

# CPC COOPERATIVE PATENT CLASSIFICATION

## G PHYSICS (NOTES omitted)

### INSTRUMENTS

## G02 OPTICS (NOTE omitted)

## G02F OPTICAL DEVICES OR ARRANGEMENTS FOR THE CONTROL OF LIGHT BY MODIFICATION OF THE OPTICAL PROPERTIES OF THE MEDIA OF THE ELEMENTS INVOLVED THEREIN; NON-LINEAR OPTICS; FREQUENCY-CHANGING OF LIGHT; OPTICAL LOGIC ELEMENTS; OPTICAL ANALOGUE/DIGITAL CONVERTERS

### WARNINGS

- The following IPC groups are not in the CPC scheme. The subject matter for these IPC groups is classified in the following CPC groups:

Subject matter covered by these groups is classified in the following CPC groups:

[G02F 1/13357](#) covered by [G02F 1/1336](#) and subgroups

- In this subclass non-limiting references (in the sense of paragraph 39 of the Guide to the IPC) may still be displayed in the scheme.

**1/00** **Devices or arrangements for the control of the intensity, colour, phase, polarisation or direction of light arriving from an independent light source, e.g. switching, gating or modulating; Non-linear optics**

### NOTE

This group covers only :

- devices or arrangements, e.g. cells, the optical operation of which is modified by changing the optical properties of the medium of the devices or arrangements by the influence or control of physical parameters, e.g. electric fields, electric current, magnetic fields, sound or mechanical vibrations, stress or thermal effects;
- devices or arrangements in which the electric or magnetic field component of the light beams influences the optical properties of the medium, i.e. non-linear optics;
- control of light by electromagnetic waves, e.g. radio waves, or by electrons or other elementary particles.

1/0009 . . {Materials therefor}

### NOTE

{[G02F 1/0009](#) and subgroups contain mostly non-patent literature.}

1/0018 . . {Electro-optical materials}

1/0027 . . . {Ferro-electric materials}

1/0036 . . {Magneto-optical materials}

1/0045 . . {Liquid crystals characterised by their physical properties}

1/0054 . . {Structure, phase transitions, NMR, ESR, Moessbauer spectra}

1/0063 . . {Optical properties, e.g. absorption, reflection or birefringence (materials for non-linear optics [G02F 1/355](#))}

1/0072 . . {Mechanical, acoustic, electro-elastic, magneto-elastic properties}

1/0081 . . {Electric or magnetic properties}

1/009 . . {Thermal properties}

1/01 . . for the control of the intensity, phase, polarisation or colour ([G02F 1/29](#), [G02F 1/35](#) take precedence)

1/0102 . . {Constructional details, not otherwise provided for in this subclass}

1/0105 . . . {Illuminating devices}

1/0107 . . . {Gaskets, spacers or sealing of cells; Filling and closing of cells}

1/011 . . {in optical waveguides, not otherwise provided for in this subclass}

1/0113 . . . {Glass-based, e.g. silica-based, optical waveguides}

1/0115 . . . {in optical fibres}

1/0118 . . . . {by controlling the evanescent coupling of light from a fibre into an active, e.g. electro-optic, overlay}

1/0121 . . {Operation of devices; Circuit arrangements, not otherwise provided for in this subclass}

1/0123 . . . {Circuits for the control or stabilisation of the bias voltage, e.g. automatic bias control [ABC] feedback loops}

1/0126 . . {Opto-optical modulation, i.e. control of one light beam by another light beam, not otherwise provided for in this subclass}

1/0128 . . {based on electro-mechanical, magneto-mechanical, elasto-optic effects}

1/0131 . . . {based on photo-elastic effects, e.g. mechanically induced birefringence}

