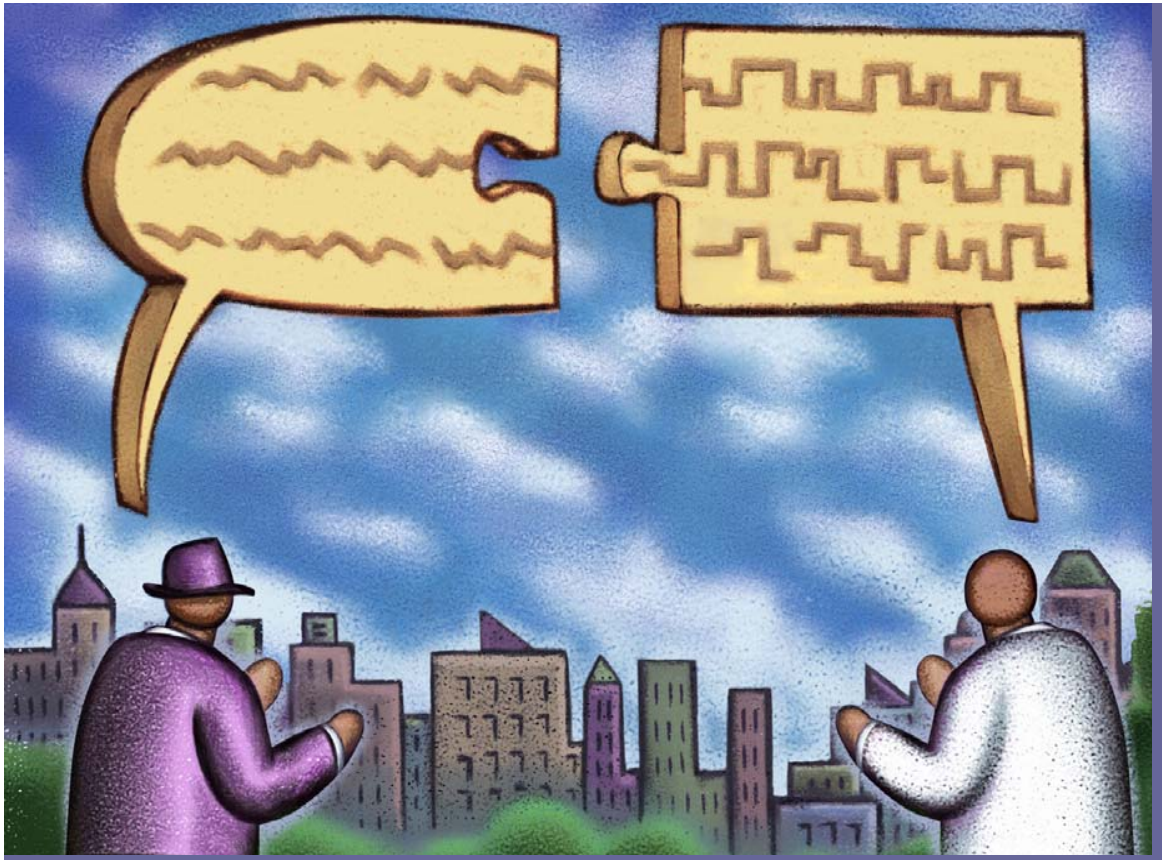

Presented to

IEEE

Santa Clara Valley

Consumer Electronics Society

FINNEGAN HENDERSON FARABOW GARRETT & DUNNER LLP

AN IP ROADMAP—PROTECTING YOUR IP

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These materials are public information and have been prepared solely for educational purposes to contribute to the understanding of American intellectual property law. These materials reflect only the personal views of the author and are not individualized legal advice. It is understood that each case is fact-specific, and that the appropriate solution in any case will vary. Therefore, these materials may or may not be relevant to any particular situation. Thus, the author and Finnegan, Henderson, Farabow, Garrett & Dunner, L.L.P. cannot be bound either philosophically or as representatives of their various present and future clients to the comments expressed in these materials. The presentation of these materials does not establish any form of attorney-client relationship with the author or Finnegan, Henderson, Farabow, Garrett & Dunner, L.L.P. While every attempt was made to insure that these materials are accurate, errors or omissions may be contained therein, for which any liability is disclaimed.

Topics

- Introduction to Intellectual Property
- Patents
  - The Rights Conferred by a Patent
  - What is a Patentable Invention?
    - Conception, Reduction to Practice, and Diligence
  - Collaboration Between Inventor and Attorney
  - Filing and Prosecuting the Patent Application
  - How to Read a Patent
- Building a Valuable Portfolio

IP is a Valuable Asset

- IP is often the single most valuable asset of a company
  - Percentage of intangible assets
    - 3M: 75.6%
    - Johnson & Johnson: 87.9%
    - Merck: 93.5%
- IP is increasingly important in today's corporate transactions involving technology
  - IP protects R&D, which is expensive
  - The deals are bigger
  - IP is more critical to the deals

Introduction—Types of IP Rights

- Trademarks—protection of commercially used marks
- Copyrights—protection of expression
- Trade secrets and know how
- Patents

Trademarks

- Word, logo, design, device identifying the origin of a product or service
  - Not a name of a product, identifies source
    - Kleenex tissue, Xerox photocopier
    - Use as noun risks loss of trademark
      - aspirin, thermos
- Term indefinite so long as continued use
  - Registration requires periodic renewal
    - U.S.—10 years
    - U.S. also requires at 5-6 years a showing of continued use

Acquiring Trademark Protection

- In U.S., acquired by use or intent to use
  - Common law
  - Federal registration (Title 15, U.S. Code)
    - Application, examination, publication
    - Some states provide registration

- Most foreign countries require registration

Transfer of Trademark Rights

- Trademarks may be sold or licensed
  - Sale must include associated goodwill
  - License must impose quality control obligations
    - Right of licensor to inspect and control quality of product or service
    - Use by licensee inures to benefit of licensor

Copyright

- Statutory right of author (Title 17, U.S.C.)
- Right attaches to original work of authorship fixed in any tangible medium of expression
  - Right comes into being on creation of work
  - No formalities necessary
    - May need publication and registration to enforce
  - Literary, musical, dramatic, choreographic, pictorial works; sound recordings, software

Scope of Copyright

- Protects only form of presentation, not the idea or concept
  - Romeo & Juliet = West Side Story
  - Software code, not concept
- Protects against copying; does not prevent independent creation
- National in scope, but international recognition by treaty—not the same everywhere

Copyright Term

- Life of author plus 70 years (in most countries)
- Work made for hire
  - 95 years from publication
  - 120 years from creation
- Copyright owned by creator
  - Joint creation—joint ownership
  - Work made for hire (requires contract terms)
    - Created by employee or consultant
- Copyright may be assigned
  - Requires written document
  - In U.S., may be revoked after 35 years

Trade Secrets

- Defined as anything secret (formula, program, device, method, technique)
  - Having independent economic value from not being generally known
  - Is the subject of reasonable efforts to maintain its secrecy
- Includes
  - Combination of generally known elements
  - Need not be patentable
  - Can be anticipated by prior art

Benefits of Trade Secrets

- Trade secret may be assigned or licensed
- Protection acquired through agreement and/or employment
- Revenue from license may last indefinitely without geographic restriction
- Damage potential similar in scope to patent infringement
  - Lost profits
  - Unjust enrichment
  - Reasonable royalty
  - Injunction

Trade Secret

- Economic Espionage Act (18 U.S.C. 1831, 1832)
  - Makes trade secret misappropriation a crime
    - "Knowing theft, unauthorized duplication, receipt and/or possession of a trade secret"
  - Defines trade secret broadly
    - “All forms and types of financial, business, scientific, technical, economic, or engineering information" that is kept secret and has reasonable independent economic value

Patents

- The Congress shall have power *to promote the progress of Science and the useful arts* by securing for limited times to . . . Inventors the exclusive rights to their discoveries.
- Legal monopoly which gives patentee right to exclude others from making, using, or selling the claimed subject matter for a limited period of time
- NOT an authorization to make, use, or sell the claimed invention

What is a Patent?

