, or plasma)
61	...Shifting means
62	....Specified plasma coupling path
63	...Intensity control
64	...Liquid light emitter
65	...Phosphor excited by fluid response
66	...Particular discharge path
67	...More than two electrodes per element
68	...Means for combining selective and sustain signals
69	....Resistor-diode arrangement
70	.....Including transformer
71	...Electrode insulated from fluid medium
72	...Color
73	..Incandescent
74.1	..Cathodolulminescent type
75.1	...Vacuum fluorescent
75.2	...Field emissive (e.g., FED, Spindt, microtip, etc.)
76	..Electroluminescent
77	...Brightness or intensity control
78	...Having compensating pulse
79	...Field period polarity reversal
80	...Driving means integral to substrate
81	...Optical addressing (e.g., photodetection)
82	..Solid body light emitter (e.g., LED)
83	...Color
84	..Light-controlling display elements
85	...Electroscopic (e.g., movable electrodes or electrostatic elements)
86	...Magneto-optic
87	...Liquid crystal display elements (LCD)
88	....Color

89	....Gray scale capability (e.g., halftone)
90	....Control means at each display element
91	.....Diode or varistor
92	.....Thin film tansistor (TFT)
93	.....Redundancy (e.g., plural control elements or electrodes)
94	....Waveform generation
95	.....Three or more voltages
96	.....Field period polarity reversal
97	.....Ferroelectric liquid crystal elements
98	....Specific display element control means (e.g., latches, memories, logic)
99	.....Particular timing circuit
100	.....Particular row or column control (e.g., shift register)
101	....Data signal compensation in response to temperature
102	....Backlight control
103	....Grouped electrodes (e.g., matrix partitioned into sections)
104	....Input/output liquid crystal display panel
105	...Electrochromic elements
106	...Thermochromic elements
107	...Particle suspensions (e.g., electrophoretic)
108	..Plural mechanically movable display elements
109	...Having shutters
110	...With motor or rotor driver means
111	...With a permanent magnet placed on movable display elements

CROSS-REFERENCE ART COLLECTIONS

901	**ELECTRONIC BOOK WITH DISPLAY**
902	**MENU DISPLAY**
903	**MODULAR DISPLAY**
904	**DISPLAY WITH FAIL/SAFE TESTING FEATURE**
905	**DISPLAY DEVICE WITH HOUSING STRUCTURE**
947	**FONT CHARACTER EDGE PROCESSING**

948	**ALTERATION OF STORED FONTS TO MAINTAIN FEATURE CONSISTENCY THROUGHOUT SCALED FONT**
949	**ANIMATION PROCESSING METHOD**
950	.Sprite processing
951	..Key frame processing
952	.Simulation
953	.Geometric processing
954	..Quaternions
955	.Morphing
956	.Language driven animation
957	..Actor
958	.Collision avoidance
959	.Object path adherence
960	.Iterative display of preconfigured images

FOREIGN ART COLLECTIONS

FOR 000 **CLASS-RELATED FOREIGN DOCUMENTS**

Any foreign patents or non-patent litera-
ture from subclasses that have been
reclassified have been transferred
directly to FOR Collections listed below.
These Collections contain ONLY foreign
patents or non-patent literature. The par-
enthetical references in the Collection
titles refer to the abolished subclasses
from which these Collections were derived.

PLURAL PHYSICAL DISPLAY ELEMENT CONTROL SYSTEM (E.G., NON-CRT) (345/30)

.Display elements arranged in matrix (e.g., rows and columns) (345/55)

FOR 100 ..Cathodolulminescent type (345/74)
FOR 101 ...Vacuum fluorescent (345/75)
FOR 102 ..Memory (345/521)
FOR 103 .Data manipulation (e.g., masking, interpolation) (345/523)
FOR 104 ..Logical operation (345/524)
FOR 105 ..Bit block transfer (345/525)
FOR 106 .Data transfer between graphic system components (345/526)
FOR 107 **DISPLAY STORAGE DEVICE (345/507)**
FOR 108 .Color memory (345/186)
FOR 109 ..Multiple planes (345/510)

