G02F

DEVICES OR ARRANGEMENTS, THE OPTICAL OPERATION OF WHICH IS MODIFIED BY CHANGING THE OPTICAL PROPERTIES OF THE MEDIUM OF THE DEVICES OR ARRANGEMENTS FOR THE CONTROL OF THE INTENSITY, COLOUR, PHASE, POLARISATION OR DIRECTION OF LIGHT, e.g. SWITCHING, GATING, MODULATING OR DEMODULATING; TECHNIQUES OR PROCEDURES FOR THE OPERATION THEREOF; FREQUENCY-CHANGING; NON-LINEAR OPTICS; OPTICAL LOGIC ELEMENTS; OPTICAL ANALOGUE/DIGITAL CONVERTERS (optical transfer means between sensing member and indicating or recording part in connection with measuring G01D5/26; devices in which mathematical operations are carried out with optical elements G06E3/00, [N: G06E3/001]; electrical signal transmission systems using optical means to convert the input signal G08C19/36; information-recording by electric or magnetic means and reproducing by sensing optical properties G11B11/00; static stores using optical elements G11C13/04; transmission systems employing electromagnetic waves other than radio waves, e.g. light, infra-red radiation, H04B10/00; optical multiplex systems H04J14/00; pictorial communication, e.g. television H04N)

Definition statement

This subclass/group covers:

Devices, the optical operation of which is modified by changing the optical properties (refraction, birefringence, absorption, nonlinear susceptibility) of the medium of the devices.

The term "optical" applies not only to visible light but also to ultra-violet, infra-red radiations or Terahertz (G02F 1/3534).

The following optical elements are therefore covered, the list being not exhaustive:

- thermo-optic elements.
- electro-optic elements.
- magneto-optic elements.
- elasto-optic elements.
- acousto-optic elements.

- liquid crystal devices.
- electrochromic elements.
- electrophoretic elements.
- non-linear optics, i.e. devices or arrangements in which the electric or magnetic field component of the light beam influences the optical properties of the medium.

Demodulating light: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, insofar these demodulators are based in substantial manner on elements which are provided for under the bullets above.

Optical logic elements:Optical bistable devices, i.e. devices exhibiting two different optical output states for a same optical input value, Optical logic elements, insofar these demodulators are based in substantial manner on elements which are provided for under the bullets above.

Optical analogue/digital converters:Optical bistable devices, i.e. devices exhibiting two different optical output states for a same optical input value, Optical logic elements, insofar these devices are based in substantial manner on elements which are provided for under the bullets above.

Relationship between large subject matter areas

G09F 9/35 covers display having a particular shape and or used for a particular application, mainly for the purpose of advertising (see for example US 2010177018, EP2116985).

G09F 9/37 covers displays using movable (rotatable) elements (see for example EP0721176, US2006176438 or US2010110531).

References relevant to classification in this subclass

This subclass/group does not cover:

Investigating or analysing materials by the use of optical means	G01N 21/00
Devices with movable or deformable element (DMD; electro-wetting)	G02B 26/00
Control arrangements or circuits for visual indicators other than cathode-ray tubes	G09G 3/00
Photoconductive antenna for Terahertz (US2011080329)	H01Q 9/00, H01L 31/00

Optical Transmission system	H04B 10/00
Optical multiplex system	H04J 14/00

Projection devices for colour picture display	H04N 9/31

Informative references

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

Devices in which mathematical operation are carried out with optical elements Optical processing (correlator)	G06E 3/00
Indicating arrangements for variable information by selection or combination of individual elements	G09F 9/35
Information-recording and reproducing by sensing optical properties	G11B 7/00, G11B 11/00
Control of light sources	H01S 3/00, H05B 35/00 - H05B 43/00

G02F 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 (thermometers using change of colour or translucency G01K11/12; using changes in fluorescence G01K11/32; light guide devices G02B6/00; optical devices or arrangements using movable or deformable elements for controlling light independent of the light source G02B26/00; control of light in general G05D25/00; visible signalling systems G08B5/00; indicating arrangements for variable information by selection or combination of individual elements G09F9/00; control arrangements or circuits for

visual indicators other than cathode-ray tubes G09G3/00; control of light sources H01S3/10, H05B33/08, H05B35/00 to H05B43/00; [N: photochromic filters G02B5/23; optical logic elements G02F3/00])

Definition statement

This subclass/group covers:

Devices and methods for the control of intensity, phase, polarisation (G02F 1/01); or direction of light (G02F 1/29).