- Congress established the U.S. Patent and Trademark Office to examine and award patents and trademarks.
- Granted by USPTO in return for “disclosure” of invention to the public
- Protects functional features of processes, machines, manufactured items, compositions of matter, or ornamental designs for articles of manufacture

Term of Patent Right

- 20 years from first filing of U.S. non-provisional application
  - In U.S., pre-June 8, 1995 applications, longer of 20 years from filing or 17 years from issue
- U.S. includes opportunity for extensions for Patent Office and FDA delays

Exclusive Rights of Patentee—35 U.S.C. Sec. 271

(a) Except as otherwise provided in this title, whoever without authority makes, uses, offers to sell, or sells any patented invention, within the United States or imports into the United States any patented invention during the term of the patent therefor, infringes the patent.

(b) Whoever actively induces infringement of a patent shall be liable as an infringer.

Exclusive Rights of Patentee—35 U.S.C. Sec. 271

(c) Whoever offers to sell or sells within the United States or imports into the United States a component of a patented machine, manufacture, combination or composition, or a material or apparatus for use in practicing a patented process, constituting a material part of the invention, knowing the same to be especially made or especially adapted for use in an infringement of such patent, and not a staple article or commodity of commerce suitable for substantial noninfringing use, shall be liable as a contributory infringer.

Statutory Definition of Patent—35 U.S.C. Sec. 101

- Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.
- A valid patent is novel, non-obvious, and filed in the name of the inventor(s).

Patents

- Statutory grant
  - Title 35, U.S. Code
- Rationale
  - Grant of a limited duration monopoly in return for publicly disclosing the invention.
- Legal right to exclude others—NOT right to exploit
  - From making, using, selling, offering for sale and importing invention claimed in patent
    - Separable rights

Requirements for a Patent

- Useful, novel, and non-obvious (inventive)
  - Specific, substantial, and credible utility—no perpetual motion machines
  - Must be new over "prior art"
  - Cannot be obvious variation over "prior art“
- Filed in the name of the inventors

Priority of Invention

- United States
  - First to invent
    - Interference proceeding to determine
  - Application by inventors
- Rest of the world
  - First to file
  - Application by owner (often employer)

Novelty

- Public disclosure of invention is absolute bar to patent in almost all countries except U.S.
  - In U.S., inventor has one year grace period
- If international protection desired, critical to file before sale or public disclosure
  - Confidential disclosure may avoid international bar, but may start one year in U.S.
- U.S. application no longer secret
  - Typically published 18 months after first filing

Inventorship

- An inventor contributes to a definite and permanent idea of the complete and operative invention
- Having the wrong inventorship can result in the patent being invalid or unenforceable!!!

Elements of Invention

- Conception
- Reduction to practice or filing of a patent application
- Diligence

Conception

"The formation in the mind of the inventor of a definite and permanent idea of the complete and operative invention as it is thereafter to be applied in practice."

Conception is Touchstone of Inventorship

- Conception must be complete
  - Recognize the ultimate result desired and develop means to accomplish
  - Communicate completed thought such that one of skill in the art can make the invention

- Only inventors conceive, others can reduce to practice

Amount of Contribution to Final Conception

- Must contribute to subject matter of at least one claim to be joint inventor

- Contributing any disclosed means of a means-plus-function claim element suffices as a joint inventive contribution

- Merely exercising normal skill to reduce an inventor's idea to practice, without an inventive act, does not make one a joint inventor of any type of claim

Joint Inventorship

- Inventors may apply for a patent jointly even though
  - They did not physically work together or at the same time;
  - Each did not make the same type or amount of contribution; or
  - Each did not contribute to the subject matter of every claim.

Collaboration Towards Conception

- Although collaboration requirement relaxed since 1984, joint inventors must at least be aware of each other
  - Some element of joint behavior
- Large inventorship entity does not create per se presumption of invalidity
- Intentional failure to name collaborating joint inventors may result in a finding of unenforceability due to inequitable conduct against the named inventors

Proving Date of Invention

- Conception—Diligence—Reduction to Practice
- Conception must be Corroborated: Evidence showing that the inventor provides to others a completed thought
- Maintaining Laboratory Records that can be used as evidence of Conception, Diligence, and Reduction to Practice

Define and Document

- Define the invention and make sure it is properly recorded, dated, and witnessed by someone (other than a co-inventor) who understands the invention

Importance of Good Recordkeeping to Establishing Date of Invention

- Details of idea or work conducted
  - Permanent, complete, and continuous form
  - Bound and consecutively numbered notebooks
  - Date ideas formed or work conducted/completed
  - Protocols, designs of experiments, results, data
- Factual record—no researcher impressions
- Laboratory records properly signed and witnessed
  - Contemporaneously read, understood and signed records
  - Sign and date every entry (at least 2 people)
  - Corroborating witness
- Records should demonstrate authenticity and reliability

What Your Records Should Include

- Record books must be bound, not looseleaf
- All records must be in ink, not pencil
- Use the same pen for the entire day
- Date each page
- Sign each page

What Your Records Should Include

- Include all details of the experiments—don't assume that another scientist will read this
- If you tape in data, initial over the tape
- Use descriptive titles
- Include results and conclusions

Electronic Record Keeping

- Much harder to use as evidence because file contents and dates are not permanent.
- Keep data files and engineering files in read-only files on folders on the computer.
- Have IT routinely download the folders onto a CD and sign a declaration attached to the CD of the date of download and the amount of data downloaded.
- Refer to the individual files in your written notebook, along with recording the file names and sizes of the file.

Reduction to Practice

- Reducing a complete and operative conception to practice
  - Inventor need not be the one to reduce conception to practice
  - Constructive and actual reduction to practice

Constructive Reduction to Practice

- Filing a patent application (U.S. or abroad) complying with requirements of 35 U.S.C. § 112, first paragraph
  - Written description
  - Enablement
  - Best mode!!

Actual Reduction to Practice

- Concrete embodiment of the invention demonstrated to work for its intended purpose
  - Amount of testing required depends on nature of invention

Diligence

- Diligence is a reasonable effort made toward actually or constructively reducing an invention to practice
- First to conceive/second to reduce to practice may still be considered first inventor based on successful showing of diligence
- “Reasonably continuous activity”
- Evidence of diligence must be corroborated

Steps for Patenting Your Invention

- Fill out Invention Disclosure Form
- Collaborate with a patent attorney
- Determine
  - If there are any bar dates
  - If the inventorship is correct
  - If there are any known prior art references
- Filing your invention
  - Provisional
  - Non-provisional

Invention Disclosure Form

No. _____
(number consecutively indicating year, e.g. 00-001)

While some of the information on this form will not be applicable to every invention and sometimes all of the information requested will not be available to the inventor, a conscientious effort should be made to fill out this form as completely as possible.

