AO 120 (Rev. 08/10)

TO:	Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Eastern District of Texas on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
2:22-cv-276	7/22/2022	Eastern District of Texas

PLAINTIFF	DEFENDANT
Orckit Corporation	Cisco Systems, Inc.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	6,680,904	1/20/2004	Orckit Corporation
2	7,545,740	6/9/2009	Orckit Corporation
3	8,830,821	9/9/2014	Orckit Corporation
4	10,652,111	5/12/2020	Orckit Corporation
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/279,045	04/07/2006	David Zelig	

CONFIRMATION NO. 7423

57449
SHEEHAN PHINNEY BASS & GREEN, PA
c/o PETER NIEVES
1000 ELM STREET
MANCHESTER, NH 03105-3701

POWER OF ATTORNEY NOTICE

OC000000084790894

Date Mailed: 08/02/2016

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 07/27/2016.

- The Power of Attorney to you in this application has been revoked by the assignee who has intervened as provided by 37 CFR 3.71. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/rmturner myles/

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/279,045	04/07/2006	David Zelig	

CONFIRMATION NO. 7423

131926
May Patents Ltd. c/o Dorit Shem-Tov
P.O.B 7230
Ramat-Gan, 5217102
ISRAEL

POA ACCEPTANCE LETTER

OC000000084790951

Date Mailed: 08/02/2016

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 07/27/2016.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/rmturner myles/

PTO/SB/80 (11-08)
Approved for use through 11/30/2011. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(b).

I hereby appoint:

☑ Practitioners associated with the Customer Number: 131926

OR

☐ Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number	Name	Registration Number

as attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(b).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(b) to:

☑ The address associated with Customer Number: 131926

OR

☐ Firm or Individual Name			
Address			
City		State	Zip
Country			
Telephone		Email	

Assignee Name and Address:

Orckit IP, LLC
874 Walker Road, Suite C, Dover, Delaware, USA

A copy of this form, together with a statement under 37 CFR 3.73(b) (Form PTO/SB/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(b) may be completed by one of the practitioners appointed in this form if the appointed practitioner is authorized to act on behalf of the assignee, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee

Signature		Date	June 5, 2016
Name	Yehuda Binder	Telephone	+972-54-4444577
Title	CEO and Owner of Orckit IP LLC		

ORCKIT IP, LLC
DE LLC # 5886551
831 Beacon St. # 307
Newton, MA 02459-1840

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	26474017
Application Number:	11279045
International Application Number:	
Confirmation Number:	7423
Title of Invention:	TWO-WAY LINK AGGREGATION
First Named Inventor/Applicant Name:	David Zelig
Customer Number:	57449
Filer:	Yehuda Binder
Filer Authorized By:	
Attorney Docket Number:	40552-6140
Receipt Date:	27-JUL-2016
Filing Date:	07-APR-2006
Time Stamp:	16:46:48
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Assignee showing of ownership per 37 CFR 3.73	SIGNED-sb0096-07.pdf	82444 5f0ceb437e16afc28bb11cbbdcab532afa8b4467	no	1

Warnings:

Information:					
2	Power of Attorney	Signed-POA.pdf	137789 03199d6fc2535ea8201418fc7d2606b12fcefb97	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	220233	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/96 (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: David Zelig, Ronen Solomon, Uzi Khill

Application No./Patent No.: 11/279,045 Filed/Issue Date: 04-07-2006

Titled: TWO-WAY LINK AGGREGATION

ORCKIT IP, LLC , a Limited Liability Company

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.

states that it is:

1. ☒ the assignee of the entire right, title, and interest in;

2. ☐ an assignee of less than the entire right, title, and interest in (The extent (by percentage) of its ownership interest is _____ %); or

3. ☐ the assignee of an undivided interest in the entirety of (a complete assignment from one of the joint inventors was made)

the patent application/patent identified above, by virtue of either:

A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy therefore is attached.

OR

B. ☒ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: David Zelig, Ronen Solomon, Uzi Khill To: .CORRIGENT SYSTEMS LTD

The document was recorded in the United States Patent and Trademark Office at Reel 017441, Frame 0881, or for which a copy thereof is attached.

2. From: .CORRIGENT SYSTEMS LTD To: ORCKIT-CORRIGENT LTD

The document was recorded in the United States Patent and Trademark Office at Reel 032579, Frame 0201, or for which a copy thereof is attached.

3. From: ORCKIT-CORRIGENT LTD To: ORCKIT IP, LLC

The document was recorded in the United States Patent and Trademark Office at Reel 038453, Frame 0840, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☐ As required by 37 CFR 3.73(b)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (*i.e.*, a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Yehuda Binder/ July 26 2016

Signature Date

ORCKIT IP, LLC
DE LLC # 5886551
831 Beacon St. # 307
Newton, MA 02459-1840

Yehuda Binder CEO and Owner of Orckit IP LLC

Printed or Typed Name Title

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PATENT ASSIGNMENT COVER SHEET

Electronic Version v1.1
Stylesheet Version v1.2

EPAS ID: PAT3858035

SUBMISSION TYPE:	NEW ASSIGNMENT
NATURE OF CONVEYANCE:	ASSIGNMENT
SEQUENCE:	1

CONVEYING PARTY DATA

Name	Execution Date
ORCKIT COMMUNICATION LTD.	04/25/2016
ORCKIT-CORRIGENT LTD.	04/25/2016

RECEIVING PARTY DATA

Name:	ORCKIT IP, LLC
Street Address:	874 WALKER ROAD
Internal Address:	SUITE C
City:	DOVER
State/Country:	DELAWARE
Postal Code:	19904-2778

PROPERTY NUMBERS Total: 13

Property Type	Number
Patent Number:	7768928
Patent Number:	8830821
Patent Number:	7593400
Patent Number:	9185151
Patent Number:	7545740
Patent Number:	8014394
Patent Number:	7463580
Patent Number:	8199637
Patent Number:	7916636
Patent Number:	7515536
Application Number:	12629310
Application Number:	14878405
Application Number:	14834480

CORRESPONDENCE DATA

Fax Number:

Correspondence will be sent to the e-mail address first; if that is unsuccessful, it will be sent using a fax number, if provided; if that is unsuccessful, it will be sent via US Mail.