Devices and methods using nonlinear optical effect (G02F 1/35)

Relationship between large subject matter areas

Light sources (Laser, LED, Lamp) are classified in the appropriate entries

H01S, H01L; H01J

References relevant to classification in this group

This subclass/group does not cover:

Photo luminescent material	C09K 11/00
Liquid crystal material	C09K 19/00
Electrochromic material	C09K 9/02
Integrated optical device with other passive /active optical elements (photonic chip)	G02B 6/12
Digital stores characterised by the use of electro-optical storage elements	G11C 13/044

Special rules of classification within this group

The class G02F 1/00 is mainly empty and consists only of materials (except nonlinear materials classified in G02F 1/355) insofar these materials are used in the devices provided for in this subclass.

G02F 1/0009

[N: Materials therefor]

Definition statement

This subclass/group covers:

New materials or compositions used in light modulation devices, see US2011008008, US2013003066, US2011181950, US2008024854.

References relevant to classification in this group

This subclass/group does not cover:

Photoluminescent materials	C09K 11/00
Liquid crystal materials	C09K 19/00
Electrochromic materials	C09K 9/02
Non linear materials	G02F 1/355

G02F 1/01

for the control of the intensity, phase, polarisation or colour (G02F1/29, G02F1/35 take precedence; polarising elements per se G02B5/30; static storage per se G11C; image tube screens acting as light valves by shutter operation H01J29/12; such screens acting by discoloration H01J29/14; [N: projection arrangements for television image reproduction, e.g. using eidophor H04N5/74; recording by light G11B7/00 to G11B11/00])

Definition statement

This subclass/group covers:

Devices and methods for modulating the light (intensity, phase, polarization, color).

Relationship between large subject matter areas

Passive optical element (Color filter, polarizer): G02B

Backlight comprising a light guide: G02B 6/00

Integrated optical element G02B 6/00

Laser: H01S

References relevant to classification in this group

This subclass/group does not cover:

Lighting Device in general	F21
Measuring Instruments characterised by the use of an interferometer	G01B 9/02
Measuring characteristics of light, e.g. intensity, spectrum	G01J
Measuring force or stress by measuring variations of optical properties of material	G01L 1/24
Holography	G03H
Optical transmission system	H04B 10/00

Examples of places where the subject matter of this group is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Eye protecting filters (Welding Helmet)	A61F 9/00
Rear-view mirrors	B60R 1/08
(smart) Windows with controllable transmission	E06B 9/24
Optical RF spectrum analyser	G01R 22/17
Head-up display	G02B 27/02
Electro-optic spectacle (sunglasses)	G02C 7/101
Constructional details related to the housing of computer displays, e.g. of of flat displays	G06F 1/1601
Transparent conductive material TCO	H01B
Thin film Transistor TFT	H01L 21/00- H01L 21/27- H01L 21/29

LED Display	H01L 25/00
Stereoscopy	H04N 13/00
Detail of television receiver	H04N 5/64
Electroluminescent Display	H05B 33/00

Arrangements in which the information is build-up by the combination of elements	G09F 9/35

Informative references

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

Integrated display and digitiser	G06F 3/0412
Active matrix with TFT	H01L 21/77T

Glossary of terms

In this subclass/group, the following terms (or expressions) are used with the meaning indicated:

BLU	Backlight Unit
TFT	Thin film transistor

Synonyms and Keywords

In patent documents the following abbreviations are often used:

SOP	State Of Polarization
PDLC	Polymer dispersed Liquid crystal
TCO	Transparent conductive oxide
EA	Electro Absorption

VOA	Variable Optical Attenuator

G02F 1/0128

[N: based on electro-mechanical, magneto-mechanical, elasto-optic effects]

Definition statement:

This subclass/group covers:

Devices where a (electro, magnetic, pressure) field produce a deformation of the structure of the material which result in change in refractive index, absorption etc, e.g. elasto-optic effect (mechanically, stress induced birefringence), see WO2012065244, US2004012840, US2004135745

G02F 1/0147

[N: based on thermo-optic effects (G02F1/132 takes precedence; tenebrescent compositions C09K9/00; radiation pyrometry G01J5/00; thermometers using change of colour or translucency G01K11/12)]

Definition statement

This subclass/group covers:

Thermo optic effect.

Informative references

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

Thermometers using change of colour or translucency	G01K 11/12

G02F 1/015

based on semiconductor elements with at least one potential jump barrier, e.g. PN, PIN junction (G02F1/03 takes precedence)

Definition statement

This subclass/group covers:

Electro optic effect in semi conductor, mainly GaAs InP devices.