1/0134 . . . . {in optical waveguides}

- 1/0136 . . {for the control of polarisation, e.g. state of polarisation [SOP] control, polarisation scrambling, TE-TM mode conversion or separation ([G02F 1/0353 takes precedence](#))}
- 1/0139 . . . {Polarisation scrambling devices; Depolarisers}
- 1/0142 . . . {TE-TM mode conversion}
- 1/0144 . . . {TE-TM mode separation}
- 1/0147 . . {based on thermo-optic effects ([G02F 1/132 takes precedence](#))}
- 1/015 . . based on semiconductor elements having potential barriers, e.g. having a PN or PIN junction ([G02F 1/03 takes precedence](#))
- 1/0151 . . . {modulating the refractive index}
- 1/0152 . . . . {using free carrier effects, e.g. plasma effect}
- 1/0153 . . . . {using electro-refraction, e.g. Kramers-Kronig relation}
- 1/0154 . . . . {using electro-optic effects, e.g. linear electro optic [LEO], Pockels, quadratic electro optical [QEO] or Kerr effect}
- 1/0155 . . . {modulating the optical absorption}
- 1/0156 . . . . {using free carrier absorption}
- 1/0157 . . . . {using electro-absorption effects, e.g. Franz-Keldysh [FK] effect or quantum confined stark effect [QCSE]}
- 1/0158 . . . . . {Blue-shift of the absorption band}
- 1/0159 . . . . . {Red-shift of the absorption band}
- 1/017 . . . Structures with periodic or quasi periodic potential variation, e.g. superlattices, quantum wells
- 1/01708 . . . . {in an optical waveguide structure}
- 1/01716 . . . . {Optically controlled superlattice or quantum well devices}
- 1/01725 . . . . {Non-rectangular quantum well structures, e.g. graded or stepped quantum wells}
- 1/01733 . . . . . {Coupled or double quantum wells}
- 1/01741 . . . . . {Asymmetrically coupled or double quantum wells}
- 1/0175 . . . . . {with a spatially varied well profile, e.g. graded or stepped quantum wells}
- 1/01758 . . . . . {with an asymmetric well profile, e.g. asymmetrically stepped quantum wells}
- 1/01766 . . . . {Strained superlattice devices; Strained quantum well devices}
- 1/01775 . . . . {involving an inter-subband transition in one well, e.g. e1->e2}
- 1/01783 . . . . {Quantum wires}
- 1/01791 . . . . {Quantum boxes or quantum dots}
- 1/025 . . . in an optical waveguide structure ([G02F 1/017](#), [G02F 1/2257](#) take precedence)
- 1/03 . . based on ceramics or electro-optical crystals, e.g. exhibiting Pockels effect or Kerr effect ([G02F 1/061 takes precedence](#))
- 1/0305 . . . {Constructional arrangements ([G02F 1/0327 - G02F 1/05 take precedence](#))}
- 1/0311 . . . . {Structural association of optical elements, e.g. lenses, polarizers, phase plates, with the crystal}
- 1/0316 . . . . {Electrodes}
- 1/0322 . . . . {Arrangements comprising two or more independently controlled crystals}
- 1/0327 . . . {Operation of the cell; Circuit arrangements ([G02F 1/05 takes precedence](#))}
- 1/0333 . . . {addressed by a beam of charged particles ([G02F 1/05 takes precedence](#))}
- 1/0338 . . . {structurally associated with a photoconductive layer or having photo-refractive properties ([G02F 1/05 takes precedence](#))}
- 1/0344 . . . {controlled by a high-frequency electromagnetic wave component in an electric waveguide ([G02F 1/0356](#), [G02F 1/05](#), [G02F 1/2255](#), [G02F 1/3134 take precedence](#))}
- 1/035 . . . in an optical waveguide structure
- 1/0353 . . . . {involving an electro-optic TE-TM mode conversion}
- 1/0356 . . . . {controlled by a high-frequency electromagnetic wave component in an electric waveguide structure}
- 1/05 . . . with ferro-electric properties ([G02F 1/035](#), [G02F 1/055 take precedence](#))
- 1/0508 . . . . {specially adapted for gating or modulating in optical waveguides}
- 1/0516 . . . . {Operation of the cell; Circuit arrangements}
- 1/0525 . . . . {addressed by a beam of charged particles}
- 1/0533 . . . . {structurally associated with a photoconductive layer}
- 1/0541 . . . . {using photorefractive effects}
- 1/055 . . . the active material being a ceramic ([G02F 1/035 takes precedence](#))
- 1/0551 . . . . {Constructional details}
- 1/0553 . . . . {specially adapted for gating or modulating in optical waveguides}
- 1/0555 . . . . {Operation of the cell; Circuit arrangements}
- 1/0556 . . . . {specially adapted for a particular application}
- 1/0558 . . . . {structurally associated with a photoconductive layer or exhibiting photorefractive properties}
- 1/061 . . based on electro-optical organic material ([G02F 1/07](#), [G02F 1/13](#) take precedence)
- 1/065 . . . in an optical waveguide structure
- 1/07 . . based on electro-optical liquids exhibiting Kerr effect
- 1/073 . . . {specially adapted for gating or modulating in optical waveguides}
- 1/076 . . . {Operation of the cell; Circuit arrangements}
- 1/09 . . based on magneto-optical elements, e.g. exhibiting Faraday effect
- 1/091 . . . {based on magneto-absorption or magneto-reflection}
- 1/092 . . . {Operation of the cell; Circuit arrangements}
- 1/093 . . . {used as non-reciprocal devices, e.g. optical isolators, circulators ([G02F 1/0955 takes precedence](#))}
- 1/094 . . . {based on magnetophoretic effect}
- 1/095 . . . in an optical waveguide structure
- 1/0955 . . . . {used as non-reciprocal devices, e.g. optical isolators, circulators}
- 1/11 . . based on acousto-optical elements, e.g. using variable diffraction by sound or like mechanical waves ([acousto-optical deflection G02F 1/33](#))
- 1/113 . . . {Circuit or control arrangements}
- 1/116 . . . {using an optically anisotropic medium, wherein the incident and the diffracted light waves have different polarizations, e.g. acousto-optic tunable filter [AOTF] ([G02F 1/125 takes precedence](#))}

