Intellectual Property Overview

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Intellectual Property

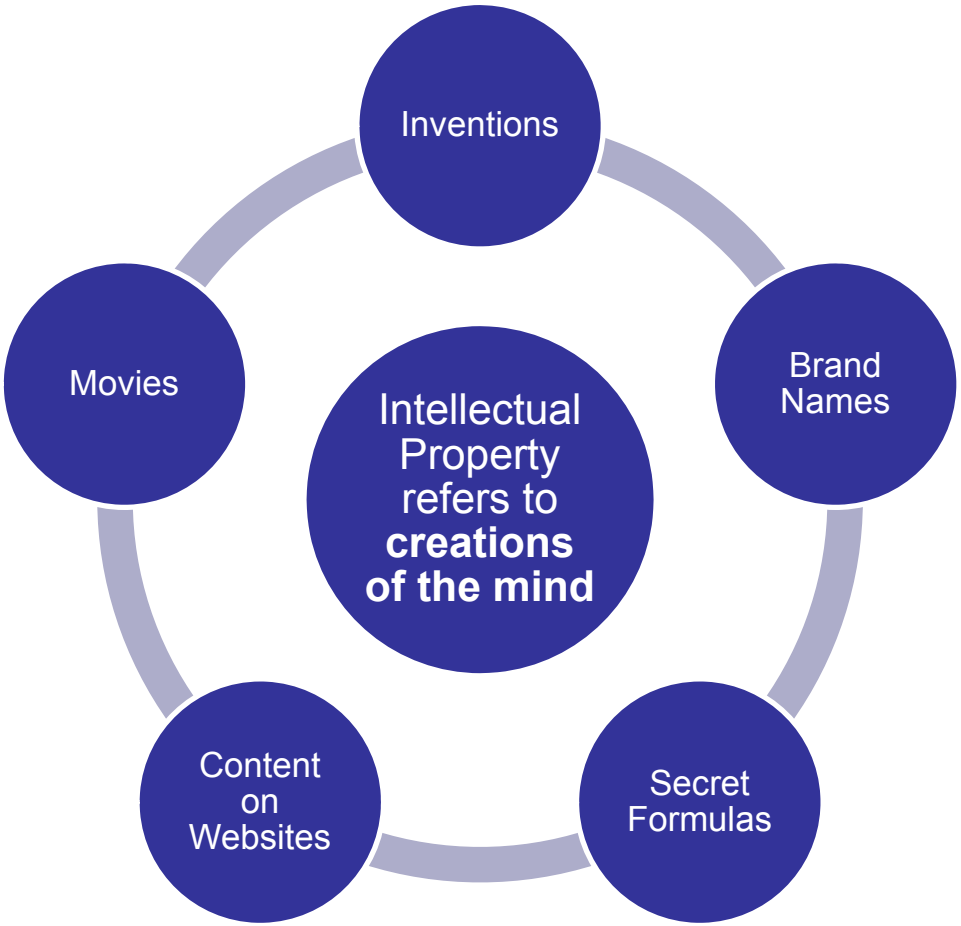
- More than one form of IP protection may apply
- Patent
  - Design patent on the bottle shape
  - Utility patent on method of fortifying drinks with vitamins
- Trademark on bottle shape and Coke
- Copyright on advertising and promotion
- Trade Secret on the formula

Intellectual Property

- In the Shark Tank show, entrepreneurs pitch their ideas to a panel of investors (Sharks).

- Here are some questions that are often asked by the Sharks:
  - "Why can't I just make this product myself?"
  - "Why do I need you?"
  - "Do you have a patent or other IP protecting the idea?"