G02F 1/025

in an optical waveguide structure (G02F1/017, [N: G02F1/2257] take precedence)

Definition statement

This subclass/group covers:

Thermo optic effect,in semi conductor, mainly silicon, devices , see for example US2008112032

G02F 1/03

based on ceramics or electro-optical crystals, e.g. exhibiting Pockels effect or Kerr effect (G02F1/061 takes precedence)

Definition statement

This subclass/group covers:

Device using insulating electro-optic crystals, e.g. made of LiNbO3, LiTtaO3, KTP material

G02F 1/0338

[N: structurally associated with a photoconductive layer or having photo-refractive properties (G02F1/05 takes precedence)]

Definition statement

This subclass/group covers:

Photo-refractive effect.

G02F 1/05

with ferro-electric properties (G02F1/035, G02F1/055 take precedence; [N: domain inversion in ferro-electric materials G02F1/3558; ferro-electric digital stores G11C11/22])

Definition statement

This subclass/group covers:

G02F 1/055 covers device using PLZT ceramic material.

Obsolete technology.

Informative references

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

Ferro-electric digital stores	G11C 11/22

G02F 1/055

the active material being a ceramic (G02F1/035 takes precedence)

Definition statement

This subclass/group covers:
Covers device using PLZT ceramic material.

G02F 1/07

based on electro-optical liquids exhibiting Kerr effect

Definition statement

This subclass/group covers:
Obsolete technology

G02F 1/09

based on magneto-optical elements, e.g. exhibiting Faraday effect

Definition statement

This subclass/group covers:
Magneto-optic effect

G02F 1/11

based on acousto-optical elements, e.g. using variable diffraction by sound or like mechanical waves ([N: elasto-optic effect without wave propagation G02F1/0131;] acousto-optical deflection G02F1/33)

Definition statement

This subclass/group covers:

Acousto-optic

G02F 1/13

based on liquid crystals, e.g. single liquid crystal display cells (liquid crystal materials C09K19/00)

Definition statement

This subclass/group covers:

Liquid crystal.

Groups in G02F 1/13 are also used to classify common devices features in electrochromic and Electrophoretic device (see for example US2007024954, US20100137569)

Relationship between large subject matter areas

Control arrangement and circuits for Liquid crystal device	G09G 3/30

G02F 1/1345

Conductors connecting electrodes to cell terminals

Definition statement

This subclass/group covers:

Details of the connection terminals of the LCD.

See for example US2011116028, US2011075089, US2010321624

G02F 1/13452

[N: Conductors connecting driver circuitry and terminals of panels (H01L21/00 takes precedence; electrical details inside the cell G02F1/133 ;)

Definition statement

This subclass/group covers:

Detail of the connection of the IC driver or PCB with the terminal pads of the LCD.

Relationship between large subject matter areas

Further details of the PCB (printed circuit board) are in H05K . Further details concerning bonding of the drivers are in H01L 21/00 (see for example US2011108979).

Informative references

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

Drivers integrated with an active matrix	G02F 1/1362D
TAB tape automated bonding. COB chip-on-board. COG chip-on-glass.	H01L 23/00

G02F 1/15

based on electrochromic elements [N: (electrochromic materials C09K9/00)]

Definition statement

This subclass/group covers:

Electrochromic.

G02F 1/1506

[N: based on electrolytic deposition of a non-organic material on or in the vicinity of an electrode]

Definition statement

This subclass/group covers:

Electroplating RED (Reversible electrodeposition device).

G02F 1/167

based on electrophoresis

Definition statement

This subclass/group covers:

Electrophoretic

G02F 1/17

based on variable absorption elements (G02F1/015 to G02F1/167 take precedence; [N: tenebrescent compositions C09K9/00])

Definition statement

This subclass/group covers:
Variable absorption device

G02F 1/172

[N: based on a suspension of orientable dipolar particles, e.g. suspended particles displays]

Definition statement

This subclass/group covers:
Suspended Particle Display

G02F 1/19

based on variable reflection or refraction elements ([N: G02F1/01M3], G02F1/015 to G02F1/167 take precedence)

Definition statement

This subclass/group covers:
Variable reflection device (switchable mirror using metal hydride)

G02F 1/23

for the control of the colour (G02F1/03 to G02F1/21 take precedence)

Definition statement

This subclass/group covers:
Obsolete technologies

Relationship between large subject matter areas

Led associated with phosphor for the control of the colour of the emitted light are classified in H05B 33/00, F21K 99/00, C09K 11/00; H01L 33/00 (US2008007172)

G02F 1/29

for the control of the position or the direction of light beams, i.e deflection ([N: optical coupling means G02B6/26; optical-mechanical scanning in general G02B26/10]; static stores with electric or magnetic read-in and optical read-out G11C; lasers provided with means to change the location from which, or the direction in which, laser radiation is emitted H01S3/101)

Definition statement

This subclass/group covers:

Devices and methods for the the control or direction (deflection) of light

- deflection of a light beam that can be spanned over a discrete number (digital) of positions, as opposed to deflection spanned over a continuous range (analog) of positions.