Phone:	+972544444577
Email:	yehuda@maypatents.com
Correspondent Name:	MAY PATENTS LTD. C/O DORIT SHEM-TOV
Address Line 1:	P.O.B 7230
Address Line 4:	RAMAT-GAN, ISRAEL 5217102

ATTORNEY DOCKET NUMBER:	ORCKIT-GENERAL
NAME OF SUBMITTER:	YEHUDA BINDER
SIGNATURE:	/Yehuda Binder/
DATE SIGNED:	05/04/2016
	This document serves as an Oath/Declaration (37 CFR 1.63).

Total Attachments: 12
source=Executed assignment agreement#page1.tif
source=Executed assignment agreement#page2.tif
source=Executed assignment agreement#page3.tif
source=Executed assignment agreement#page4.tif
source=Executed assignment agreement#page5.tif
source=Executed assignment agreement#page6.tif
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source=Executed assignment agreement#page9.tif
source=Executed assignment agreement#page10.tif
source=Executed assignment agreement#page11.tif
source=Executed assignment agreement#page12.tif

ASSIGNMENT AGREEMENT

This Assignment Agreement (the "**Agreement**") is made and entered into this 25 day of April 2016 (the "**Effective Date**"), by Orckit Communications Ltd., an Israeli limited liability company (under Creditors' Arrangement) and Orckit - Corrigent Ltd. ("**Orckit**"), having an address with Lior Dagan, Adv. (Trustee), 1 Azrielli Center (Round Building), 35th Floor, Tel-Aviv 67021, Israel (severally and jointly "**Assignor**") and Orckit IP, LLC, a Delaware limited liability company having an address at 874 Walker Road, Suite C, Dover, Delaware and a mailing address at 831 Beacon Street #307, Newton, MA, USA (02459) ("**Assignee**").

RECITALS

A. Assignor is the owner of (select as appropriate):

- ☐ the United States Patents set forth on Appendix A hereto (the "US Patents");
- ☐ the non-United States patents set forth on Appendix A hereto (the "Foreign Patents");
- ☐ the United States patent applications set forth on Appendix B hereto (the "US Patent Applications");
- ☐ the United States provisional patent applications set forth on Appendix B hereto (the "US Provisional Patent Applications"); and/or
- ☐ the foreign patent applications set forth on Appendix B hereto (the "Foreign Patent Applications");

Which collectively shall be referred to herein as the "**Patents**".

B. Assignor and Assignee have agreed by way of a purchase agreement (the "Purchase Agreement") dated November 30, 2015, by and between Assignor and Assignee, the terms of which are incorporated herein by reference, that Assignor shall sell, transfer, and assign and set over unto Assignee and Assignee shall accept, all rights, title and interest in and to the Patents as specified in this Agreement. In the event of any conflict between the terms of this Patent Assignment Agreement and the referenced Purchase Agreement, the terms of the Purchase Agreement shall prevail.

AGREEMENT

NOW, THEREFORE, in consideration of the foregoing premises, and the covenants and agreements in this Assignment, Assignor and Assignee agree as follows:

1. Assignor does hereby sell, transfer, convey, assign and deliver to Assignee all of Assignor's right, privilege, title and interest in, to and under the Patents and in the case of patent applications in and to any patents that may issue therefrom, including, in all instances, any counterparts of any of the foregoing in any jurisdiction throughout the world, and any and all divisions, continuations, reissues or reexaminations of any of the foregoing, and, further, all applications for industrial property protection, including without limitation, all applications for patents, utility models, copyright, and designs which may hereafter be filed for any inventions described in said Patents in any country or countries, together with the right to file such applications and the right to claim for the same the priority rights derived from the inventions and the Patents under the laws of the United States, the International Convention for the Protection of Industrial Property, or any other international agreement or the domestic laws of the country in which any such application is filed, as may be applicable, in each instance the same to be held by Assignee for Assignee's own use and enjoyment, and for the use and enjoyment of Assignee's successors, permitted assigns and other legal representatives, as fully and entirely as the same would have been held and enjoyed by Assignor if this Assignment and sale had not been made; together with all claims for damages, royalties, income or other remuneration (hereinafter "Damages") by

reason of past, present and future infringements of the Patents or other rights being assigned hereunder, along with the right to sue for and collect such Damages for the use and benefit of Assignee and its successors, permitted assigns and other legal representatives.

2. Insofar as this assignment concerns European patents and patent applications, Assignor does hereby declare that it is the owner of said Patents and that Assignor has assigned same, along with all rights and duties appurtenant thereto, to Assignee and agree that the assignment will be recorded in the register with the European Patent Office; and Assignee hereby declares that Assignee has agreed to the assignment of the aforementioned Patents to it and that Assignee will simultaneously apply for recording of the assignment in the register with the European Patent Office.

3. Assignor hereby authorizes and requests the Commissioner for Patents of the United States, and any officer of any country or countries foreign to the United States, whose duty it is to issue patents or other evidence or forms of intellectual property protection or applications as aforesaid, to issue the same to Assignee and its successors, permitted assigns and other legal representatives in accordance with the terms of this instrument.