Intellectual Property



Types of Intellectual Property

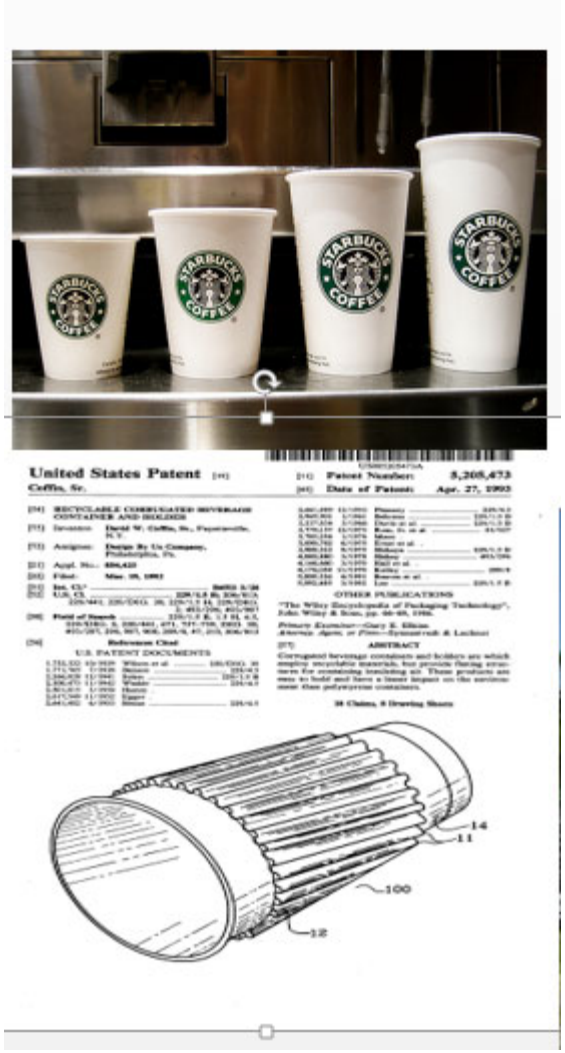
Patents	• Inventions
Trademarks	• Identify source of a product or service
Copyrights	• Expressions of ideas
Trade Secrets	• Secret information with commercial value

What is a Patent?

- Limited property right to **exclude** others from making, using, or selling an invention.

- Does **not** give the right to practice your invention.

A Famous Patent



Types of Patents

- Utility Patents
  - Protect the way an invention works
  - 20 year term from filing date
  - Provisional and Non-provisional applications

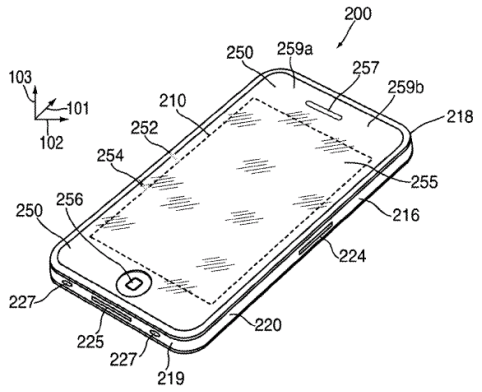


FIG. 2A

Apple U.S. Patent No. 8,551,283

- Design Patents
  - Protect ornamental appearance
  - 15 year term from issue date

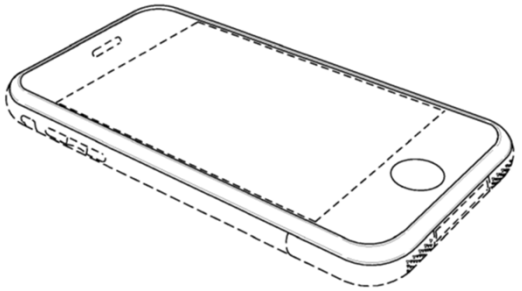


FIG. 1

Apple Design Patent No. D593,087

- Plant Patents
  - Protect new varieties of asexually produced plants

US006414405B1

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

(10) **Patent No.: US 6,414,405 B1**
(45) **Date of Patent: Jul. 2, 2002**

(54) **METHOD AND APPARATUS FOR OPERATING CABLED-FIBER UNDERSEA NETWORK, AND FAULT-TOLERANT BRANCHING UNIT FOR USE THEREIN**