A. Title of Invention:_____
B. When did you first think of the invention:_____
C. Laboratory Notebook Pages on which this disclosure is based: _____
D. Date of first drawing, if any, illustrating the invention:_____
E. Date of first written description of the invention:_____
F. To whom was the invention first disclosed?_____
G. Date of disclosure:_____

Invention Disclosure Form

H. When did you first do experimental work toward carrying out the invention?

_____

I. When were you satisfied that you had solved the problem toward which your invention was directed:

_____

J. Who has observed the progress of your experimental work?

_____

K. Statement of the problem that the invention solves:

_____

L. Statement of what had been done previously in the art to solve the problem:

_____

M. Statement of how this solution is better than the prior art:

_____

N. List all prior patents (including patents of Company) and published articles of which you are aware that are related to the invention:

_____

O. Has the invention been described in a printed publication or sold or offered for sale?

_____

P. Is this the Best Mode of the Invention?

_____

Q. General statement of invention:

_____

Invention Disclosure Form

1. Where appropriate, include drawings with reference characters.
2. If additional space is needed, use additional sheets. Each sheet should be dated and signed by each inventor and two disinterested witnesses.

- Date:_____
- Date:_____
- The above was read and understood by me on this _____ day of _____, 20____.

- By:_____
  Signature of inventor
- By:_____
  Signature of witness
- By: _____
  Signature of witness

Drafting Applications

- Inventor interviews to determine full scope of invention
  - 10,000 foot view of the invention
  - Sketch of figures
  - Additional embodiments
  - Drafting claims
  - Plan for going forward
- Understanding the scope of prior art

Developing a Strong Patent Portfolio

- Prosecuting a strong patent, i.e., a patent that will stand the rigors of repeated attacks
- Upfront investment in drafting broad applications to cover the invention, commercial embodiments, and likely competitors, but just inside the “prior art”
- Careful prosecution to avoid relinquishing subject matter in application
- Filing strategies—filing early; quality vs. quantity

Developing a Strong Patent Portfolio

- Preparation of a specification of a patent application
  - 35 U.S.C. 112 requirements
    - Written Specification
    - Enablement
    - Best mode
  - Drafting claims

Written Description

- Possession of idea is not enough: the claimed invention must be described in sufficient detail by written text of originally-filed patent application
- Purpose is to show that the inventor had possession of the claimed invention as of the filing date
  - Build specification with support for every embodiment disclosed
  - One skilled in the art should "reasonably conclude" that patentee had "possession" by describing claimed invention and all limitations
- Burden on USPTO to show failure to comply with requirement

Enablement

- Patent specification must describe the claimed invention in sufficient detail to enable a person of skill in the art to make and use the claimed invention without undue experimentation.
- "Enablement" required throughout the scope of the patent claims.

Best Mode

- If the inventor's preferred technique for practicing the invention is known to any inventor before filing of a patent application, it must be disclosed in the patent application
- Policy against concealment—The best mode requirement restrains inventors from obtaining patent protection for an invention while concealing from the public their preferred embodiments
- No affirmative duty to discover best mode

Drafting Applications

- Disclose all known and possible embodiments—avoid single embodiment
- Define terms and use them consistently
- Avoid patent profanity (e.g., “must,” “essential,” “required”)
- Include actual and prophetic examples

Drafting Claims

- Draft claims of sufficient scope to cover commercial embodiment or read on the competition, yet just narrow enough to avoid the prior art

Balancing Act

Provide notice, but not too restrictive

- Use only terms that are necessary
- Use relative terms carefully

Claim Construction

- Issue—"the extent to which we should resort to and rely on a patent's specification in seeking to ascertain the proper scope of its claims."
  - *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc)

Claim Construction—*Phillips*

- The specification is always highly relevant to claim construction and is the single best guide to the meaning of a claim term in dispute
- The prosecution history, if in evidence, can indicate how the PTO and the inventor understood the patent, but it is not a tool for expanding the specification

Claim Construction—*Phillips*

- Courts are authorized to rely on extrinsic evidence
- But it is less significant than the intrinsic record in determining the meaning of claim language
- Examples of extrinsic evidence: dictionaries and treatises, expert testimony
- Expert testimony can be useful, such as to ensure that the court's understanding is consistent with that of person of ordinary skill in the art or to establish a particular meaning of a term

Software is Patentable

- Types of claims
  - Process;
  - Apparatus performing the process;
  - Computer-readable medium; and
  - System performing the process.

The “Duty of Disclosure”

- Each person associated with the filing and prosecution of a patent application has a duty of candor and good faith in dealing with the U.S. Patent Office

Complying with the “Duty of Disclosure”

- Required to submit any documents that may be ‘materially relevant’ to the patent application
- Duty is continuing, ongoing: any documents or references made aware of during prosecution of the application, not just at the time of filing
- Possible consequence of failure to disclose—an unenforceable patent

Timing and Filing Issues

- "First to Invent" (U.S.) vs. "First to File" (rest of the world)
  - U.S.—first to invent
  - Rest of the world—race to the patent office
  - Changes are in the offing

More Timing Issues

- Statutory bar in the U.S.—one year grace period from date of public disclosure (e.g., publication or offer for sale)
- Other countries—absolute novelty

Provisional Applications

- TIMING! Gives you priority
  - Saves the initial filing date
- Non-provisional can claim priority to the provisional application
- Formal requirements absent
  - Specification important (no claims needed)
- The disclosure has the same requirements as the non-provisional application to be valid (i.e., written description, enablement, and best mode).

Filing a Non-Provisional Patent Application

- Application contents
  - Drawings
  - Title
  - Reference to related applications
  - Background section
  - Summary of the invention
  - Detailed description of the invention
  - One or more claims
  - Abstract