- 1/125 . . . in an optical waveguide structure
- 1/13 . . based on liquid crystals, e.g. single liquid crystal display cells
- 1/1303 . . . {Apparatus specially adapted to the manufacture of LCDs}
- 1/1306 . . . {Details}
- 1/1309 . . . . {Repairing; Testing}
- 1/1313 . . . {specially adapted for a particular application}
- 1/1316 . . . {Methods for cleaning the liquid crystal cells, or components thereof, during manufacture: Materials therefor}
- 1/132 . . . {Thermal activation of liquid crystals exhibiting a thermo-optic effect}
- 1/1323 . . . {Arrangements for providing a switchable viewing angle}
- 1/1326 . . . {Liquid crystal optical waveguides or liquid crystal cells specially adapted for gating or modulating between optical waveguides}
- 1/133 . . . Constructional arrangements; Operation of liquid crystal cells; Circuit arrangements (arrangements or circuits for control of liquid crystal elements in a matrix, not structurally associated with these elements [G09G 3/36](#))
- 1/13306 . . . . {Circuit arrangements or driving methods for the control of single liquid crystal cells ([G02F 1/132](#), [G02F 1/133382](#) take precedence)}
- 1/13312 . . . . {Circuits comprising photodetectors for purposes other than feedback}
- 1/13318 . . . . {Circuits comprising a photodetector}
- 1/13324 . . . . {Circuits comprising solar cells}
- 1/1333 . . . . Constructional arrangements; {Manufacturing methods} ([G02F 1/135](#), [G02F 1/136](#) take precedence)
- 1/133302 . . . . {Rigid substrates, e.g. inorganic substrates}
- 1/133305 . . . . {Flexible substrates, e.g. plastics, organic film}
- 1/133308 . . . . {Support structures for LCD panels, e.g. frames or bezels}
- 1/133311 . . . . {Environmental protection, e.g. against dust or humidity}
- 1/133314 . . . . {Back frames}
- 1/133317 . . . . {Intermediate frames, e.g. between backlight housing and front frame}
- 1/13332 . . . . {Front frames}
- 1/133322 . . . . {Mechanical guidance or alignment of LCD panel support components}
- 1/133325 . . . . {Assembling processes}
- 1/133328 . . . . {Segmented frames}
- 1/133331 . . . . {Cover glasses}
- 1/133334 . . . . {Electromagnetic shields}
- 1/133337 . . . . {Layers preventing ion diffusion, e.g. by ion absorption}
- 1/13334 . . . . {Plasma addressed liquid crystal cells [PALC]}
- 1/133342 . . . . {for double-sided displays}
- 1/133345 . . . . {Insulating layers ([G02F 1/1335](#), [G02F 1/1337](#), [G02F 1/135](#), [G02F 1/136](#) take precedence)}
- 1/133348 . . . . {Charged particles addressed liquid crystal cells, e.g. controlled by an electron beam}
- 1/133351 . . . . {Manufacturing of individual cells out of a plurality of cells, e.g. by dicing}
- 1/133354 . . . . {Arrangements for aligning or assembling substrates}
- 1/133357 . . . . {Planarisation layers}
- 1/13336 . . . . {Combining plural substrates to produce large-area displays, e.g. tiled displays}
- 1/133362 . . . . {Optically addressed liquid crystal cells ([G02F 1/135](#) takes precedence)}
- 1/133365 . . . . {Cells in which the active layer comprises a liquid crystalline polymer}
- 1/133368 . . . . {Cells having two substrates with different characteristics, e.g. different thickness or material}
- 1/133371 . . . . {Cells with varying thickness of the liquid crystal layer}
- 1/133374 . . . . {for displaying permanent signs or marks}
- 1/133377 . . . . {Cells with plural compartments or having plurality of liquid crystal microcells partitioned by walls, e.g. one microcell per pixel}
- 1/13338 . . . . {Input devices, e.g. touch panels}
- 1/133382 . . . . {Heating or cooling of liquid crystal cells other than for activation, e.g. circuits or arrangements for temperature control, stabilisation or uniform distribution over the cell}
- 1/133385 . . . . . {with cooling means, e.g. fans}
- 1/133388 . . . . {with constructional differences between the display region and the peripheral region}
- 1/133391 . . . . {Constructional arrangement for sub-divided displays}
- 1/133394 . . . . {Piezoelectric elements associated with the cells}
- 1/133397 . . . . {for suppressing after-image or image-sticking}
- 1/1334 . . . . based on polymer dispersed liquid crystals, e.g. microencapsulated liquid crystals
- 1/13342 . . . . . {Holographic polymer dispersed liquid crystals}
- 1/13345 . . . . . {Network or three-dimensional gels}
- 1/13347 . . . . . {working in reverse mode, i.e. clear in the off-state and scattering in the on-state}
- 1/1335 . . . . Structural association of cells with optical devices, e.g. polarisers or reflectors
- 1/133502 . . . . . {Antiglare, refractive index matching layers}
- 1/133504 . . . . . {Diffusing, scattering, diffracting elements (associated to illuminating devices [G02F 1/133606](#))}
- 1/133507 . . . . . {Films for enhancing the luminance}
- 1/133509 . . . . . {Filters, e.g. light shielding masks}
- 1/133512 . . . . . {Light shielding layers, e.g. black matrix ([G02F 1/136209](#) takes precedence)}
- 1/133514 . . . . . {Colour filters}
- 1/133516 . . . . . {Methods for their manufacture, e.g. printing, electro-deposition or photolithography}
- 1/133519 . . . . . {Overcoatings}
- 1/133521 . . . . . {Interference filters}
- 1/133524 . . . . . {Light-guides, e.g. fibre-optic bundles, louvered or jalousie light-guides}

- 1/133526 . . . . . {Lenses, e.g. microlenses or Fresnel lenses}
- 1/133528 . . . . . {Polarisers}
- 1/133531 . . . . . {characterised by the arrangement of polariser or analyser axes}
- 1/133533 . . . . . {Colour selective polarisers ([G02F 1/1347 takes precedence](#))}
- 1/133536 . . . . . {Reflective polarizers ([G02F 1/13362 takes precedence](#))}
- 1/133538 . . . . . {with spatial distribution of the polarisation direction}
- 1/133541 . . . . . {Circular polarisers}
- 1/133543 . . . . . {Cholesteric polarisers}
- 1/133545 . . . . . {Dielectric stack polarisers}
- 1/133548 . . . . . {Wire-grid polarisers}
- 1/13355 . . . . . {Polarising beam splitters [PBS]}
- 1/133553 . . . . . {Reflecting elements ([associated to illuminating devices G02F 1/133605](#))}
- 1/133555 . . . . . {Transflectors}
- 1/133557 . . . . . {Half-mirrors}
- 1/13356 . . . . . {characterised by the placement of the optical elements}
- 1/133562 . . . . . {on the viewer side}
- 1/133565 . . . . . {inside the LC elements, i.e. between the cell substrates}
- 1/133567 . . . . . {on the back side}
- 1/1336 . . . . . {Illuminating devices}
- 1/133601 . . . . . {for spatial active dimming}
- 1/133602 . . . . . {Direct backlight}
- 1/133603 . . . . . {with LEDs}
- 1/133604 . . . . . {with lamps}
- 1/133605 . . . . . {including specially adapted reflectors}
- 1/133606 . . . . . {including a specially adapted diffusing, scattering or light controlling members}
- 1/133607 . . . . . {the light controlling member including light directing or refracting elements, e.g. prisms or lenses}
- 1/133608 . . . . . {including particular frames or supporting means}
- 1/133609 . . . . . {including means for improving the color mixing, e.g. white}
- 1/133611 . . . . . {including means for improving the brightness uniformity}
- 1/133612 . . . . . {Electrical details}
- 1/133613 . . . . . {characterized by the sequence of light sources}
- 1/133614 . . . . . {using photoluminescence, e.g. phosphors illuminated by UV or blue light}
- 1/133615 . . . . . {Edge-illuminating devices, i.e. illuminating from the side}
- 1/133616 . . . . . {Front illuminating devices}
- 1/133617 . . . . . {Illumination with ultraviolet light; Luminescent elements or materials associated to the cell}
- 1/133618 . . . . . {for ambient light}
- 1/13362 . . . . . {providing polarized light, e.g. by converting a polarisation component into another one}
- 1/133621 . . . . . {providing coloured light ([G02F 1/133617, G02F 1/133533 take precedence](#))}
- 1/133622 . . . . . {Colour sequential illumination}
- 1/133623 . . . . . {Inclined coloured light beams}
- 1/133624 . . . . . {characterised by their spectral emissions}
- 1/133625 . . . . . {Electron stream lamps}
- 1/133626 . . . . . {providing two modes of illumination, e.g. day-night}
- 1/133627 . . . . . {Projection-direct viewing}
- 1/133628 . . . . . {with cooling means}
- 1/13363 . . . . . Birefringent elements, e.g. for optical compensation
- 1/133631 . . . . . {with a spatial distribution of the retardation value}
- 1/133632 . . . . . {with refractive index ellipsoid inclined relative to the LC-layer surface}
- 1/133633 . . . . . {using mesogenic materials}
- 1/133634 . . . . . {the refractive index  $N_z$  perpendicular to the element surface being different from in-plane refractive indices  $N_x$  and  $N_y$ , e.g. biaxial or with normal optical axis}
- 1/133635 . . . . . {Multifunctional compensators}
- 1/133636 . . . . . {with twisted orientation, e.g. comprising helically oriented LC-molecules or a plurality of twisted birefringent sublayers}
- 1/133637 . . . . . {characterised by the wavelength dispersion}
- 1/133638 . . . . . {Waveplates, i.e. plates with a retardation value of  $\lambda/2n$ }
- 1/1337 . . . . . Surface-induced orientation of the liquid crystal molecules, e.g. by alignment layers
- 1/133703 . . . . . {by introducing organic surfactant additives into the liquid crystal material}
- 1/133707 . . . . . {Structures for producing distorted electric fields, e.g. bumps, protrusions, recesses, slits in pixel electrodes}
- 1/133711 . . . . . {by organic films, e.g. polymeric films}
- 1/133715 . . . . . {by first depositing a monomer}
- 1/133719 . . . . . {with coupling agent molecules, e.g. silane}
- 1/133723 . . . . . {Polyimide, polyamide-imide}
- 1/133726 . . . . . {made of a mesogenic material}
- 1/13373 . . . . . {Disclination line; Reverse tilt}
- 1/133734 . . . . . {by obliquely evaporated films, e.g. Si or SiO<sub>2</sub> films}
- 1/133738 . . . . . {for homogeneous alignment}
- 1/133742 . . . . . {for homeotropic alignment}
- 1/133746 . . . . . {for high pretilt angles, i.e. higher than 15 degrees}
- 1/133749 . . . . . {for low pretilt angles, i.e. lower than 15 degrees}
- 1/133753 . . . . . {with different alignment orientations or pretilt angles on a same surface, e.g. for grey scale or improved viewing angle}
- 1/133757 . . . . . {with different alignment orientations}
- 1/133761 . . . . . {with different pretilt angles}
- 1/133765 . . . . . {without a surface treatment}