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(73) Assignee: **Tyco Telecommunications (US) Inc.**, Morristown, NJ (US)

(*) 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.: **09/460,011**

(22) Filed: **Dec. 13, 1999**

(51) **Int. Cl.**[7] **H02J 7/00**
(52) **U.S. Cl.** **307/149**; 307/52; 307/38; 307/100; 307/113; 307/125; 307/131; 307/139; 307/149
(58) **Field of Search** 307/149, 38, 100, 307/139, 113, 125, 131, 52; 340/850

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,841,205 A * 11/1998 Webb 307/130
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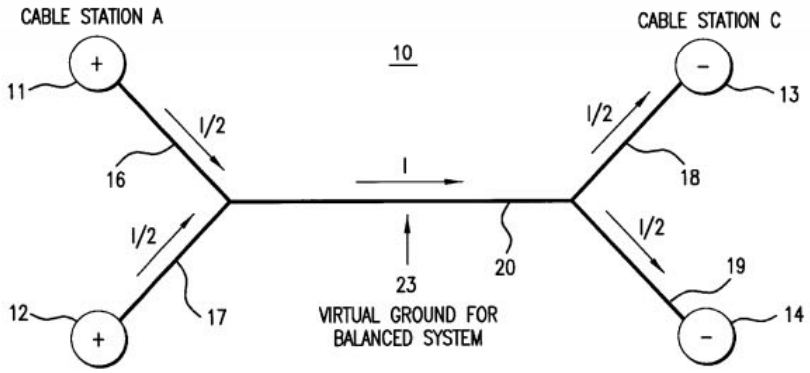
* cited by examiner

Primary Examiner—Stephen W. Jackson
Assistant Examiner—Robert L Deberadinis

(57) **ABSTRACT**

A powering arrangement for an undersea cable system provides that each branch of the system is supplied with a current equal to half of the current in the trunk. By coupling both branches to the trunk, the current adds at the branching unit. Upon occurrence of a power path fault in any branch, a virtual ground moves to the site of the fault. In addition, an image virtual ground moves to a similar point in the branch that does not have the cable fault. As a result of this implementation, the cable power system is able to tolerate at least one fault in a branch without necessitating repair, and can tolerate some multiple branch faults depending upon their location. In contrast to the operation of existing power-switched branching units, the fault-tolerant branching unit does not require down-powering and re-powering in order in order to change the power configuration, e.g., to allow a virtual ground to be re-located at shunt fault sites that occur in either trunk or branches. Moreover, even with a branch shunt fault or cable break, the fault-tolerant branching unit allows for power to be removed from the faulted branch for repair without having to first power down the other two legs. And finally, at the completion of a branch repair, power to the repaired branch can be restored without first powering down the other two legs.

33 Claims, 11 Drawing Sheets



SUMMARY OF THE INVENTION

The present invention solves these and other problems by providing that each branch of the system be supplied with a current equal to half the current in the trunk and by coupling the power path of both branches to the trunk so that the current sums at the branching unit. As a result of the above provisions, upon occurrence of a cable fault in any branch, a virtual ground moves to the site of the cable fault, even in the branch with the fault. In addition, an image virtual ground moves to a similar point in the branch that does not have the cable fault.

As a result of this implementation, a system employing the techniques and apparatuses of the present invention is able to tolerate at least one fault in a branch without necessitating down powering and re-powering:

1) to maintain traffic (provided the fault is a shunt and the cabled glass fibers are not damaged);

2) to subsequently allow the branch containing the fault to be powered-down separately to ensure the safety of shipboard personnel during the repair operation while still allowing traffic to be carried over the portions of the system without a fault; and

3) to return to a normal powering configuration upon completion of a repair without affecting traffic being carried over the portion of the system without a fault.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1A** depicts a block diagram of a conventional single power-switched branching unit showing the powering arrangement for the trunk and branches.

FIG. **1B** depicts a block diagram of an alternate powering arrangement for the conventional power-switched branch shown in FIG. **1A**.