4. Assignor authorizes and empowers Assignee, its successors, permitted assigns and legal representatives or nominees, to invoke and claim for any application for patent or other form of protection for the inventions, the benefit of the right of priority provided by the International Convention for the Protection of Industrial Property, as amended, or by any convention which may henceforth be substituted for it, or any other international agreement or the domestic laws of the country in which any such application is filed, as may be applicable, and to invoke and claim such right of priority without further written or oral authorization from Assignor.

5. Assignor hereby acknowledges and agrees that all of the rights, title and interest in and to the Patents sold, transferred, assigned and set over to Assignee hereunder include all income, royalties, damages and payments now or hereafter due or payable with respect thereto, and all causes of action (whether in law or equity) and the right to sue, counterclaim, and recover for the past, present and future infringement of the rights assigned or to be assigned hereunder.

6. Assignor hereby consents that a copy of this Agreement shall be deemed a full legal and formal equivalent of any assignment, consent to file or like document that may be required in any country for any purpose and more particularly in proof of the right of Assignee or nominee to claim the aforesaid benefit of the right of priority provided by the International Convention for the Protection of Industrial Property, as amended, or by any convention which may henceforth be substituted for it.

IN WITNESS WHEREOF, the Parties have executed this Assignment on the Effective Date written at _____.

Assignor:

Orckit Communications Ltd. (Under Creditors' Arrangement)

Orckit - Corrigent Ltd.

By: _____

Name: Adv. Lior Dagan

Title: Trustee for the Creditors' Arrangement of Orckit Communications Ltd (Under Creditors' Arrangement)

Assignee: Orckit IP, LLC

By: _____

Name: Mr. Yehuda Binder

Title: C.E.O and Owner

ORCKIT IP, LLC
DE LLC # 5086551
891 Beacon St. # 307
Newton, MA 02459-1840

APPENDIX A

TO ASSIGNMENT AGREEMENT

TITLE	COUNTRY	FILED	SERIALNO	ISSUED	PATENT NO
AUTO-CONFIGURATION OF NETWORK INTERFACES IN A BIDIRECTIONAL RING NETWORK					
	UNITED STATES	16-Oct-01	09/978,642	06-Dec-05	6973049
AUTOMATED WEIGHT CALCULATION FOR PACKET NETWORKS					
	UNITED STATES	03-Jun-04	10/861,272	26-Aug-08	7418000
Automatic Implementation of Network Configuration Changes					
	UNITED STATES	11-Aug-00	09/637,300	17-May-05	6894983
AVOIDING OVERLAPPING SEGMENTS IN TRANSPARENT LAN SERVICES ON RING-BASED NETWORKS					
	UNITED STATES	25-Jan-02	10/057,332	24-Oct-06	7127523
	UNITED STATES	25-Jan-02	10/054,845	05-Dec-06	7145878
BANDWIDTH ALLOCATION FOR LINK AGGREGATION					
	UNITED STATES	13-May-03	10/436,516	26-Feb-08	7336605
BANDWIDTH SHARING METHOD					
	UNITED STATES	28-Feb-00	09/514,745	03-Feb-04	6687224
Bi-directional Chaining of Network Access Ports					
	UNITED STATES	27-Dec-99	09/472,683	20-Jan-04	6680904
COMMUNICATION IN A BIDIRECTIONAL RING NETWORK WITH SINGLE-DIRECTION RECEIVING					
	UNITED STATES	07-Jun-01	09/876,414	04-Oct-05	6952397
CONNECTIVITY FAULT MANAGEMENT (CFM) IN NETWORKS WITH LINK AGGREGATION GROUP CONNECTIONS					
	UNITED STATES	11-Jul-06	11/483,650	03-Aug-10	7768928

L.D.

	JAPAN	11-Jun-07	2009519055	08-Mar-13	5213854
	SOUTH KOREA	11-Jun-07	2009-7001476	28-Jan-14	10-1360120
DIFFERENTIATED SERVICES WITH MULTIPLE TAGGING LEVELS					
	UNITED STATES	24-Apr-02	10/128,454	09-Oct-07	7280560
DYNAMIC PACKET FRAGMENTATION					
	UNITED STATES	08-Jan-01	09/756,554	10-May-05	6891855
EFFICIENT TRANSPORT OF TDM SERVICES OVER PACKET NETWORKS					
	UNITED STATES	24-Mar-03	10/396,008	07-Apr-09	7515605
	UNITED STATES	16-Mar-09	12/404,444	14-Jun-11	7961755
EQUIPMENT PROTECTION USING A PARTIAL STAR ARCHITECTURE					
	UNITED STATES	02-Aug-02	10/211,065	18-Apr-06	7032135
FAST FAILURE PROTECTION USING REDUNDANT NETWORK EDGE PORTS					
	UNITED STATES	07-Jan-02	10/036,518	12-Jul-05	6917986
FAST PROTECTION IN RING TOPOLOGIES					
	UNITED STATES	30-Aug-01	09/941,723	13-Jun-06	7061859
FAULT-TOLERANT MEDIUM ACCESS CONTROL (MAC) ADDRESS ASSIGNMENT IN NETWORK ELEMENTS					
	UNITED STATES	22-Sep-06	11/534,556	09-Feb-10	7660234
	EUROPEAN PATENT CONVENT	18-Sep-07	07805604.1	22-Jan-14	2069934
	UNITED KINGDOM	18-Sep-07	07805604.1	22-Jan-14	2069934
FLOW ALLOCATION IN A RING TOPOLOGY					
	UNITED STATES	09-Jan-01	09/756,946	25-Apr-06	7035279
FORWARDING MULTICAST TRAFFIC OVER LINK AGGREGATION PORTS					
	UNITED STATES	21-Dec-06	11/644,773	13-Apr-10	7697525
FRAME CONCATENATION WITH DROP PRECEDENCE ASSIGNMENT					
	UNITED STATES	08-Feb-07	11/704,615	13-Apr-10	7697532