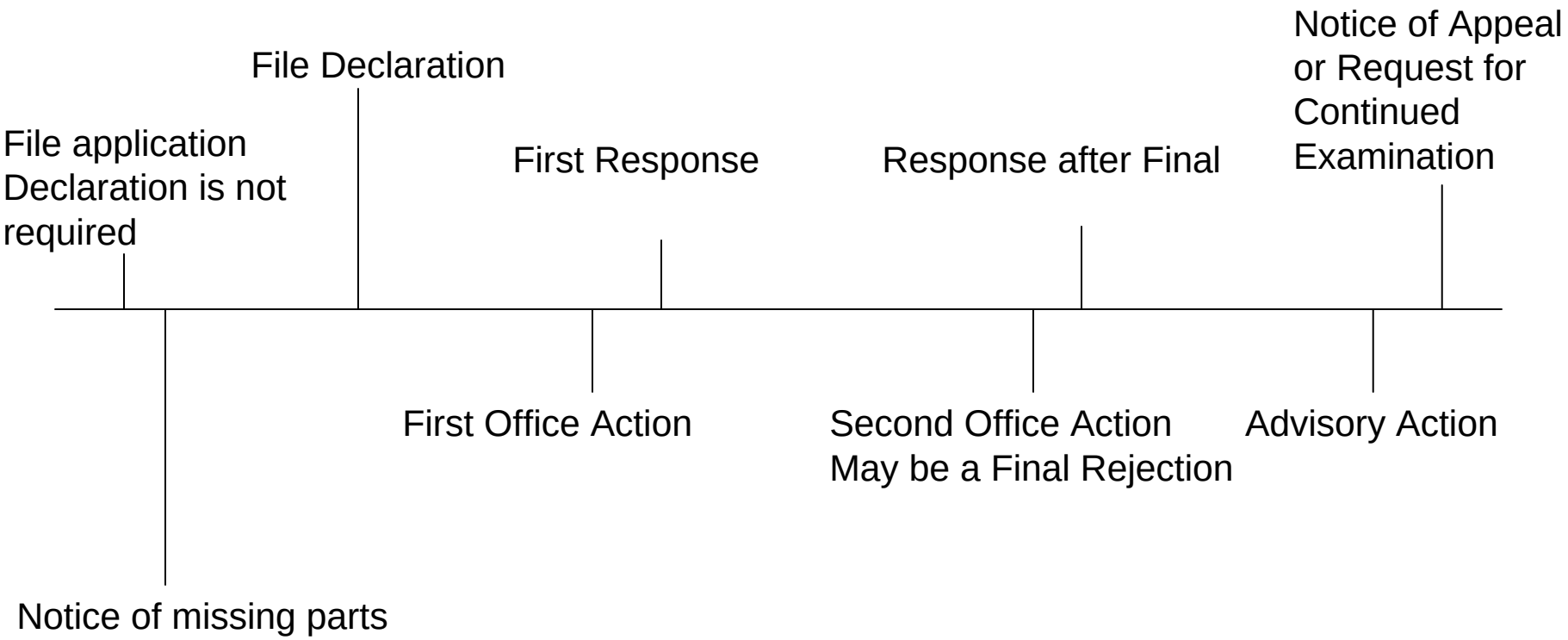
Filing a Non-Provisional Patent Application

- Papers typically filed with the application
  - Oath or Declaration
  - Power of Attorney
  - Claim for Foreign Priority
  - Information Disclosure Statement
  - Fee
  - Assignment

Filing a Non-Provisional Patent Application

- Minimum required for a filing date
  - Description of the invention
  - At least one claim
  - A drawing, if the invention requires
  - A docket reference to identify the application
  - Note: The inventor's names are not required

Timeline of Patent Prosecution



First Office Action

- Two to three years after filing
- Action on the merits
  - Objections
  - Rejections: enablement, indefiniteness, novelty, obviousness

Action on the Merits

- Common rejections
  - 35 U.S.C. 101
    - No utility or non-statutory subject matter
  - 35 U.S.C. 112, Second Paragraph
    - The claims are not clear and definite
  - 35 U.S.C. 112, First Paragraph
    - No enablement or written description
  - 35 U.S.C. 102: Prior art anticipation
  - 35 U.S.C. 103: Obviousness

First Response or Amendment

- Action on the merits
  - Time period
    - Three months after office action
    - May be extended to six months
  - Amendment or Response
    - Argue against objections and rejections
    - Correct grammatical and typographical errors in specification
    - Amend the claims

Careful Prosecution

- Make only the arguments necessary
  - Rifle, not shotgun approach
  - Avoid narrowing characterizations of claims
- Consider Examiner interviews to explore allowable claims and possible evidence

Second Office Action

- May be a final rejection
  - Second rejection or subsequent examination
  - Limits the applicant's response
    - Propose an amendment
    - File a Request for Continued Examination (RCE)
    - File a continuation application
    - Appeal a claim rejection

Allowance of Patent Application

- Patent term is from issuance until
  - Twenty (20) years from filing date
  - Filing date of first U.S. application

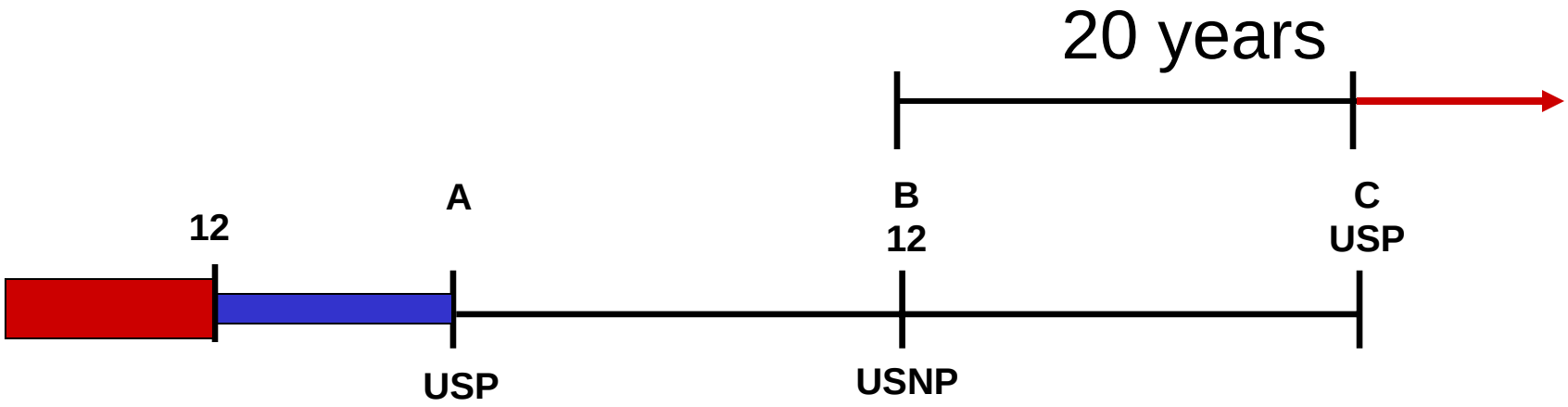
Realities of USPTO Examination

- Slow—average pendency to beginning of examination process is over 20 months
- Uncertain—over 3,500 patent examiners who vary considerably in technical, legal, and procedural expertise
- Easy to get a patent, but more difficult to get a valuable patent

Coordination of Multinational IP Prosecution

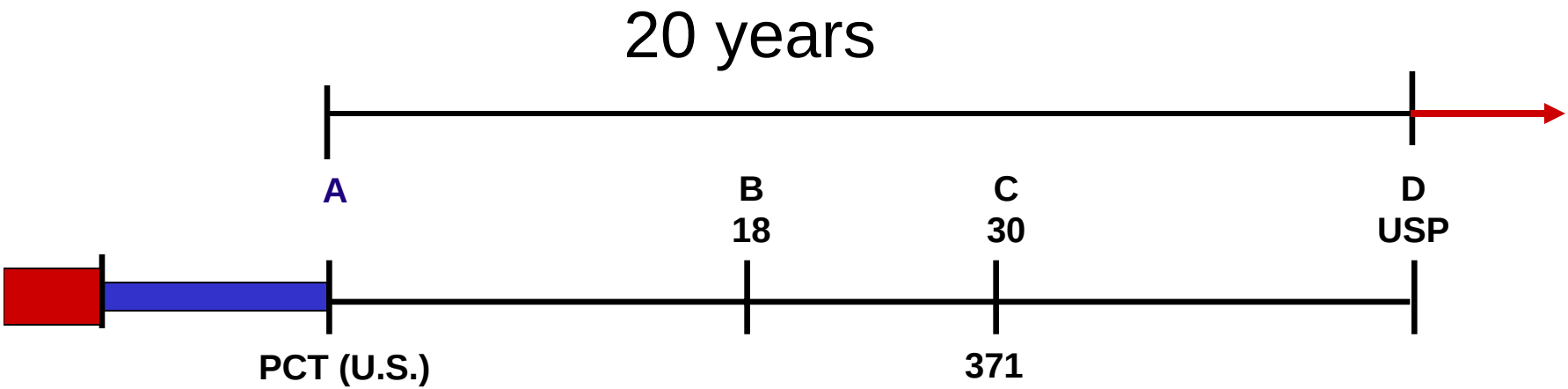
- "Global" patent applications
- Deferral of costs via PCT
- Translation and foreign associate issues
- Centralized approach to prior art
  - Consistency of arguments