- 1/133769 . . . . . {comprising an active, e.g. switchable, alignment layer}
- 1/133773 . . . . . {the alignment material or treatment being different for the two opposite substrates}
- 1/133776 . . . . . {having structures locally influencing the alignment, e.g. unevenness}
- 1/13378 . . . . . {by treatment of the surface, e.g. embossing, rubbing or light irradiation ([G02F 1/133711](#), [G02F 1/133734](#), [G02F 1/133753](#) take precedence)}
- 1/133784 . . . . . {by rubbing}
- 1/133788 . . . . . {by light irradiation, e.g. linearly polarised light photo-polymerisation}
- 1/133792 . . . . . {by etching}
- 1/133796 . . . . . {having conducting property}
- 1/1339 . . . . . Gaskets; Spacers; Sealing of cells
- 1/13392 . . . . . {spacers dispersed on the cell substrate, e.g. spherical particles, microfibres}
- 1/13394 . . . . . {spacers regularly patterned on the cell substrate, e.g. walls, pillars ([G02F 1/133377](#) takes precedence)}
- 1/13396 . . . . . {Spacers having different sizes}
- 1/13398 . . . . . {Spacer materials; Spacer properties}
- 1/1341 . . . . . Filling or closing of cells
- 1/13415 . . . . . {Drop filling process}
- 1/1343 . . . . . Electrodes {([reflective electrodes G02F 1/133553](#))}
- 1/134309 . . . . . {characterised by their geometrical arrangement}
- 1/134318 . . . . . {having a patterned common electrode}
- 1/134327 . . . . . {Segmented, e.g. alpha numeric display}
- 1/134336 . . . . . {Matrix}
- 1/134345 . . . . . {Subdivided pixels, e.g. for grey scale or redundancy}
- 1/134354 . . . . . {the sub-pixels being capacitively coupled}
- 1/134363 . . . . . {for applying an electric field parallel to the substrate, i.e. in-plane switching [IPS]}
- 1/134372 . . . . . {for fringe field switching [FFS] where the common electrode is not patterned}
- 1/134381 . . . . . {Hybrid switching mode, i.e. for applying an electric field with components parallel and orthogonal to the substrates}
- 1/13439 . . . . . {characterised by their electrical, optical, physical properties; materials therefor; method of making}
- 1/1345 . . . . . Conductors connecting electrodes to cell terminals
- 1/13452 . . . . . {Conductors connecting driver circuitry and terminals of panels}
- 1/13454 . . . . . {Drivers integrated on the active matrix substrate ([G02F 1/136277](#) takes precedence)}
- 1/13456 . . . . . {Cell terminals located on one side of the display only}
- 1/13458 . . . . . {Terminal pads}
- 1/1347 . . . . . Arrangement of liquid crystal layers or cells in which the final condition of one light beam is achieved by the addition of the effects of two or more layers or cells
- 1/13471 . . . . . {in which all the liquid crystal cells or layers remain transparent, e.g. FLC, ECB, DAP, HAN, TN, STN, SBE-LC cells ([G02F 1/13475](#) takes precedence)}
- 1/13473 . . . . . {for wavelength filtering or for colour display without the use of colour mosaic filters}
- 1/13475 . . . . . {in which at least one liquid crystal cell or layer is doped with a pleochroic dye, e.g. GH-LC cell ([G02F 1/13476](#) takes precedence)}
- 1/13476 . . . . . {in which at least one liquid crystal cell or layer assumes a scattering state}
- 1/13478 . . . . . {based on selective reflection}
- 1/135 . . . . . Liquid crystal cells structurally associated with a photoconducting or a ferro-electric layer, the properties of which can be optically or electrically varied {([G02F 1/133348](#) takes precedence)}
- 1/1351 . . . . . {Light-absorbing or blocking layers}
- 1/1352 . . . . . {Light-reflecting layers}
- 1/1354 . . . . . {having a particular photoconducting structure or material}
- 1/1355 . . . . . {Materials or manufacture processes thereof}
- 1/1357 . . . . . {Electrode structure}
- 1/1358 . . . . . {the supplementary layer being a ferro-electric layer}
- 1/136 . . . . . Liquid crystal cells structurally associated with a semi-conducting layer or substrate, e.g. cells forming part of an integrated circuit ([G02F 1/135](#) takes precedence)
- 1/13606 . . . . . {having means for reducing parasitic capacitance}
- 1/13613 . . . . . {the semiconductor element being formed on a first substrate and thereafter transferred to the final cell substrate}
- 1/1362 . . . . . Active matrix addressed cells {([G02F 1/134336](#), [G02F 1/134363](#) take precedence)}
- 1/136204 . . . . . {Arrangements to prevent high voltage or static electricity failures}
- 1/136209 . . . . . {Light shielding layers, e.g. black matrix, incorporated in the active matrix substrate, e.g. structurally associated with the switching element}
- 1/136213 . . . . . {Storage capacitors associated with the pixel electrode}
- 1/136218 . . . . . {Shield electrodes}
- 1/136222 . . . . . {Colour filters incorporated in the active matrix substrate}
- 1/136227 . . . . . {Through-hole connection of the pixel electrode to the active element through an insulation layer}
- 1/136231 . . . . . {for reducing the number of lithographic steps}
- 1/136236 . . . . . {using a grey or half tone lithographic process}
- 1/13624 . . . . . {having more than one switching element per pixel}