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	EUROPEAN PATENT CONVENT	11-Dec-07	07849561.1	09-Jul-14	2132905
	UNITED KINGDOM	11-Dec-07	07849561.1	09-Jul-14	2132905
	HONG KONG	11-Dec-07	10106007.6	23-Jan-15	HK113953 1
GENERIC FRAMEWORK FOR EMBEDDED SOFTWARE DEVELOPMENT					
	UNITED STATES	03-Dec-01	10/005,030	27-Jun-06	7069546
HASH-BASED MULTI-HOMING					
	UNITED STATES	16-Jul-07	11/778,286	01-Dec-09	7626930
HIDDEN FAILURE DETECTION					
	UNITED STATES	30-May-02	10/156,851	18-Oct-05	6957369
HIERARCHICAL VIRTUAL PRIVATE LAN SERVICE PROTECTION SCHEME					
	UNITED STATES	07-Jan-03	10/337,382	16-Oct-07	7283465
HIGH CAPACITY RING COMMUNICATION NETWORK					
	UNITED STATES	02-Mar-06	11/367,231	05-Oct-10	7808931
	UNITED STATES	04-Oct-10	12/897,341	30-Aug-11	8009684
HIGH-SPEED PROCESSING OF MULTICAST CONTENT REQUESTS					
	UNITED STATES	11-Feb-09	12/369,011	06-Sep-11	8014394
INTERCONNECT AND GATEWAY PROTECTION IN BIDIRECTIONAL RING NETWORKS					
	UNITED STATES	24-Jul-01	09/910,790	30-May-06	7054264
INTERFACE BETWEEN A SYNCHRONOUS NETWORK AND HIGH-SPEED ETHERNET					
	ISRAEL	11-Apr-07	194824	01-Jul-14	194824
LATENCY EVALUATION IN A RING NETWORK					
	UNITED STATES	04-Sep-01	09/947,183	26-Sep-06	7113485
LAYER-3 NETWORK ROUTING WITH RPR LAYER-2 VISIBILITY					
	UNITED STATES	29-Mar-04	10/812,321	23-Jun-09	7551599

L.O.

LINE DRIVER WITH OUTPUT IMPEDANCE SYNTHESIS					
	UNITED STATES	23-Dec-99	09/470,777	17-Apr-01	6218872
MAC ADDRESS LEARNING IN A DISTRIBUTED BRIDGE					
	UNITED STATES	19-May-06	11/419,444	22-Sep-09	7593400
	ISRAEL	17-May-07	195263	29-May-13	195263
	SOUTH KOREA	17-May-07	10200870306 94	08-Oct-14	10-1451174
MAC ADDRESS SCALABILITY IN INTERCONNECTED RINGS					
	UNITED STATES	18-Jun-07	11/764,764	13-Apr-10	7697552
MANAGEMENT INTERFACE FOR A NETWORK ACCESS MULTIPLEXING SYSTEM					
	UNITED STATES	08-Nov-00	09/708,845	23-Nov-04	6822944
Method and Apparatus for Compensating for an Echo Signal Component in Telecommunication Systems					
	UNITED STATES	14-Dec-99	09/460,891	18-Oct-05	6956944
METHOD AND APPARATUS FOR FILTERING ASYMMETRIC DIGITAL SUBSCRIBER LINE (ADSL) SIGNALS					
	UNITED STATES	12-May-99	09/310,518	02-Nov-04	6813343
METHOD FOR SUPPORTING MPLS TRANSPORT PATH RECOVERY WITH MULTIPLE PROTECTION ENTITIES					
	UNITED STATES	05-Dec-11	13/311,128	09-Sep-14	8830821
MULTIPOINT TO MULTIPOINT COMMUNICATION OVER RING TOPOLOGIES					
	UNITED STATES	03-Sep-04	10/933,572	12-Feb-08	7330431
MULTIPROTOCOL MEDIA CONVERSION					
	UNITED STATES	13-Jun-03	10/461,807	10-Jun-08	7386010
NETWORK ACCESS MULTIPLEXER WITH PROTOCOL ADDRESS TRANSLATION					
	UNITED STATES	08-Nov-00	09/708,841	23-Nov-04	6822943

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NETWORK INTERFACE AUTO-CONFIGURATION IN AN ACCESS MULTIPLEXING SYSTEM					
	UNITED STATES	01-Aug-00	09/629,664	04-May-04	6731607
PACKET FRAGMENTATION WITH NESTED INTERRUPTIONS					
	UNITED STATES	08-Jan-01	09/756,553	05-Apr-05	6876669
PERFORMANCE MONITORING OF HIGH SPEED COMMUNICATIONS NETWORKS					
	UNITED STATES	24-Apr-02	10/128,459	28-Nov-06	7142516
PERFORMANCE MONITORING OF MULTIPLE CHANNELS IN AN AUTOMATIC PROTECTION SWITCHED NETWORK					
	UNITED STATES	25-Feb-02	10/082,771	02-Jan-07	7158721
POINT-TO-MULTIPOINT FUNCTIONALITY IN A BRIDGED NETWORK					
	UNITED STATES	22-Aug-06	11/508,599	09-Feb-10	7660303
	JAPAN	19-Jun-07	2009525169	03-Aug-12	5053376
	SOUTH KOREA	19-Jun-07	1020097005097	23-Jan-14	10-1357457
Prevention Of Frame Duplication In Interconnected Ring Networks					
	UNITED STATES	07-Mar-08	12/044,158	25-Jan-11	7876673
PROTECTING THE FILTERING DATABASE IN VIRTUAL BRIDGES					
	UNITED STATES	01-Feb-02	10/061,721	26-Dec-06	7154899
	UNITED STATES	09-Nov-06	11/595,635	10-Aug-10	7773508
Protection Against Master Unit Failure in Remote Network Access Multiplexing					
	UNITED STATES	11-Aug-00	09/637,757	21-Dec-04	6834038
RATE CONTROL IN TRANSMISSION OF PACKET DATA OVER AN ATM NETWORK					
	UNITED STATES	27-Nov-00	09/723,206	31-Aug-04	6785232
RESOURCE RESERVATION IN A RING NETWORK					
	UNITED STATES	26-Feb-01	09/794,898	08-Nov-05	6963537

L.O.