Analog scanner US2008112042 (Electro-optic beam steering) electro active lens US2010226000.

Deflection based on total internal reflection (TIR), producing a yes/no deflection, which is covered by group G02F 1/315.

Relationship between large subject matter areas

Wavelength multiplexer/demultiplexer are classified in G02B 26/293W2 for the optical details and in H04Q 11/0001 H04J 14/02 for the control details.

References relevant to classification in this group

This subclass/group does not cover:

Examples of places where the subject matter of this group is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Working and shaping a Laser beam	B23K 26/06
Scanning arrangement	G02B 26/10; H04N 1/04
Optical switching system	H04Q 3/52

Informative references

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

Optical beam shaping, splitting, combining	G02B 27/09-10

G02F 1/35

Non-linear optics (optical bistable devices G02F3/02; lasers using stimulated Brillouin or Raman effect H01S3/30)

Definition statement

This subclass/group covers:

Devices and methods using nonlinear optical processes.

Frequency conversion; Harmonic generation.

Wave mixing.

Optical rectification.

Optical KERR effect.

Self de or /focusing.

Self phase modulation (Soliton propagation).

Cross phase modulation.

nonlinear absorption (optical limiter).

Optical phase conjugation.

Parametric amplification.

References relevant to classification in this group

This subclass/group does not cover:

Brillouin, Raman laser	H01S 3/30
Photoconductive Terahertz emitter (antenna) (Auston switch)	H01L 31/00, H01Q 9/00

Examples of places where the subject matter of this group is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Analysing materials by the use of optical means and of the non-linear properties of the material	G01N 21/636

G02F 2/00

Demodulating light; Transferring the modulation of modulated light; Frequency-changing of light (G02F1/35 takes precedence; photoelectric detecting or measuring devices G01J, H01J40/00, H01L31/00; demodulating laser arrangements [N: e.g. switching, gating] H01S3/10; demodulation or transference of modulation of modulated electro-magnetic waves in general H03D9/00)

Definition statement

This subclass/group covers:

Demodulating light; Transferring the modulation of modulated light.

Frequency-changing of light, e.g. by quantum counters Up-converter Infrared to visible converter, Down converter.

Frequency-changing of light using nonlinear optical effect G02F 1/35 takes precedence.

References relevant to classification in this group

This subclass/group does not cover:

Measuring optical wavelength	G01J 3/00
Measuring optical phase difference	G01J 9/00

Examples of places where the subject matter of this group is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Optical receiver/ transmitter	H04B 10/155, H04B 10/158
Optical clock arrangement for synchronisation	H04L 7/0075
Optical demodulator for modulated carrier	H04L 7/22P
Millimeter wave (RF) generation using optical means (Radio over Fiber system)	H04B 10/12R

Demodulator for optical sensor	G01D 5/26

Informative references

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

Pulse train generation using laser	H01S
RF synthesysizer	H03B 21/00
Phase antenna array (US 5859611)	H01Q 3/2676

G02F 2/004

[N: 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]

Definition statement

This subclass/group covers:

Wavelength converter used to convert the carrier of high-bit-rate data from one wavelength to another see for example US2002085266

G02F 2/02

Frequency-changing of light, e.g. by quantum counters (luminescent materials HYPERLINK "sfpluscla://ECLA/C09K11/00" C09K11/00)

Definition statement

This subclass/group covers:

This group class covers:

Frequency-changing of light, e.g. by quantum counters.

Obsolete technology.

G02F 3/00

Optical logic elements (optical computing G06E); electric

pulse generators using opto-electronic devices as active elements H03K3/42; logic circuits using opto-electronic devices H03K19/14); Optical bistable devices

Definition statement

This subclass/group covers:

Optical logic elements, i.e. optical basic logic gates, e.g. AND, OR, NAND.

Optical bistable devices i.e. devices exhibiting two different optical output states for a same optical input value.

This group is not active.

References relevant to classification in this group

This subclass/group does not cover:

Logic circuits using opto-electronic devices	H03K 19/14

Informative references

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

Electric-pulse generators using opto-electronic devices as active elements	H03K 3/42
Optical computing	G06E

G02F 3/02

Optical bistable devices

Definition statement

This subclass/group covers:

Obsolete technology.

G02F 7/00

Optical analogue/digital converters

Definition statement

This subclass/group covers:

Optical analogue/digital converters (http://www.wipo.int/ipcpub)

This group covers only converters based in substantial manner on elements which are provided for in group G02F 1/00.

Informative references

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

Conversion of a code using opto-electronic devices	H03M 7/008