FIG. **2** depicts a block diagram of an exemplary embodiment of a system employing fault-tolerant branching units according to one aspect of the present invention.

FIG. **3** depicts the powering arrangement of the system of FIG. **2** in a normal operating state according to another aspect of the present invention.

FIG. **4** depicts the powering arrangement of the system of FIG. **2** in an operating state in which there is a single fault according to another aspect of the present invention.

FIG. **5** depicts the powering arrangement of the system of FIG. **2** in a single fault repair operating state according to another aspect of the present invention.

FIG. **6** depicts the powering arrangement of the system of FIG. **2** in a operating state in which there are two faults according to another aspect of the present invention.

FIG. **7** depicts the powering arrangement of the system of FIG. **2** in a second fault repair operating state according to another aspect of the present invention.

FIG. **8A** depicts the normal operating state of the cable system employing the fault-tolerant branching unit according to yet another aspect of the present invention.

FIG. **8B** depicts the voltage profile of the system as depicted in FIG. **8A**.

FIG. **9A** depicts the single fault operating state of the cable system employing the fault-tolerant branching unit according to yet another aspect of the present invention.

FIG. **11** depicts an exemplary embodiment of one aspect of the present invention for use in a generalized cable system, in which the number of branches at each end may vary.

DETAILED DESCRIPTION

System Implementation with Fault-Tolerant Branching Unit

The system **10** depicted in FIG. **2**, which interconnects four stations **11**, **12**, **13** and **14** over a single trunk **15**, implements fault-tolerant electrical powering. The configuration shown in FIG. **2** enables a continuous connection from cable station A **11** to cable stations C **13** and D **14** even in the event of a cable fault in branch **17**, for example. As most cable faults occur in the segment of the system from the edge of the continental shelf to the landing (which are usually served by branches, such as **16**, **17**, **18** or **19**), enabling continuous connection even in the event of a branch cable fault significantly improves the reliability and availability of the entire system. Moreover, as alternate connections (shown as dotted lines **24**, **25**) between cable stations A **11** and B **12** can be provided over land line networks in the event of a cable break, traffic may still be able to flow from cable station B **12** to cable stations C **13** and D **14** even with a break in the branch **17**. In addition, the configuration shown in FIG. **2** requires only a single cable to be laid across the ocean in contrast to traditional dual cable systems necessary to provide similar reliability and availability. Elimination of a single transoceanic cable can have a significant cost reduction on the installation costs (and capital investment costs) of such a system.

Fault-tolerant electrical powering enables the cabled-fiber system **10** to survive single branch shunt faults (i.e., a fault in branches **16**, **17**, **18** or **19**) without losing any traffic in the system **10** (provided the cabled fibers are not damaged), except during repair of the fault. Moreover, the fault-tolerant electrical powering according to this aspect of the present invention enables the system to survive single-branch complete cable breaks (i.e., breaks in branches **16**, **17**, **18** or **19**) while only losing the traffic carried in the faulted branch **16**, **17**, **18** or **19**.

A second fault can also be tolerated before the first fault is repaired. For example, if a single fault occurs in branch **16**, a second fault can be tolerated if it occurs in branches **17**, **18** or **19**. However, if the first fault occurs in branch **16**, for example, a second fault in branch **17** could be tolerated by the system **10**, but not repaired until the repair of the first fault is completed in branch **16**. Similarly, if the first fault occurs in branch **17**, for example, a second fault in branch **16** could be tolerated by the system **10** but not repaired until the repair of the first fault is completed. If a single fault occurs in branch **16** or **17**, a second fault in branch **18** or **19** can be tolerated and repaired simultaneously with the first fault. The same is true for two faults in branches **18** and **19**.