Filing Strategies—Alternative 1



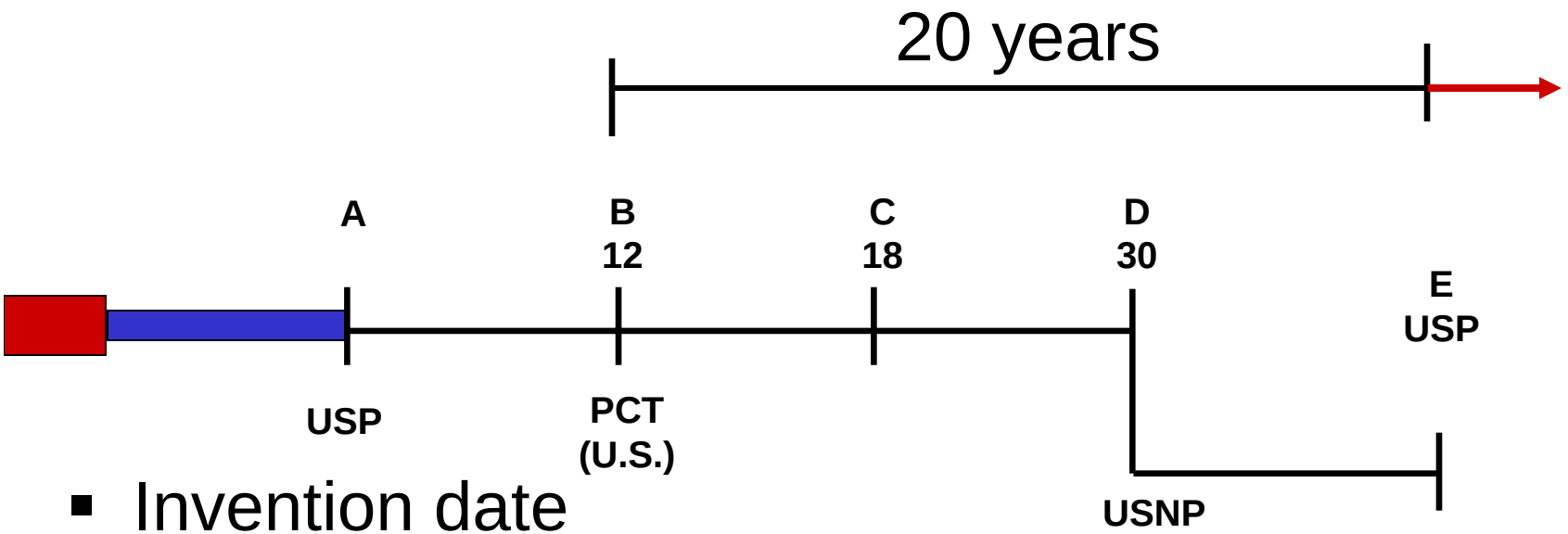
- Invention date/filing date
  - § 102 (b)
  - § 102 (a)
  - § 102 (e)
  - Patent Term

Filing Strategies—Alternative 2



- Invention date
  - § 102 (a)
  - § 102 (b)
  - § 102 (e)
  - Patent Term

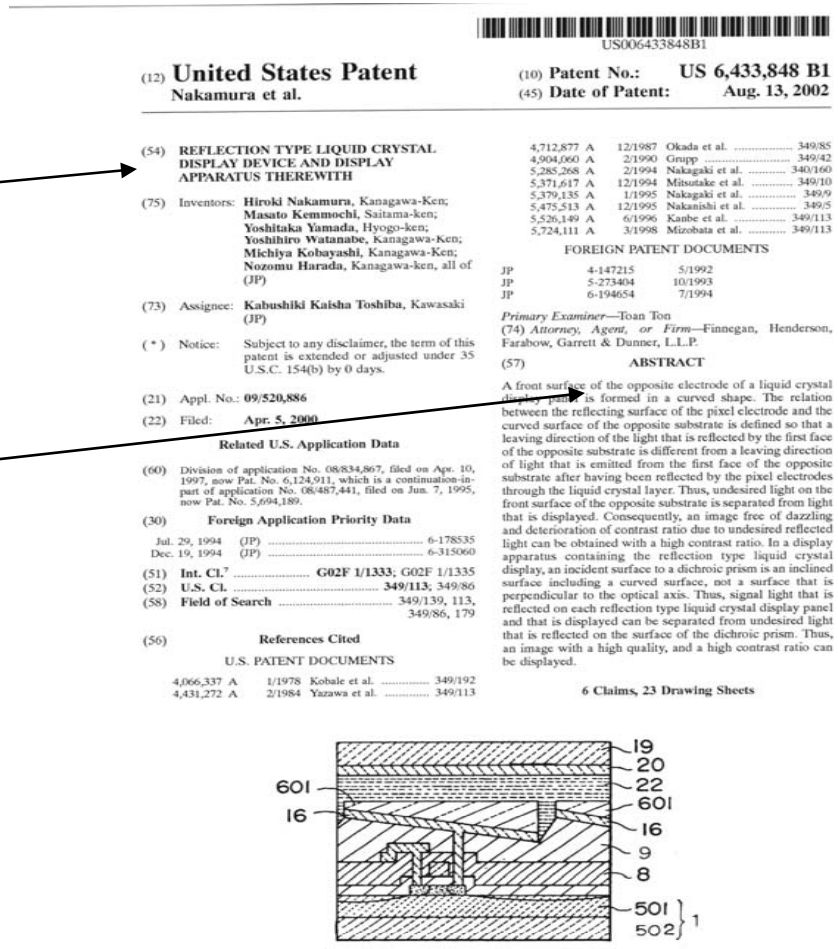
Filing Strategies—Alternative 3



- Invention date
  - § 102 (a)
  - § 102 (b)
  - § 102 (e)
  - Patent Term

How to Read a Patent

- U.S. Patent Office requires
  - Title
  - Background
  - Figures (if needed)
  - Abstract
  - Detailed Description
  - "Best Mode"
  - Claims



US006433848B1

(12) **United States Patent**
Nakamura et al.