RESOURCE SHARING AMONG NETWORK TUNNELS					
	UNITED STATES	15-Dec-05	11/305,486	09-Dec-08	7463580
RING NETWORK AGGREGATE RATES					
	UNITED STATES	05-Jan-09	12/348,361	29-Mar-11	7916636
RING NETWORK WITH VARIABLE RATE					
	UNITED STATES	12-Mar-03	10/387,657	02-Sep-08	7420922
ROUTE SELECTION WITH BANDWIDTH SHARING OPTIMIZATION OVER RINGS					
	UNITED STATES	24-Jan-06	11/339,148	29-Sep-09	7596088
	ISRAEL	03-Oct-06	192993	25-Jun-13	192993
SELECTIVE PROTECTION FOR RING TOPOLOGIES					
	UNITED STATES	03-Oct-01	09/969,839	10-May-05	6892329
	GERMANY	03-Mar-02	602 12 108.6	06-Jul-06	602 12 108.6
	EUROPEAN PATENT CONVENT	03-Mar-02	02701519.7		1378096
	SPAIN	03-Mar-02	02701519.7	07-Jun-06	2 266 445
	FRANCE	03-Mar-02	02701519.7	07-Jun-06	1378096
	UNITED KINGDOM	03-Mar-02	02701519.7	07-Jun-06	1378096
	ISRAEL	03-Mar-02	158008	05-Dec-09	158008
	ITALY	03-Mar-02	02701519.7	07-Jun-06	1378096
	JAPAN	03-Mar-02	2002577349	08-Aug-08	4167072
SIGNALING MPLS OVER RPR RINGS					
	UNITED STATES	20-Feb-03	10/369,953	27-Jan-09	7483399
SONET CIRCUIT EMULATION WITH VT COMPRESSION					
	UNITED STATES	17-Oct-01	09/978,342	07-Nov-06	7133415
Splitterless Ethernet DSL on Subscriber Loops					
	UNITED STATES	01-Jul-99	09/346,416	19-Nov-02	6483903
SYNCHRONIZED RING SOFTWARE DOWNLOAD					
	UNITED STATES	27-Sep-04	10/951,575	13-Jan-09	7478382
TRAFFIC ENGINEERING IN BI-DIRECTIONAL RING NETWORKS					
	UNITED STATES	02-Aug-02	10/211,066	16-Oct-07	7283478

L.O.

TRANSPARENT TRANSPORT OF FIBRE CHANNEL TRAFFIC OVER PACKET-SWITCHED NETWORKS					
	UNITED STATES	29-Jun-06	11/479,595	07-Apr-09	7515536
Tunnel provisioning with link aggregation					
	UNITED STATES	06-May-05	11/123,801	05-Jul-11	7974202
	UNITED STATES	26-May-11	13/116,696	17-Sep-13	8537682
	UNITED STATES	31-May-11	13/149,196	23-Apr-13	8427953
	UNITED STATES	17-Aug-13	13/969,520	25-Aug-15	9118602
TWO-WAY LINK AGGREGATION					
	UNITED STATES	07-Apr-06	11/279,045	09-Jun-09	7545740
	ISRAEL	27-Mar-07		31-Jul-2015	194652
VIRTUAL PRIVATE LAN SERVICE OVER RING NETWORKS					
	UNITED STATES	19-Nov-04	10/993,882	05-Jul-11	7974223
VIRTUAL PRIVATE LAN SERVICE USING A MULTICAST PROTOCOL					
	UNITED STATES	23-Aug-02	10/226,525	04-Mar-08	7339929
VPLS failure protection in ring networks					
	UNITED STATES	18-Jan-06	11/335,770	19-Jul-11	7983150
	GERMANY	18-Jan-07	0770619.2	24-Jul-13	6.02007E+11 –
	EUROPEAN PATENT CONVENT	18-Jan-07	07706019.2	24-Jul-13	1974485
	FRANCE	18-Jan-07	07706019.2	24-Jul-13	1974485
	UNITED KINGDOM	18-Jan-07	07706019.2	24-Jul-13	1974485
VPLS REMOTE FAILURE INDICATION					
	GERMANY	07-Nov-06	06809843.3	09-Oct-13	602006038796.2
	EUROPEAN PATENT CONVENT	07-Nov-06	06809843.3	09-Oct-13	1958364
	FRANCE	07-Nov-06	06809843.3	09-Oct-13	1958364
	UNITED KINGDOM	07-Nov-06	06809843.3	09-Oct-13	1958364
	ISRAEL	07-Nov-06	191454	01-Feb-14	191454
	UNITED STATES	07-Nov-06	12/093,824	12-Jun-12	8199637
METHOD FOR SUPPORTING SNCP OVER PACKET					

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NETWORK					
	UNITED STATES	15-Apr-11	13/087,438	13-Oct-15	9160446
Device, Method and System for Media Packet Distribution					
	UNITED STATES	02-Dec-10	12/738,080	10-Nov-15	9185151