The system **10** can also survive a shunt fault in the trunk **15** and maintain traffic (provided the cabled fibers are not damaged), but during the repair operation the trunk must be powered-down with the concomitant loss of trunk traffic until the repair is complete. If the trunk cable **15** is completely broken (i.e., both power conductor **20** and fibers **1**–**8** are parted), the system **10** is out of service until a repair is

What is claimed is:

1. In a cable network having four cable stations, a first cable station and a second cable station of which four cable stations are coupled to a first branching unit via a first branch and a second branch, respectively, a third cable station and a fourth cable station of which four cable stations are coupled to a second branching unit via a third branch and a fourth branch, respectively, and the first and second branching units are coupled together via a trunk, a method for powering the cable network comprising the steps of:

a) supplying a first current from the first cable station to the first branching unit of the cable network;

b) supplying a second current from the second cable station to the first branching unit of the cable network; and

c) adding the first and second currents at the first branching unit to obtain a third current, which is twice the first current and twice the second current; and

d) supplying the trunk with the third current.

2. The method according to claim **1**, further comprising the step of splitting the third current into two currents of equal magnitude at the second branching unit.

3. The method according to claim **1**, further comprising the steps of coupling a first positive voltage source to the first branch, and coupling a second positive voltage source to the second branch.

4. The method according to claim **3**, further comprising the steps of coupling a first negative voltage source to the third branch, and coupling a second negative voltage source to the fourth branch.

5. The method according to claim **4**, further comprising the step of selecting values of the first, second, third and fourth voltage sources so that a virtual ground can exist at a point approximately in a middle of the trunk.

6. The method according to claim **5**, further comprising the step of maintaining the values of the first, second third and fourth voltages in the event of a power path fault so that the virtual ground moves to the site of the fault.

7. In a cable network including at least four cable stations, a first cable station and a second cable station of which four cable stations are coupled to a first branching unit via a first branch and a second branch, respectively, a third cable station and a fourth cable station of which four cable stations are coupled to a second branching unit via a third branch and a fourth branch, respectively, and the first and second branching units are coupled together via a trunk, an apparatus for powering the cable network comprising:

a) a first voltage source disposed at the first cable station, being coupled to the first branch and supplying a first current to the first branching unit of the cable network via the first branch;

b) a second voltage disposed at the second cable station, being coupled to the second branch and supplying a second current to the first branching unit of the cable network via the second branch; and

c) a current adder disposed in the first branching unit adding the first and second currents to obtain a third current, which is twice the first current and twice the second current, and outputting the third current to the trunk.

8. The apparatus according to claim **7**, further comprising a current splitter disposed in the second branching unit, splitting the third current into a fourth current and a fifth current having approximately equal magnitude, outputting

9. The apparatus according to claim **7**, further comprising a first positive voltage source disposed in the first cable station and coupled to the first branch, and a second positive voltage source disposed in the second cable station and coupled to the second branch.

10. The apparatus according to claim **9**, further comprising a first negative voltage source disposed in the third cable station and coupled to the third branch, and a second negative voltage source disposed in the fourth cable station and coupled to the fourth branch.

11. The apparatus according to claim **10**, wherein each output voltage of each of the first and second positive and negative voltage sources are set so that a virtual ground exists at a predetermined point the cable system.

12. The apparatus according to claim **11**, wherein the first and second positive and negative voltage sources maintain the values of their voltages in the event of a power-path fault so that the virtual ground moves to the site of the fault.

13. A method for powering a cable network in which the cable network need not be powered-down upon occurrence of a power-path fault and re-powered after repair, comprising the steps of:

a) powering a trunk section with a first current;

b) powering branch sections with a second current being approximately half the first current; and

c) maintaining said first and second currents at their normal operating levels in the event of a power-path fault but adjusting a supply voltage, thereby creating a ground at the power-path fault site.

14. The method according to claim **13**, further comprising the step of grounding a first branch including a first power-path fault prior to commencing a repair operation.

15. The method according to claim **14**, further comprising the step of increasing the second current in a first co-branch of the first branch including the first power-path fault to be equal to the first current in the trunk.

16. The method according to claim **15**, further comprising the step of removing the ground from the first branch after repair of the first power-path fault.