(10) **Patent No.: US 6,433,848 B1**
(45) **Date of Patent: Aug. 13, 2002**

(54) **REFLECTION TYPE LIQUID CRYSTAL DISPLAY DEVICE AND DISPLAY APPARATUS THEREWITH**

(75) Inventors: **Hiroki Nakamura**, Kanagawa-Ken; **Masato Kemmochi**, Saitama-ken; **Yoshitaka Yamada**, Hyogo-ken; **Yoshihiro Watanabe**, Kanagawa-Ken; **Michiya Kobayashi**, Kanagawa-Ken; **Nozomu Harada**, Kanagawa-ken, all of (JP)

(73) Assignee: **Kabushiki Kaisha Toshiba**, Kawasaki (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/520,886**

(22) Filed: **Apr. 5, 2000**

Related U.S. Application Data

(60) Division of application No. 08/834,867, filed on Apr. 10, 1997, now Pat. No. 6,124,911, which is a continuation-in-part of application No. 08/487,441, filed on Jun. 7, 1995, now Pat. No. 5,694,189.

(30) **Foreign Application Priority Data**

Jul. 29, 1994 (JP) 6-178535
Dec. 19, 1994 (JP) 6-315060

(51) **Int. Cl.**[7] **G02F 1/1333**; G02F 1/1335
(52) **U.S. Cl.** **349/113**; 349/86
(58) **Field of Search** 349/139, 113, 349/86, 179

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Primary Examiner—Toan Ton
(74) *Attorney, Agent, or Firm*—Finnegan, Henderson, Farabow, Garrett & Dunner, L.L.P.

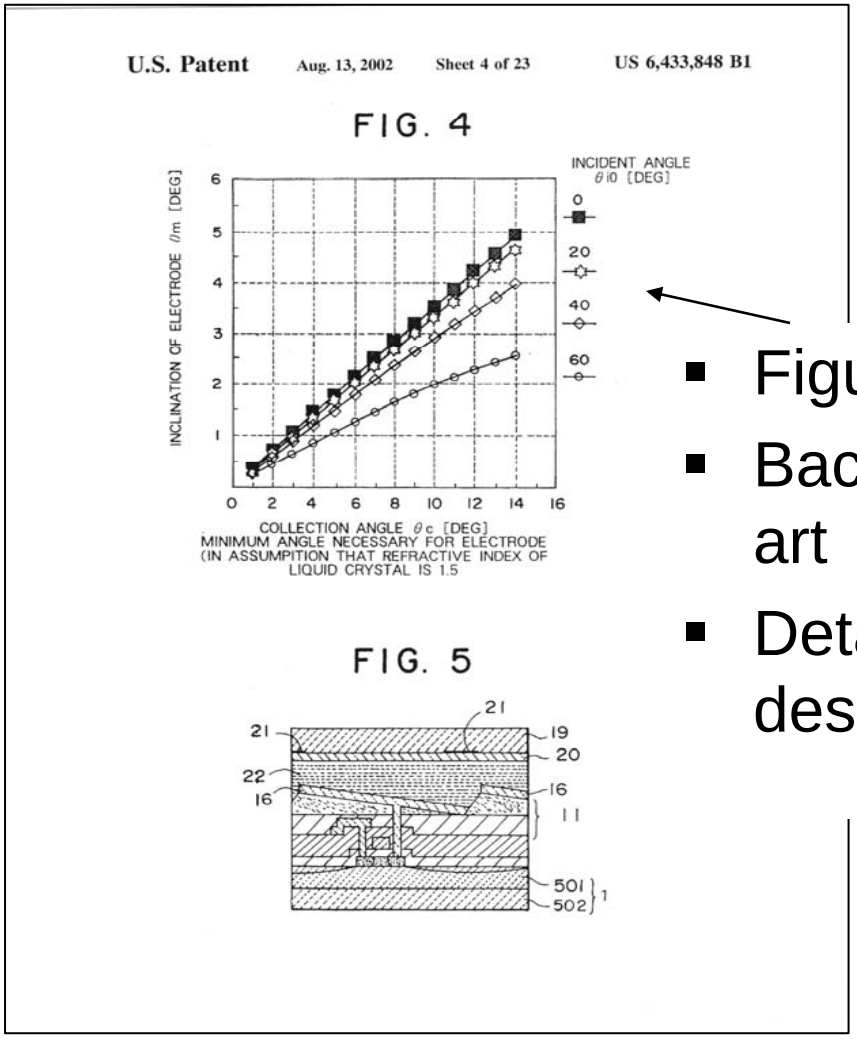
(57) **ABSTRACT**

A front surface of the opposite electrode of a liquid crystal display panel is formed in a curved shape. The relation between the reflecting surface of the pixel electrode and the curved surface of the opposite substrate is defined so that a leaving direction of the light that is reflected by the first face of the opposite substrate is different from a leaving direction of light that is emitted from the first face of the opposite substrate after having been reflected by the pixel electrodes through the liquid crystal layer. Thus, undesired light on the front surface of the opposite substrate is separated from light that is displayed. Consequently, an image free of dazzling and deterioration of contrast ratio due to undesired reflected light can be obtained with a high contrast ratio. In a display apparatus containing the reflection type liquid crystal display, an incident surface to a dichroic prism is an inclined surface including a curved surface, not a surface that is perpendicular to the optical axis. Thus, signal light that is reflected on each reflection type liquid crystal display panel and that is displayed can be separated from undesired light that is reflected on the surface of the dichroic prism. Thus, an image with a high quality, and a high contrast ratio can be displayed.