- 1/136245 . . . . . {having complementary transistors}
- 1/13625 . . . . . {Patterning using multi-mask exposure}
- 1/136254 . . . . . {Checking; Testing}
- 1/136259 . . . . . {Repairing; Defects}
- 1/136263 . . . . . {Line defects}
- 1/136268 . . . . . {Switch defects}
- 1/136272 . . . . . {Auxiliary lines}
- 1/136277 . . . . . {formed on a semiconductor substrate, e.g. of silicon}
- 1/136281 . . . . . {having a transmissive semiconductor substrate}
- 1/136286 . . . . . {Wiring, e.g. gate line, drain line}
- 1/13629 . . . . . {Multilayer wirings}
- 1/136295 . . . . . {Materials; Compositions; Manufacture processes}
- 1/1365 . . . . . in which the switching element is a two-electrode device {(G02F 1/136277 takes precedence)}
- 1/1368 . . . . . in which the switching element is a three-electrode device {(G02F 1/136277 takes precedence)}
- 1/13685 . . . . . {Top gates}
- 1/137 . . . characterised by the electro-optical or magneto-optical effect, e.g. field-induced phase transition, orientation effect, guest-host interaction or dynamic scattering
- 1/13706 . . . . {the liquid crystal having positive dielectric anisotropy}
- 1/13712 . . . . {the liquid crystal having negative dielectric anisotropy}
- 1/13718 . . . . {based on a change of the texture state of a cholesteric liquid crystal}
- 1/13725 . . . . {based on guest-host interaction (G02F 1/13762, G02F 1/13737, take precedence)}
- 1/13731 . . . . {based on a field-induced phase transition (G02F 1/13781 takes precedence)}
- 1/13737 . . . . {in liquid crystals doped with a pleochroic dye}
- 1/13743 . . . . {based on electrohydrodynamic instabilities or domain formation in liquid crystals}
- 1/1375 . . . . {using dynamic scattering}
- 1/13756 . . . . {the liquid crystal selectively assuming a light-scattering state (G02F 1/1334, G02F 1/13718 take precedence)}
- 1/13762 . . . . {containing luminescent or electroluminescent additives}
- 1/13768 . . . . {based on magneto-optical effects}
- 1/13775 . . . . {Polymer-stabilized liquid crystal layers}
- 1/13781 . . . . {using smectic liquid crystals (G02F 1/141 takes precedence)}
- 1/13787 . . . . {Hybrid-alignment cells (G02F 1/1393 takes precedence)}
- 1/13793 . . . . {Blue phases}
- 1/139 . . . . based on orientation effects in which the liquid crystal remains transparent
- 1/1391 . . . . {Bistable or multi-stable liquid crystal cells (G02F 1/141 takes precedence)}
- 1/1392 . . . . {using a field-induced sign-reversal of the dielectric anisotropy}
- 1/1393 . . . . {the birefringence of the liquid crystal being electrically controlled, e.g. ECB-, DAP-, HAN-, PI-LC cells (G02F 1/1396, G02F 1/141 take precedence)}
- 1/1395 . . . . {Optically compensated birefringence [OCB]- cells or PI- cells}
- 1/1396 . . . . {the liquid crystal being selectively controlled between a twisted state and a non-twisted state, e.g. TN-LC cell (G02F 1/141 takes precedence)}
- 1/1397 . . . . {the twist being substantially higher than 90°, e.g. STN-, SBE-, OMI-LC cells}
- 1/1398 . . . . {the twist being below 90°}
- 1/141 . . . . using ferroelectric liquid crystals
- 1/1412 . . . . {Antiferroelectric liquid crystals}
- 1/1414 . . . . {Deformed helix ferroelectric [DHL]}
- 1/1416 . . . . {Details of the smectic layer structure, e.g. bookshelf, chevron, C1 and C2}
- 1/1418 . . . . {using smectic liquid crystals, e.g. based on the electroclinic effect}
- 1/15 . . . based on an electrochromic effect
- 2001/1502 . . . {complementary cell}
- 2001/15025 . . . {having an inorganic electrochromic layer and a second solid organic electrochromic layer}
- 1/1503 . . . caused by oxidation-reduction reactions in organic liquid solutions, e.g. viologen solutions
- 1/1506 . . . caused by electrodeposition, e.g. electrolytic deposition of an inorganic material on or close to an electrode
- 1/1508 . . . {using a solid electrolyte}
- 1/1514 . . . characterised by the electrochromic material, e.g. by the electrodeposited material
- 2001/15145 . . . {the electrochromic layer comprises a mixture of anodic and cathodic compounds}
- 1/1516 . . . comprising organic material
- 1/15165 . . . {Polymers}
- 2001/1517 . . . {Cyano complex compounds, e.g. Prussian blue}
- 2001/1518 . . . {Ferrocene compounds}
- 1/1523 . . . comprising inorganic material
- 1/1524 . . . Transition metal compounds
- 1/15245 . . . {based on iridium oxide or hydroxide}
- 1/1525 . . . {characterised by a particular ion transporting layer, e.g. electrolyte}
- 1/153 . . . Constructional details
- 1/1533 . . . {structural features not otherwise provided for}
- 2001/1536 . . . {additional, e.g. protective, layer inside the cell}
- 1/155 . . . Electrodes
- 2001/1552 . . . {Inner electrode, e.g. the electrochromic layer being sandwiched between the inner electrode and the support substrate}
- 2001/1555 . . . {Counter electrode}
- 2001/1557 . . . {Side by side arrangements of working and counter electrodes}
- 1/157 . . . Structural association of cells with optical devices, e.g. reflectors or illuminating devices
- 1/161 . . . Gaskets; Spacers; Sealing of cells; Filling or closing of cells