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APPENDIX B

TO ASSIGNMENT AGREEMENT

TITLE	COUNTRY	FILED	SERIALNO
CONNECTIVITY FAULT MANAGEMENT (CFM) IN NETWORKS WITH LINK AGGREGATION GROUP CONNECTIONS			
	EUROPEAN PATENT CONVENT	11-Jun-07	07736442
	ISRAEL	11-Jun-07	196401
Device, Method and System for Media Packet Distribution			
	INDIA	22-Oct-08	836/MUMNP/2010
Edge optimized transrating system			
	UNITED STATES	02-Dec-09	12/629,310
FORWARDING MULTICAST TRAFFIC OVER LINK AGGREGATION PORTS			
	EUROPEAN PATENT CONVENT	09-Dec-07	07827481.8
HASH-BASED MULTI-HOMING			
	EUROPEAN PATENT CONVENT	12-Nov-07	07827358.8
METHOD FOR SUPPORTING MPLS TRANSPORT ENTITY RECOVERY WITH MULTIPLE PROTECTION ENTITIES			
	UNITED KINGDOM	22-Jun-12	1400156.4
METHOD FOR SUPPORTING SNCP OVER PACKET NETWORK			
	EUROPEAN PATENT CONVENT	13-Apr-12	12772045.6
	UNITED STATES	8-Oct-15	14/878,405
POINT-TO-MULTIPOINT FUNCTIONALITY IN A BRIDGED			

L.D.

NETWORK			
	EUROPEAN PATENT CONVENT	19-Jun-07	07736484.2
	HONG KONG	19-Jun-07	09110631.5
RESOURCE SHARING AMONG NETWORK TUNNELS			
	ISRAEL	14-Dec-06	192192
ROUTE SELECTION WITH BANDWIDTH SHARING OPTIMIZATION OVER RINGS			
	EUROPEAN PATENT CONVENT	03-Oct-06	06796145.8
TRANSPARENT TRANSPORT OF FIBRE CHANNEL TRAFFIC OVER PACKET-SWITCHED NETWORKS			
	EUROPEAN PATENT CONVENT	09-Jul-06	06756247
A METHOD AND SYSTEM FOR DEEP PACKET INSPECTION IN SOFTWARE DEFINED NETWORKS	US	21- April – 15	PCT/US15/26869
Tunnel provisioning with link aggregation	US	25-Aug-15	14/834,480

L.D.

UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/279,045	04/07/2006	David Zelig	06727/0204293-US0

CONFIRMATION NO. 7423

57449
SHEEHAN PHINNEY BASS & GREEN, PA
c/o PETER NIEVES
1000 ELM STREET
MANCHESTER, NH 03105-3701

POA ACCEPTANCE LETTER

OC000000045733502

Date Mailed: 01/31/2011

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 01/24/2011.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/tnnguyen/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

COMBINED REVOCATION OF POWER OF ATTORNEY WITH A NEW POWER OF ATTORNEY AND CHANGE OF CORRESPONDENCE ADDRESS AND STATEMENT UNDER 37 CFR 3.73(B)

To: Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

CORRIGENT SYSTEMS LTD., a corporation organized under the laws of Israel, states that it is:

1. The assignee of the entire, right, title and interest in each of the patents and patent applications identified on the attached Schedule A by virtue of either an assignment from the inventor(s) of each of the identified patents and patent applications to the current assignee as identified on the attached Schedule A, or a chain of title from the inventor(s) of the patent application/patents to the current assignee as identified on the attached Schedule A, said assignments recorded with the United States Patent and Trademark Office at the reel and frame identified on the attached Schedule A or for which a copy therefore is attached; and

2. As required by 37 CFR 3.73(b)(1)(i), for each of the patents and patent applications listed on the attached Schedule A the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

FURTHER, Corrigent Systems Ltd. states

3. That it hereby revokes all previous Powers of Attorney in the patents and patent applications identified on the attached Schedule A, and hereby appoints Practitioners associated with Customer Number 57449 as its attorneys and agents with respect to the patents and patent applications identified in the attached Schedule A, and to transact all business in the United States Patent and Trademark Office connected therewith; and

4. Requests that this Office please change the correspondence address for the patents and patent applications identified in the attached Schedule A to the address associated with Customer Number 57449.

The undersigned has reviewed all documents in the chain of title for the patents and patent applications identified in the attached Schedule A, and to the best of the undersigned's knowledge and belief, right, title and interest to the applications identified is in the assignee identified above. The undersigned is empowered to act on behalf of the assignee.

CORRIGENT SYSTEMS LTD.