6 Claims, 23 Drawing Sheets

FINNEGAN HENDERSON FARABOW GARRETT & DUNNER LLP

Components of a Patent II

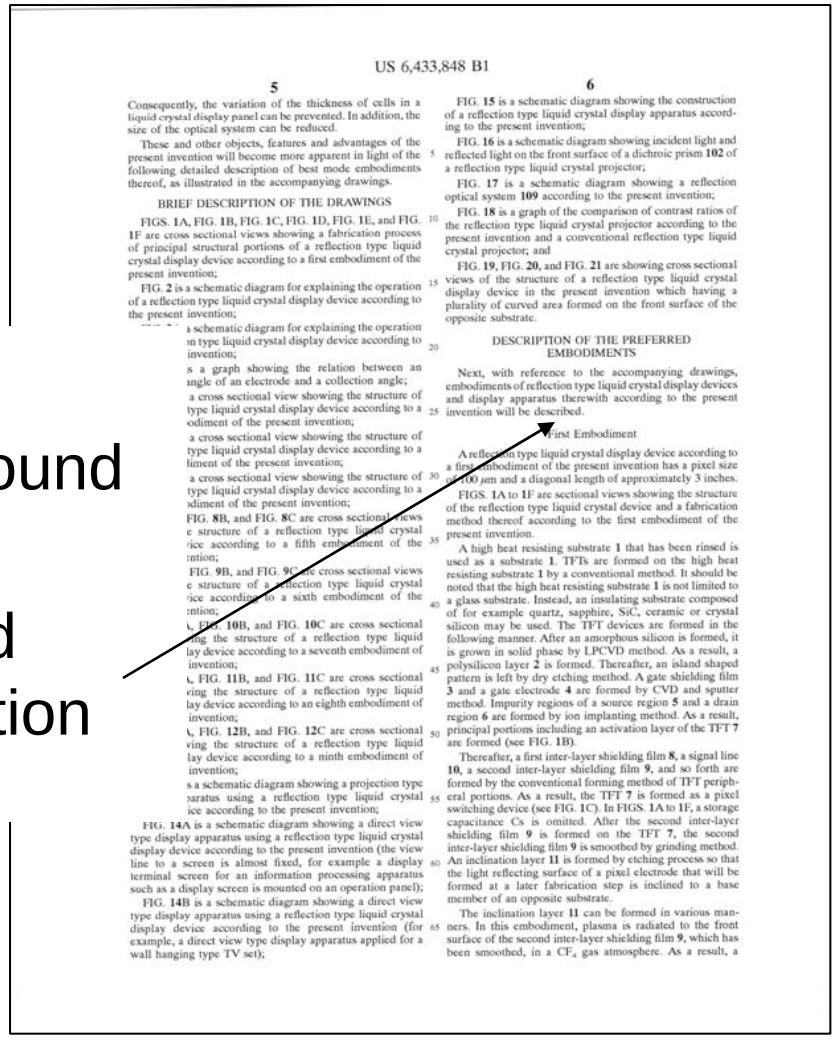


U.S. Patent Aug. 13, 2002 Sheet 4 of 23 US 6,433,848 B1

FIG. 4

FIG. 5

- Figures
- Background art
- Detailed description



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Consequently, the variation of the thickness of cells in a liquid crystal display panel can be prevented. In addition, the size of the optical system can be reduced.

These and other objects, features and advantages of the present invention will become more apparent in light of the following detailed description of best mode embodiments thereof, as illustrated in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. **1**A, FIG. **1**B, FIG. **1**C, FIG. **1**D, FIG. **1**E, and FIG. **1**F are cross sectional views showing a fabrication process of principal structural portions of a reflection type liquid crystal display device according to a first embodiment of the present invention;

FIG. **2** is a schematic diagram for explaining the operation of a reflection type liquid crystal display device according to the present invention;

...a schematic diagram for explaining the operation ...n type liquid crystal display device according to ...invention;

...s a graph showing the relation between an ...ngle of an electrode and a collection angle;

...a cross sectional view showing the structure of ...type liquid crystal display device according to a ...odiment of the present invention;

...a cross sectional view showing the structure of ...type liquid crystal display device according to a ...liment of the present invention;

...a cross sectional view showing the structure of ...type liquid crystal display device according to a ...odiment of the present invention;

...FIG. **8**B, and FIG. **8**C are cross sectional views ...e structure of a reflection type liquid crystal ...rice according to a fifth embodiment of the ...ntion;

...FIG. **9**B, and FIG. **9**C are cross sectional views ...e structure of a reflection type liquid crystal ...rice according to a sixth embodiment of the ...ntion;

...FIG. **10**B, and FIG. **10**C are cross sectional ...ing the structure of a reflection type liquid ...lay device according to a seventh embodiment of ...invention;

...FIG. **11**B, and FIG. **11**C are cross sectional ...ing the structure of a reflection type liquid ...lay device according to an eighth embodiment of ...invention;

...FIG. **12**B, and FIG. **12**C are cross sectional ...ing the structure of a reflection type liquid ...lay device according to a ninth embodiment of ...invention;

...s a schematic diagram showing a projection type ...paratus using a reflection type liquid crystal ...ice according to the present invention;

FIG. **14**A is a schematic diagram showing a direct view type display apparatus using a reflection type liquid crystal display device according to the present invention (the view line to a screen is almost fixed, for example a display terminal screen for an information processing apparatus such as a display screen is mounted on an operation panel);

FIG. **14**B is a schematic diagram showing a direct view type display apparatus using a reflection type liquid crystal display device according to the present invention (for example, a direct view type display apparatus applied for a wall hanging type TV set);

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FIG. **15** is a schematic diagram showing the construction of a reflection type liquid crystal display apparatus according to the present invention;

FIG. **16** is a schematic diagram showing incident light and reflected light on the front surface of a dichroic prism **102** of a reflection type liquid crystal projector;

FIG. **17** is a schematic diagram showing a reflection optical system **109** according to the present invention;

FIG. **18** is a graph of the comparison of contrast ratios of the reflection type liquid crystal projector according to the present invention and a conventional reflection type liquid crystal projector; and

FIG. **19**, FIG. **20**, and FIG. **21** are showing cross sectional views of the structure of a reflection type liquid crystal display device in the present invention which having a plurality of curved area formed on the front surface of the opposite substrate.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Next, with reference to the accompanying drawings, embodiments of reflection type liquid crystal display devices and display apparatus therewith according to the present invention will be described.

First Embodiment

A reflection type liquid crystal display device according to a first embodiment of the present invention has a pixel size of 100 μm and a diagonal length of approximately 3 inches.

FIGS. **1**A to **1**F are sectional views showing the structure of the reflection type liquid crystal device and a fabrication method thereof according to the first embodiment of the present invention.

A high heat resisting substrate **1** that has been rinsed is used as a substrate **1**. TFTs are formed on the high heat resisting substrate **1** by a conventional method. It should be noted that the high heat resisting substrate **1** is not limited to a glass substrate. Instead, an insulating substrate composed of for example quartz, sapphire, SiC, ceramic or crystal silicon may be used. The TFT devices are formed in the following manner. After an amorphous silicon is formed, it is grown in solid phase by LPCVD method. As a result, a polysilicon layer **2** is formed. Thereafter, an island shaped pattern is left by dry etching method. A gate shielding film **3** and a gate electrode **4** are formed by CVD and sputter method. Impurity regions of a source region **5** and a drain region **6** are formed by ion implanting method. As a result, principal portions including an activation layer of the TFT **7** are formed (see FIG. **1**B).

Thereafter, a first inter-layer shielding film **8**, a signal line **10**, a second inter-layer shielding film **9**, and so forth are formed by the conventional forming method of TFT peripheral portions. As a result, the TFT **7** is formed as a pixel switching device (see FIG. **1**C). In FIGS. **1**A to **1**F, a storage capacitance Cs is omitted. After the second inter-layer shielding film **9** is formed on the TFT **7**, the second inter-layer shielding film **9** is smoothed by grinding method. An inclination layer **11** is formed by etching process so that the light reflecting surface of a pixel electrode that will be formed at a later fabrication step is inclined to a base member of an opposite substrate.

The inclination layer **11** can be formed in various manners. In this embodiment, plasma is radiated to the front surface of the second inter-layer shielding film **9**, which has been smoothed, in a CF_4 gas atmosphere. As a result, a

Components of a Patent III

- Claims, claims, claims!
  - Boundary of what you own

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inclination angle to the main surface on the light leaving side. The reflection optical system **106** is adhered to the main surface on the light leaving side of the dichroic prism **102**.

Since the liquid crystal display panels for use in the reflection type projector are reflection type liquid crystal display panels, for simplicity, the illustration and description thereof are omitted. The reflection type liquid crystal display panels according to the twelfth embodiment are conventional TFT active matrix type liquid crystal display panels. Each of the liquid crystal display panels has a pixel size of 100 μm and a diagonal length of approximately 3 inches. The projection type liquid crystal projector includes three reflection type liquid crystal display panels for R, G, and B. As the liquid crystal layer, a polymer dispersed type liquid crystal is used so as to improve the luminance. Alternatively, conventional TN type or STN type liquid crystal display devices may be used.

Between each of the liquid crystal display panels **100***a*, **100***b*, and **100***c* and the dichroic prism **102**, an optical matching layer **107** is formed.