- 1/163 . . . Operation of electrochromic cells, e.g. electrodeposition cells; Circuit arrangements therefor
- 2001/1635 . . . . {the pixel comprises active switching elements, e.g. TFT}
- 2001/164 . . . . {the electrolyte is made of polymers}
- 1/165 . . based on translational movement of particles in a fluid under the influence of an applied field
- 1/166 . . . characterised by the electro-optical or magneto-optical effect
- 1/167 . . . . by electrophoresis
- 1/1671 . . . . involving dry toners
- 1/1673 . . . . by magnetophoresis
- 1/1675 . . . Constructional details
- 1/16753 . . . . Structures for supporting or mounting cells, e.g. frames or bezels
- 1/16755 . . . . Substrates
- 1/16756 . . . . Insulating layers
- 1/16757 . . . . Microcapsules
- 1/1676 . . . . Electrodes
- 1/16761 . . . . . Side-by-side arrangement of working electrodes and counter-electrodes
- 1/16762 . . . . . having three or more electrodes per pixel
- 1/16766 . . . . . for active matrices
- 1/1677 . . . . Structural association of cells with optical devices, e.g. reflectors or illuminating devices
- 2001/1678 . . . . {characterised by the composition or particle type}
- 1/1679 . . . . Gaskets; Spacers; Sealing of cells; Filling or closing of cells
- 1/1681 . . . . . having two or more microcells partitioned by walls, e.g. of microcup type
- 1/1685 . . . Operation of cells; Circuit arrangements affecting the entire cell
- 1/169 . . based on orientable non-spherical particles having a common optical characteristic, e.g. suspended particles of reflective metal flakes
- 1/17 . . based on variable-absorption elements not provided for in groups [G02F 1/015](#) - [G02F 1/169](#)
- 1/172 . . . {based on a suspension of orientable dipolar particles, e.g. suspended particles displays}
- 1/174 . . . {based on absorption band-shift, e.g. Stark - or Franz-Keldysh effect ([G02F 1/015](#), [G02F 1/178](#) take precedence)}
- 1/176 . . . {using acid- based indicators}
- 1/178 . . . {based on pressure effects ([G02F 1/195](#) takes precedence)}
- 1/19 . . based on variable-reflection or variable-refraction elements not provided for in groups [G02F 1/015](#) - [G02F 1/169](#)
- 1/195 . . . {by using frustrated reflection (digital reflection using controlled total internal reflection [G02F 1/315](#))}
- 1/21 . . by interference
- 1/211 . . . {Sagnac type}
- 1/212 . . . {Mach-Zehnder type}
- 1/213 . . . {Fabry-Perot type}
- 1/215 . . . {Michelson type}
- 1/216 . . . {using liquid crystals, e.g. liquid crystal Fabry-Perot filters}
- 1/217 . . . {Multimode interference type}
- 1/218 . . . {using semi-conducting materials}
- 1/225 . . . in an optical waveguide structure
- 1/2252 . . . . {in optical fibres}
- 1/2255 . . . . {controlled by a high-frequency electromagnetic component in an electric waveguide structure}
- 1/2257 . . . . {the optical waveguides being made of semiconducting material}
- 1/23 . . for the control of the colour ([G02F 1/03](#) - [G02F 1/21](#) take precedence)
- 1/25 . . . as to hue or predominant wavelength
- 1/29 . for the control of the position or the direction of light beams, i.e. deflection
- 1/291 . . {Two-dimensional analogue deflection}
- 1/292 . . {by controlled diffraction or phased-array beam steering (controlled diffraction for optical switching [G02F 1/31](#))}
- 1/293 . . {by another light beam, i.e. opto-optical deflection}
- 1/294 . . {Variable focal length devices}
- 1/295 . . {Analog deflection from or} in an optical waveguide structure]
- 1/2955 . . . {by controlled diffraction or phased-array beam steering (controlled diffraction for optical waveguide switching [G02F 1/313](#))}
- 1/31 . . Digital deflection, {i.e. optical switching} ([G02F 1/33](#) takes precedence)
- 1/311 . . . {Cascade arrangement of plural switches}
- 1/313 . . . in an optical waveguide structure
- 1/3131 . . . . {in optical fibres}
- 1/3132 . . . . {of directional coupler type}
- 1/3133 . . . . . {the optical waveguides being made of semiconducting materials}
- 1/3134 . . . . . {controlled by a high-frequency electromagnetic wave component in an electric waveguide structure}
- 1/3135 . . . . . {Vertical structure}
- 1/3136 . . . . {of interferometric switch type}
- 1/3137 . . . . {with intersecting or branching waveguides, e.g. X-switches and Y-junctions}
- 1/3138 . . . . . {the optical waveguides being made of semiconducting materials}
- 1/315 . . . based on the use of controlled internal reflection
- 1/33 . . Acousto-optical deflection devices {(circuit or control arrangements therefor [G02F 1/113](#))}
- 1/332 . . . {comprising a plurality of transducers on the same crystal surface, e.g. multi-channel Bragg cell}
- 1/335 . . . having an optical waveguide structure
- 1/35 . Non-linear optics
- 1/3501 . . {Constructional details or arrangements of non-linear optical devices, e.g. shape of non-linear crystals}
- 1/3503 . . . {Structural association of optical elements, e.g. lenses, with the non-linear optical device}
- 1/3505 . . . {Coatings; Housings; Supports}
- 1/3507 . . . {Arrangements comprising two or more nonlinear optical devices}
- 1/3509 . . . {Shape, e.g. shape of end face}
- 1/3511 . . {Self-focusing or self-trapping of light; Light-induced birefringence; Induced optical Kerr-effect}
- 1/3513 . . . {Soliton propagation}