Signature: _____ Date: 24-Jan-2011

Printed Name: RAFI RAM

Title: PATENT ASSIGNEE

SCHEDULE A

Matter No.	Patent name	Application Nr.	Recorded
40552-6103	Multiple Data Links Aggregation With Nested Packet Interruption	09/756,553	Assignment from Inventors to Corrigent Systems Ltd. recorded 7/15/2003 at 014274/0423
40552-6100	Dynamic Fragmentation in Low Rate Channels	09/756,554	Assignment from Inventors to Orckit Communications, Ltd. recorded 3/15/2001 at 011593/0881; Assignment from Orckit Communications Ltd. to Corrigent Systems Ltd. recorded 4/26/2002 at 012866/0880
40552-6102	Flows Allocation in IP Ring Topologies	09/756,946	Assignment from Inventors to Orckit Communications, Ltd. recorded 1/9/2001 at 011435/0015, Assignment from Orckit Communications Ltd. to Corrigent Systems Ltd. recorded 4/26/2002 at 012866/0880
40552-6101	Resource Reservation in a Ring Network	09/794,898	Assignment from Inventors to Orckit Communications, Ltd. recorded 2/26/2001 at 011580/0893; Assignment from Orckit Communications Ltd. to Corrigent Systems Ltd. recorded 4/26/2002 at 012866/0880
40552-6104	One Sided RPR	09/876,414	Assignment from Inventors to Corrigent Systems Ltd. recorded 6/7/2001 at 011888/0028
40552-6107	Interconnect And Gateway Protection In Bidirectional Rings Networks	09/910,790	Assignment from Inventors to Corrigent Systems Ltd. recorded 7/24/2001 at 012017/0934
40552-6108	Fast Protection in Ring Topologies	09/941,723	Assignment from Inventors to Corrigent Systems Ltd. recorded 8/30/2001 at 012130/0608
40552-6109	Latency evaluation in a ring network	09/947,183	Assignment from Inventors to Corrigent Systems Ltd. recorded 11/29/2001 at 012336/0419
40552-6106	Selective protection for ring topologies	09/969,839	Assignment from Inventors to Corrigent Systems Ltd. recorded 10/3/2001 at 012229/0832
40552-6110	Sonet circuit emulation with VT compression	09/978,342	Assignment from Inventors to Corrigent Systems Ltd. recorded 10/17/2001 at 012270-0165
40552-6111	Configuration of network interfaces in a bidirectional ring network	09/978,642	Assignment from Inventors to Corrigent Systems Ltd. recorded 10/16/2001 at 012274/0607
40552-6117	Generic Framework for Embedded Software Development	10/005,030	Assignment from Inventors to Corrigent Systems Ltd. recorded 12/3/2001 at 012358/0508
40552-6118	Fast failure protection using redundant network edge ports	10/036,518	Assignment from Inventors to Corrigent Systems Ltd. recorded 1/7/2002 at 012442/0914
40552-6114	Avoiding Overlapping Segments In ring based TLS	10/054,845	Assignment from Inventors to Corrigent Systems Ltd. recorded 1/25/2002 at 012523/0691
40552-6115	Spanning Tree Protocol For Transparent LAN Services	10/057,332	Assignment from Inventors to Corrigent Systems Ltd. recorded 1/25/2002 at 012535/0510
40552-6112	Protecting the Filtering Data Base in Virtual B ridges	10/061,721	Assignment from Inventors to Corrigent Systems Ltd. recorded 2/1/2002 at 012568/0664
40552-6113	Protecting the filtering database in virtual bridges	10/061,721	Assignment from Inventors to Corrigent Systems Ltd. recorded 2/1/2002 at 012568/0664

40552-6121	Performance monitoring of multiple channels in an automatic protection switched network	10/082,771	Assignment from Inventors to Corrigent Systems Ltd. recorded 2/25/2002 at 012645/0029
40552-6120	Differentiated services with multiple lagging levels	10/128,454	Assignment from Inventors to Corrigent Systems Ltd. recorded 4/24/2002 at 012833/0049
40552-6116	Performance Monitoring of high speed communications network	10/128,459	Assignment from Inventors to Corrigent Systems Ltd. recorded 4/24/2002 at 012832/0932
40552-6122	Hidden Failure Detection	10/156,851	Assignment from Inventors to Corrigent Systems Ltd. recorded 5/30/2002 at 012954/0104
40552-6123	Equipment Protection Using a Partial Star Architecture	10/211,065	Assignment from Inventors to Corrigent Systems Ltd. recorded 8/2/2002 at 013170/0387
40552-6119	Traffic Engineerings in Bi-directional Ring Networks	10/211,066	Assignment from Inventors to Corrigent Systems Ltd. recorded 8/2/2002 at 013172/0613
40552-6125	VPLS using a multicast protocol	10/226,525	Assignment from Inventors to Corrigent Systems Ltd. recorded 8/23/2002 at 013242/0050
40552-6126	Hierarchical VPLS protection	10/337,382	Assignment from Inventors to Corrigent Systems Ltd. recorded 1/7/2003 at 013638/0975
40552-6124	MPLS signaling over RPR	10/369,953	Assignment from Inventors to Corrigent Systems Ltd. recorded 2/20/2003 at 013807/0903
40552-6130	Ring network with variable rate	10/387,657	Assignment from Inventors to Corrigent Systems Ltd. recorded 3/12/2003 at 013884/0505
40552-6128	Efficient Transport of TDM Services	10/396,008	Assignment from Inventors to Corrigent Systems Ltd. recorded 3/24/2003 at 013915/0077
40552-6131	Bandwidth Allocations for Link Aggregation	10/436,516	Assignment from Inventors to Corrigent Systems Ltd. recorded 5/13/2003 at 014072/0524
40552-6132	Multiprotocol media conversion	10/461,807	Assignment from Inventors to Corrigent Systems Ltd. recorded 6/13/2003 at 014190/0326
40552-6133	Layer 3 network routing with RPR Layer 2 visibility	10/812,321	Assignment from Inventors to Corrigent Systems Ltd. recorded 3/29/2004 at 015161/0655
40552-6134	Weight calculation for traffic management	10/861,272	Assignment from Inventors to Corrigent Systems Ltd. recorded 6/3/2004 at 015444/0178
40552-6135	Multipoint to multipoint communication over ring topologies	10/933,572	Assignment from Inventors to Corrigent Systems Ltd. recorded 11/17/2004 at 015389/0644
40552-6137	Synchronized Ring Software Download (SRDL)	10/951,575	Assignment from Inventors to Corrigent Systems Ltd. recorded 9/27/2004 at 015844/0428
40552-6136	VPLS over ring networks	10/993,882	Assignment from Inventors to Corrigent Systems Ltd. recorded 11/19/2004 at 016019/0425
40552-6138	Link aggregation With Tunneling	11/123,801	Assignment from Inventors to Corrigent Systems Ltd. recorded 5/6/2005 at 016545/0876
40552-6140	Two Way Link Aggregation	11/279,045	Assignment from Inventors to Corrigent Systems Ltd. recorded 4/7/2006 at 017441/0881