The liquid crystal display panels **100***a*, **100***b*, and **100***c* are adhered to the three main surfaces of the dichroic prism **102** with an acrylic adhesive resin whose refractive index is 1.5.

At this point, the main surface on the light incidence side of the dichroic prism **102** is inclined as the inclined surface **108**, not perpendicular to the optical axis. The inclined surface can be formed in curved shape. Alternatively, a wedge shape or a triangular prism shape reflection optical system **106** is adhered to the main surface on the light incident side of the dichroic prism **102**. Consequently, the light that is reflected on the liquid crystal display panel and that is displayed is separated from the undesired light that is reflected on the front side of the dichroic prism **102**. As a result, a reflection type display apparatus with a high on/off ratio and a high contrast ratio can be accomplished.

As described above, it is very important for the reflection type liquid crystal display apparatus to separate undesired light that is reflected on the substrate or the light leaving side (screen) from light that is reflected on the pixel electrode and displayed so as to improve the luminance of the display screen and the contrast ratio. The angle of the pixel electrode to the surface direction can be calculated as follows. FIG. **16** is a schematic diagram showing incident light and reflected light. The surface **108** can be formed in a curved shape.

The incident surface on the light source side of the conventional dichroic prism **102** is inclined for θs. Light is entered into the inclined surface at an inclined angle θi to the normal. At this point, the collection angle θc at the aperture **105** should satisfy the following condition.

$$\theta c < (\theta i + \theta r) = 2 \times \theta i \quad (1)$$

where θm is the entering angle of the light to the dichroic prism **102**; and θr is the reflecting angle on the front surface of the dichroic prism **102**.

When light is vertically entered into the dichroic prism (namely, θm =θs), the following equation is satisfied.

$$n = \sin \theta i / \sin \theta m \quad (2)$$

where n is the refractive index (the refractive index n of glass to air is 1.5).

In other words, the relation of θi and θs can be obtained from Snell's law.

When the collection angle is 5 degrees, the incident angle θi is preferably 2.5 degrees or more due to the equation (1). When the result is substituted into the equation (2), the inclination angle of the substrate is given by the following equation.

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$$\theta s = \arcsin((\sin \theta i)/n) \quad (3)$$

where θs is the inclination angle of the substrate.

From the equation, it is clear that θs is 1.7 degrees or greater.

At this inclination angle, the effect of the prism by the reflection optical system **106** can be optically ignored. The inclination angle of the reflection optical system **106** can be obtained by grinding one main surface of the dichroic prism **102** or adhering a glass substrate with an inclined surface.

The shape of the reflection optical system **106** is not limited to the above-described wedge shape. Alternatively, the shape of the reflection optical system **106** may be a triangular prism shape with a cross section of an isosceles triangle as shown in FIG. **17**.

FIG. **18** is a graph showing experimental results of projected images of the reflection type liquid crystal projector according to the this embodiment and conventional reflection type liquid crystal projector. Referring to FIG. **18**, the contrast ratio of the reflection type liquid crystal projector according to the this embodiment is 100:1 that is remarkably improved than that of the conventional reflection type liquid crystal projector. In addition, the contrast ratio of the reflection type liquid crystal projector according to this embodiment is twice or more times improved than that of a conventional reflection type liquid crystal projector using a reflection protecting film.

As described in the twelfth embodiment of the present invention, according to the present invention, a reflection type liquid crystal projector including reflection type liquid crystal display devices that separate light displayed as an image from undesired light reflected on the front surface of the liquid crystal display panel and prevents luminance characteristics and a contrast ratio from deteriorating due to the reflected light can be provided so as to display an image with a high contrast ratio.

Although the present invention has been shown and described with respect to best mode embodiments thereof, it should be understood by those skilled in the art that the foregoing and various other changes, omissions, and additions in the form and detail thereof may be made therein without departing from the spirit and scope of the present invention.

What is claimed is:

1. A reflection type liquid crystal display apparatus comprising:

a plurality of scanning lines and a plurality of signal lines that are intersected with each other and that are disposed on a flat base member;

a switching device connected to the scanning lines and the signal lines and controlled by scanning voltages of an image signal voltage applied from the scanning lines;

a switching device array substrate having a pixel electrode connected to the switching device and to which the image signal voltage is applied and that is adapted for reflecting incident light;

an opposite substrate having an opposite electrode disposed opposite to said switching device array substrate with a space on a base member; and

a liquid crystal layer disposed in the space between said switching device array substrate and said opposite substrate, the periphery of said switching device array substrate and said opposite substrate being sealed,

wherein said pixel electrode includes a first pixel electrode layer which has a reflecting main surface inclined to said opposite substrate and a second pixel electrode layer disposed on the main surface of the first pixel electrode layer, and

Why and When to File a Patent Application

- Before publication or offer for sale
- Before public use
- When you are concerned that your competitors are getting close
- When you need patents or patent applications to establish credibility to attract partners or financing
- When you are required to because of your agreements
- When the inventions are in your core business areas

Introduction—"Strategic IP Management"?

- "Strategic IP Management" relates to improving corporate value through the effective acquisition and use of IP
  - "Value" can take many forms—cash, market exclusivity, basis for cross-licensing or joint venture, etc.

What Is "Strategic IP Management"?

- "IP Management" includes four basic processes
  1. Creating New Value through the integration of the company's IP and new product development strategies to generate IP that strongly protects the products and products that avoid infringement of third party rights
  2. Maximizing IP Value by aligning the client's IP portfolio with its business objectives and coordinating international prosecution and litigation
  3. Assessing IP Value and Risks in various litigation and transactional scenarios
  4. Realizing Value through IP enforcement and/or business arrangements (licensing, acquisitions, financings, donations, collaborative arrangements, etc.)

Goals of a Strategic Portfolio

- Defensive
  - Patents with claims that cover your products
  - Trademark registrations that protect your mark's goodwill
  - Judicious use of copyrights to protect software
  - Trade Secret protection only for material that can be kept secret

Goals of a Strategic Portfolio

- Offensive
  - Patents with claims that that cover competitor's products
  - Patents on material that is anticipated to be necessary for production of a new generation of products

Goals of a Strategic Portfolio

- Attractive purpose
  - Patents that cover technology perceived to be of future value by investors
  - Trade Secrets and Know-how in a technology perceived to be of future value by investors
  - Documentation of IP in a manner to enhance value (i.e., well written specifications for patent applications)
  - “Clean” and complete prosecution of patent and trademark applications

Strategy Boards

- Decides which inventions to protect
- Makes strategic decisions regarding maintenance of the patent portfolio
- In some cases, investigates positions with respect to the IP of others

Strategy Boards—Composition

- Ideally, one for each line of business plus Central R&D
- Must have tripartite participation (business, legal, technical) and support
- Meets on regular basis (quarterly) or on continuous basis via e-mail
- Consider
  - New invention disclosures from your inventors and whether to file or to keep as trade secret
  - Filing strategy

Strategy Boards

- Other responsibilities
  - Pruning the existing database
  - Third party developments
  - Contracts
  - Litigation
  - Licensing
  - Opinions of Counsel
  - Changes in the law (legal decisions and patent changes)
  - “Horizon” issues—are we obtaining IP that will cover where the company/industry is going?