- 1/3515 . . {All-optical modulation, gating, switching, e.g. control of a light beam by another light beam ([G02F 1/353](#), [G02F 1/37](#), [G02F 1/39](#) take precedence)}
- 1/3517 . . . {using an interferometer}
- 1/3519 . . . . {of Sagnac type, i.e. nonlinear optical loop mirror [NOLM]}
- 1/3521 . . . {using a directional coupler}
- 1/3523 . . {Non-linear absorption changing by light, e.g. bleaching}
- 1/3525 . . {Optical damage}
- 1/3526 . . {using two-photon emission or absorption processes}
- 1/3528 . . {for producing a supercontinuum}
- 1/353 . . {Frequency conversion, i.e. wherein a light beam is generated with frequency components different from those of the incident light beams}
- 1/3532 . . . {Arrangements of plural nonlinear devices for generating multi-colour light beams, e.g. arrangements of SHG, SFG, OPO devices for generating RGB light beams}
- 1/3534 . . . {Three-wave interaction, e.g. sum-difference frequency generation ([G02F 1/3532](#) takes precedence)}
- 1/3536 . . . {Four-wave interaction}
- 1/3538 . . . . {for optical phase conjugation (controlling the intensity, frequency, phase, polarisation or direction of the emitted radiation using optical phase conjugation [H01S 3/10076](#))}
- 1/354 . . . {Third or higher harmonic generation}
- 1/3542 . . . {Multipass arrangements, i.e. arrangements to make light pass multiple times through the same element, e.g. using an enhancement cavity}
- 1/3544 . . . {Particular phase matching techniques}
- 1/3546 . . . . {Active phase matching, e.g. by electro- or thermo-optic tuning}
- 1/3548 . . . . {Quasi phase matching [QPM], e.g. using a periodic domain inverted structure}
- 1/355 . . characterised by the materials used
- 1/3551 . . . {Crystals}
- 1/3553 . . . . {having the formula  $\text{MTiOYO}_4$ , where  $\text{M}=\text{K, Rb, TI, NH}_4$  or  $\text{Cs}$  and  $\text{Y}=\text{P or As}$ , e.g. KTP}
- 1/3555 . . . {Glasses}
- 1/3556 . . . {Semiconductor materials, e.g. quantum wells}
- 1/3558 . . . {Poled materials, e.g. with periodic poling; Fabrication of domain inverted structures, e.g. for quasi-phase-matching [QPM]}
- 1/361 . . . Organic materials
- 1/3611 . . . . {containing Nitrogen}
- 1/3612 . . . . . {Heterocycles having N as heteroatom}
- 1/3613 . . . . . {containing Sulfur}
- 1/3614 . . . . . {Heterocycles having S as heteroatom}
- 1/3615 . . . . . {containing polymers}
- 1/3616 . . . . . {having the non-linear optical group in the main chain}
- 1/3617 . . . . . {having the non-linear optical group in a side chain}
- 1/3618 . . . . {Langmuir Blodgett Films}
- 1/3619 . . . . {Organometallic compounds}
- 1/365 . . in an optical waveguide structure ([G02F 1/377](#), [G02F 1/395](#) take precedence)
- 1/37 . . for second-harmonic generation {([G02F 1/3532](#) takes precedence)}
- 1/372 . . . {Means for homogenizing the output beam}
- 1/374 . . . {Cherenkov radiation}
- 1/377 . . . in an optical waveguide structure
- 1/3775 . . . . {with a periodic structure, e.g. domain inversion, for quasi-phase-matching [QPM] ([G02F 1/383](#) takes precedence)}
- 1/383 . . . . of the optical fibre type
- 1/39 . . for parametric generation or amplification of light, infrared or ultraviolet waves
- 1/392 . . . {Parametric amplification}
- 1/395 . . . {in optical waveguides}
- 1/397 . . . {Amplification of light by wave mixing involving an interference pattern, e.g. using photorefractive material}
- 2/00 Demodulating light; Transferring the modulation of modulated light; Frequency-changing of light ([G02F 1/35](#) takes precedence)**
- 2/002 . {using optical mixing}
- 2/004 . {Transferring the modulation of modulated light, i.e. transferring the information from one optical carrier of a first wavelength to a second optical carrier of a second wavelength, e.g. all-optical wavelength converter}
- 2/006 . . {All-optical wavelength conversion}
- 2/008 . . {Opto-electronic wavelength conversion, i.e. involving photo-electric conversion of the first optical carrier}
- 2/02 . Frequency-changing of light, e.g. by quantum counters
- 3/00 Optical logic elements; Optical bistable devices**
- 3/02 . Optical bistable devices
- 3/022 . . {based on electro-, magneto- or acousto-optical elements ([G02F 3/028](#) takes precedence)}
- 3/024 . . {based on non-linear elements, e.g. non-linear Fabry-Perot cavity ([G02F 3/028](#) takes precedence)}
- 3/026 . . {based on laser effects}
- 3/028 . . {based on self electro-optic effect devices [SEED]}
- 7/00 Optical analogue/digital converters**
- NOTE**
- This group covers only converters based in substantial manner on elements which are provided for in group [G02F 1/00](#).
- 2201/00 Constructional arrangements not provided for in groups [G02F 1/00](#) - [G02F 7/00](#)**
- 2201/02 . fibre
- 2201/04 . monomode
- 2201/05 . multimode
- 2201/06 . integrated waveguide
- 2201/063 . . ridge; rib; strip loaded
- 2201/066 . . channel; buried
- 2201/07 . buffer layer
- 2201/08 . light absorbing layer
- 2201/083 . . infrared absorbing
- 2201/086 . . UV absorbing
- 2201/12 . electrode
- 2201/121 . . common or background