FOR 110 ...Addressing with priority (345/188)
FOR 111 .Bit map or graphic memory (345/509)
FOR 112 ..Addressing (345/515)
FOR 113 ..Mask data operation (345/191)
FOR 114 .Character memory (345/192)
FOR 115 ..Addressing (345/193)
FOR 116 ..Character generator (345/194)
FOR 117 ...Multiple fonts (345/195)
FOR 118 .Row buffer (e.g., line memory) (345/196)
FOR 119 .Register (345/513)
FOR 120 ..Shift register (345/197)
FOR 121 ...With routing logic (345/198)
FOR 122 .Color look-up-table (e.g., palette) (345/199)
FOR 123 .Addressing circuuuitry (345/516)
FOR 124 ..Memory addresses arranged in matrix (e.g., row and column addresses) (345/517)
FOR 125 .Plural storage devices (345/508)
FOR 126 ..Data transfer between memories (345/511)
FOR 127 .Shared memory (345/512)
FOR 128 .Condition code, flag, or status (345/514)
FOR 129 .Multiple port access (345/518)
FOR 130 .Data compression or compaction (345/202)
FOR 131 .Significant data assignment in storage device (345/203)
FOR 132 **PLURAL DISPLAY SYSTEMS (345/1)**
FOR 133 .Remotely located (345/2)
FOR 134 .Diverse systems (e.g., CRT/LCD interface) (345/3)
FOR 135 **DISPLAY ATTRIBUTE CONTROLLER (345/112)**
FOR 136 .Particular overlay (e.g., superimposing feature) (345/113)
FOR 137 ..Foreground and background (345/114)
FOR 138 .Simultaneous diverse images (345/115)
FOR 139 ..Character and graphical display (345/116)
FOR 140 .Specified image of abnormal condition (345/117)
FOR 141 .Having image confined to designated region (e.g., image clipping) (345/118)
FOR 142 .Image movement or position control (e.g., panning) (345/121)

FOR 143 ..Scrolling (345/123)
FOR 144 ...Alphanumeric (345/124)
FOR 145 ...Graphical (345/125)
FOR 146 ..Rotation (345/126)
FOR 147 .Image size control (345/127)
FOR 148 ..Alphanumeric (345/128)
FOR 149 ...Reduction (345/129)
FOR 150 ...Enlargement (345/130)
FOR 151 ..Graphical (345/131)
FOR 152 .Defined resolution (e.g., EGA,
        VGA) (345/132)
FOR 153 .Graphic display (345/133)
FOR 154 ..Waveform display (e.g.,
        oscilloscope type) (345/134)
FOR 155 ..Vector display (345/135)
FOR 156 ..With image smoothing control
        (e.g., anti-aliasing) (345/
        136)
FOR 157 ...Convolving technique (345/137)
FOR 158 ..Averaging technique (345/138)
FOR 159 ..Perspective (345/139)
FOR 160 ..Bar graph (345/140)
FOR 161 .Character display (345/141)
FOR 162 ..Calligraphic (345/142)
        COMPUTER GRAPHICS PROCESSING
        (345/418)
        .Character generating (345/467)
FOR 163 ..Character border (345/144)
FOR 164 **CURSOR MANIPULATION (345/145)**
FOR 165 .Menu selection (345/146)
        DISPLAY ATTRIBUTE CONTROLLER
        (345/112)
FOR 166 .Intensity control (e.g., gray
        scale) (345/147)
FOR 167 ..Temporal processing (e.g.,
        pulse width variation over
        time) (345/148)
FOR 168 ..Spatial processing (e.g.,
        patterns or subpixel
        configurations) (345/149)
FOR 169 .Selectable color attributes
        (345/150)
FOR 170 ..Including optical means (345/
        151)
FOR 171 ..Designated subpixel arrangement
        (345/152)
FOR 172 ..Color bit data modification or
        conversion (345/153)
FOR 173 ...Format change (e.g., NTSC to
        RGB, RGB to composite, or XYZ
        to RGB) (345/154)
FOR 174 ...Change in number of bits for a
        designated color (e.g., 4 bits
        to 8 bits, 8 bits to 4 bits)
        (345/155)

COMPUTER GRAPHICS PROCESSING
        (345/418)
FOR 175 .Synchronization of diverse media
        (345/302)
        COMPUTER GRAPHICS PROCESSING
        (345/418)
        .Three-dimension (345/419)
FOR 209 ..Mapping image onto surface of
        3D object (345/425)
FOR 210 .Surface detail/characteristic
        (345/429)
FOR 211 ..Texture (345/430)
FOR 212 ..Color (345/431)
FOR 213 ..Intensity (345/432)
FOR 214 .Object processing (345/433)
FOR 215 ..Clipping (345/434)
FOR 216 ..Merge/overlay (345/435)
FOR 217 ..Affine (345/436)
FOR 218 ..Rotation (345/437)
FOR 219 ..Translation (345/438)
FOR 220 ..Sealing (345/439)