17. The method according to claim **16**, further comprising the step of decreasing the second current in the first co-branch to be approximately half of the trunk current after repair of the first power-path fault.

18. The method according to claim **14**, further comprising the step of grounding a second branch including a second power-path fault prior to commencing a repair operation.

19. The method according to claim **18**, further comprising the step of increasing the second current in a second co-branch of the second branch including the second power-path fault to be equal to the first current in the trunk.

20. The method according to claim **19**, further comprising the step of removing the ground from the second branch after repair of the second power-path fault.

21. The method according to claim **20**, further comprising the step of decreasing the second current in the second co-branch to be approximately half of the trunk current after repair of the second power-path fault.

22. The method in accordance with claim **18** wherein said step of grounding a second branch is in response to an optical command channel.

23. The method in accordance with claim **14** wherein said step of grounding a first branch is in response to an optical command channel.

24. A method for powering a cable network having a trunk and a first plurality (n) of branches at at least a first end

Why Protect Your Inventions

- Showcase your technology
  - ♦ Asset when looking for funding
  - ♦ Critical factor in obtaining funds for investors
- Block your competition
- Protect an area of research while you identify a product
- Licensing revenue
- Source of recognition for the inventor
- Stimulates innovation and economic growth by protecting investment

What Can Be Patented?

". . . anything under the sun that is made by man."

U.S. Supreme Court in *Diamond v. Chakrabarty*, 447 U.S. 303 (1980)

What Can Be Patented?

- Anything new and useful
- Methods, Machines, Compositions of Matter, Manufacture
- Mathematical algorithms, laws of nature, and ideas?
  – No

Requirements for Patentability

Utility

Novelty

Non-Obvious

Description/
Enablement

Novelty

- Not already known
- Judged as of the date that the application is filed
- Invention will be compared against all public information available before the filing date of the application

Prior Art

- "Otherwise Available to the Public"
  - Oral Presentation
  - Lecture or speech
  - Demonstration at a trade show

Public Disclosures

- A public disclosure can impact the ability to obtain a patent

Timing Requirements

- United States
  - One year grace period

- Most foreign countries/regions (for example: Europe)
  - Absolute novelty

Potential Strategies

- File a patent application before public disclosure
- Render the disclosure non-public
  - an executed confidentiality or non-disclosure agreement
- Avoid disclosure from being fully enabling

Disclosure Form

- Report your inventions via the NJIT Inventor Portal

https://njit-ip.ttoportal.com/Login.aspx

No patent rights after submitting the invention disclosure form

Trade Secrets

- Secret information with commercial value
- Reasonable degree of protection
  - Physical security, limited access to material, need to know
- Recipes or formulas, business plans, customer lists, manufacturing processes
  - The formula for CocaCola (secret for more than 125 years)
  - The recipe for KFC

Trade Secrets Versus Patents

- Available for as long as the information remains confidential
  - Patent protection generally lasts about 20 years
- Could be reverse engineered or independently discovered
  - A reason to pursue patent protection
- Cannot be disclosed to the public
  - Information is disclosed in a patent application

Trademarks

- Any word, name, symbol, design, sound, color, touch, smell, device

- Identify and distinguish a product or a service
- Trademarks are adjectives; not nouns or verbs
  - Ray-Ban sunglasses
- Trade name: company or business
  - Apple
- Trademark: identifies goods
  - iPhone

Copyright

- Protects original works of authorship
  - Literary
  - Musical
  - Artistic
- Originality: independently created
- Only minimal creativity required
- Exists upon fixation of work in any tangible medium
  - No registration required

Copyright Term

- Generally life of author plus 70 years
- Work made for hire: 95 years from publication or 120 years from creation, whichever expires first

Issues

- Contact us for any advice
  - IP@NJIT.edu
- For what types of IP protection does work quality?
- Who owns the IP?
  - Each IP can have a different owner
  - Review NJIT Patent Policy
  - Review your employment agreement
- Develop an overall strategy for IP from the start before the product is introduced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