2201/122	. . having a particular pattern	2202/043	. . pleochroic
2201/123	. . pixel	2202/046	. . fluorescent
2201/124	. . interdigital	2202/06	. dopant
2201/125	. . delta-beta	2202/07	. poled
2201/126	. . push-pull	2202/08	. glass transition temperature
2201/127	. . travelling wave	2202/09	. inorganic glass
2201/128	. . field shaping	2202/10	. semiconductor
2201/14	. asymmetric	2202/101	. . Ga×As and alloy
2201/15	. periodic	2202/102	. . In×P and alloy
2201/16	. series; tandem	2202/103	. . a-Si
2201/17	. Multi-pass arrangements, i.e. arrangements to pass light a plurality of times through the same element, e.g. by using an enhancement cavity	2202/104	. . poly-Si
2201/18	. parallel	2202/105	. . single crystal Si
2201/20	. delay line	2202/106	. . Cd×Se or Cd×Te and alloys
2201/205	. . of fibre type	2202/107	. . Zn×S or Zn×Se and alloys
2201/30	. grating	2202/108	. . quantum wells
2201/302	. . grating coupler	2202/12	. photoconductor
2201/305	. . diffraction grating	2202/13	. photorefractive
2201/307	. . Reflective grating, i.e. Bragg grating	2202/14	. photochromic
2201/34	. reflector	2202/16	. conductive
2201/343	. . cholesteric liquid crystal reflector	2202/20	. LiNbO <sub>3</sub> , LiTaO <sub>3</sub>
2201/346	. . distributed (Bragg) reflector	2202/22	. Antistatic materials or arrangements
2201/36	. Airflow channels, e.g. constructional arrangements facilitating the flow of air	2202/28	. Adhesive materials or arrangements
2201/38	. Anti-reflection arrangements	2202/30	. Metamaterials
2201/40	. Arrangements for improving the aperture ratio	2202/32	. Photonic crystals
2201/42	. Arrangements for providing conduction through an insulating substrate	2202/34	. Metal hydrides materials
2201/44	. Arrangements combining different electro-active layers, e.g. electrochromic, liquid crystal or electroluminescent layers	2202/36	. Micro- or nanomaterials
2201/46	. Fixing elements	2202/38	. Sol-gel materials
2201/465	. . Snap -fit	2202/40	. Materials having a particular birefringence, retardation
2201/48	. Flattening arrangements	2202/42	. Materials having a particular dielectric constant
2201/50	. Protective arrangements	<b>2203/00</b>	<b>Function characteristic</b>
2201/501	. . Blocking layers, e.g. against migration of ions	2203/01	. transmissive
2201/503	. . Arrangements improving the resistance to shock	2203/02	. reflective
2201/505	. . Arrangements improving the resistance to acoustic resonance like noise	2203/023	. . total internal reflection
2201/506	. . Repairing, e.g. with redundant arrangement against defective part	2203/026	. . attenuated or frustrated internal reflection
2201/508	. . . Pseudo repairing, e.g. a defective part is brought into a condition in which it does not disturb the functioning of the device	2203/03	. scattering
2201/52	. RGB geometrical arrangements	2203/04	. wavelength independent
2201/54	. Arrangements for reducing warping-twist	2203/05	. wavelength dependent
2201/56	. Substrates having a particular shape, e.g. non-rectangular	2203/055	. . wavelength filtering
2201/58	. Arrangements comprising a monitoring photodetector	2203/06	. Polarisation independent
<b>2202/00</b>	<b>Materials and properties</b>	2203/07	. Polarisation dependent
2202/01	. dipole	2203/09	. transfective
2202/02	. organic material	2203/10	. plasmon
2202/021	. . low molecular weight	2203/11	. involving infrared radiation
2202/022	. . polymeric	2203/12	. spatial light modulator
2202/023	. . . curable	2203/13	. involving THZ radiation
2202/025	. . . . thermocurable	2203/15	. involving resonance effects, e.g. resonantly enhanced interaction
2202/026	. . charge transfer complex	2203/16	. involving spin polarization effects
2202/027	. . Langmuir-Blodgett film	2203/17	. involving soliton waves
2202/028	. . photobleached	2203/18	. adaptive optics, e.g. wavefront correction
2202/04	. dye	2203/19	. linearised modulation; reduction of harmonic distortions
		2203/20	. Intrinsic phase difference, i.e. optical bias, of an optical modulator; Methods for the pre-set thereof
		2203/21	. Thermal instability, i.e. DC drift, of an optical modulator; Arrangements or methods for the reduction thereof
		2203/22	. diffractive
		2203/24	. beam steering

- 2203/25 . Frequency chirping of an optical modulator;  
Arrangements or methods for the pre-set or tuning thereof
- 2203/255 . . Negative chirp
- 2203/26 . Pulse shaping; Apparatus or methods therefor
- 2203/28 . focussing or defocussing
- 2203/30 . Gray scale
- 2203/34 . Colour display without the use of colour mosaic filters
- 2203/48 . Variable attenuator
- 2203/50 . Phase-only modulation
- 2203/52 . Optical limiters
- 2203/54 . Optical pulse train (comb) synthesizer
- 2203/56 . Frequency comb synthesizer
- 2203/58 . Multi-wavelength, e.g. operation of the device at a plurality of wavelengths
- 2203/585 . . Add/drop devices
- 2203/60 . Temperature independent
- 2203/62 . Switchable arrangements whereby the element being usually not switchable
- 2203/64 . Normally black display, i.e. the off state being black
- 2203/66 . Normally white display, i.e. the off state being white
- 2203/68 . Green display, e.g. recycling, reduction of harmful substances
- 2203/69 . Arrangements or methods for testing or calibrating a device
- 2203/70 . Semiconductor optical amplifier [SOA] used in a device covered by [G02F](#)
- 2413/00 Indexing scheme related to [G02F 1/13363](#), i.e. to birefringent elements, e.g. for optical compensation, characterised by the number, position, orientation or value of the compensation plates**
- 2413/01 . Number of plates being 1
- 2413/02 . Number of plates being 2
- 2413/03 . Number of plates being 3
- 2413/04 . Number of plates greater than or equal to 4
- 2413/05 . Single plate on one side of the LC cell
- 2413/06 . Two plates on one side of the LC cell
- 2413/07 . All plates on one side of the LC cell
- 2413/08 . with a particular optical axis orientation
- 2413/10 . with refractive index ellipsoid inclined, or tilted, relative to the LC-layer surface O plate
- 2413/105 . . with varying inclination in thickness direction, e.g. hybrid oriented discotic LC
- 2413/12 . Biaxial compensators
- 2413/13 . Positive birefringence
- 2413/14 . Negative birefringence
- 2413/15 . with twisted orientation, e.g. comprising helically oriented LC-molecules or a plurality of twisted birefringent sublayers