40552-6142	Resource Sharing Among Network Tunnels	11/305486	Assignment from Inventors to Corrigent Systems Ltd. recorded 1/11/2006 at 017001/0167
40552-6144	VPLS Faliure Protection In Ring Networks	11/335,770	Assignment from Inventors to Corrigent Systems Ltd. recorded 1/18/2006 at 017502/0055
40552-6143	Route Selection with Bandwidth Sharing Optimazation Over Rings	11/339,148	Assignment from Inventors to Corrigent Systems Ltd. recorded 1/24/2006 at 017504/0802
40552-6145	High capacity ring communication network	11/367,231	Assignment from Inventors to Corrigent Systems Ltd. recorded 3/2/2006 at 017651/0359; corrective assignment to add the additional name of a conveying party recorded 6/27/2006 at 017868/0544; corrective assignment to correct the 5th assignor's name previously recorded, recorded 7/31/2006 at 018035/0163
40552-6146	MAC address learning in a distributed bridge	11/419,444	Assignment from Inventors to Corrigent Systems Ltd. recorded 7/10/2006 at 017904/0311
40552-6139	Transparent Transport of Fibre Channel Traffic Over Packet-Switched Networks	11/479,595	Assignment from Inventors to Corrigent Systems Ltd. recorded 6/29/2006 at 018034/0195
40552-6149	Connectivity Fault Management (CFM) In Networks With Link Aggregation Group Connections	11/483,650	Assignment from Inventors to Corrigent Systems Ltd. recorded 7/11/2006 at 018103/0490
40552-6150	Point-to-multipoint functionality in a bridged network	11/508,599	Assignment from Inventors to Corrigent Systems Ltd. recorded 8/22/2006 at 018222/0834
40552-6151	Fault-tolerant medium access control (MAC) address assignment in network elements	11/534,536	Assignment from Inventors to Corrigent Systems Ltd. recorded 9/22/2006 at 018292/0823
40552-6154	Hash-based multi-homing	11/559,037	Assignment from Inventors to Corrigent Systems Ltd. recorded 12/27/2007 at 020292/0128
40552-6152	Forwarding Multicast Traffic Over link Aggregation Ports	11/644,773	Assignment from Inventors to Corrigent Systems Ltd. recorded 12/21/2006 at 018743/0396
40552-6155	Frame Concatenation with Drop Precedence Assignment	11/704,615	Assignment from Inventors to Corrigent Systems Ltd. recorded 2/8/2007 at 018986/0082
40552-6153	MAC ADDRESS SCALABILITY IN INTERCONNECTED RINGS	11/764,764	Assignment from Inventors to Corrigent Systems Ltd. recorded 6/18/2007 at 019459/0806
40552-6156	Prevention Of Frame Duplication In Interconnected Ring Network	12/044,158	Assignment from Inventors to Corrigent Systems Ltd. recorded 3/7/2008 at 020615/0339
40552-6141	VPLS remote failure indicator	12/093,824	Assignment from Inventors to Corrigent Systems Ltd. recorded 7/22/2008 at 021269/0633
40552-6158	A Device Method and System for providing a media stream	12/143,944	Assignment from Inventors to Corrigent Systems Ltd. recorded 2/2/2009 at 022186/0537

40552-6159	Efficient Full Mesh Load Testing of Packet based Communication Systems	12/261,072	Assignment from Inventors to Corrigent Systems Ltd. recorded 10/30/2008 at 021759/0438
40552-6162	Ring Network Aggregate Rates	12/348,361	Assignment from Inventors to Corrigent Systems Ltd. recorded 1/5/2009 at 022053/0650
40552-6160	High-Speed Processing of Multicast Content Requests	12/369,011	Assignment from Inventors to Corrigent Systems Ltd. recorded 2/11/2009 at 022238/0791
40552-6129	Efficient transport of TDM services over packet networks	12/404,444	Assignment from Inventors to Corrigent Systems Ltd. recorded 3/17/2009 at 022405/0541
40552-6161	Method for unicast streaming of multicast content	12/628,247	Assignment from Inventors to Corrigent Systems Ltd. recorded 12/1/2009 at 023582/0533

Electronic Acknowledgement Receipt

EFS ID:	9289208
Application Number:	11279045
International Application Number:	
Confirmation Number:	7423
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First Named Inventor/Applicant Name:	David Zelig
Customer Number:	07278
Filer:	Peter Anthony Nieves/Elaine Cote
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Warnings:	
Information:	

Total Files Size (in bytes):	347366

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/279,045	06/09/2009	7545740	06727/0204293-US0	7423

7278 7590 05/20/2009

DARBY & DARBY P.C.
P.O. BOX 770
Church Street Station
New York, NY 10008-0770

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 461 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

David Zelig, Givatayim, ISRAEL;
Ronen Solomon, Givatayim, ISRAEL;
Uzi Khill, Netanya, ISRAEL;

IR103 (Rev. 11/05)

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

7278 7590 02/02/2009

DARBY & DARBY P.C.
P.O. BOX 770
Church Street Station
New York, NY 10008-0770

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/279,045	04/07/2006	David Zelig	06727/0204293-US0	7423

TITLE OF INVENTION: TWO-WAY LINK AGGREGATION

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	$755	$300	$0	$1055	05/04/2009

EXAMINER	ART UNIT	CLASS-SUBCLASS
HYUN, SOON D	2416	370-465000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 Darby & Darby P.C.
2
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: Corrigent Systems Ltd.

(B) RESIDENCE: (CITY and STATE OR COUNTRY): Tel Aviv, Israel

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:
☒ Issue Fee
☒ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
☐ A check is enclosed.
☐ Payment by credit card. Form PTO-2038 is attached.
☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number 04-0100 (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.
☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature Mitchell Bernstein Reg. No. 46,550 for Date May 4, 2009

Typed or printed name S. Peter Ludwig Registration No. 25,351

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Electronic Patent Application Fee Transmittal

Application Number:	11279045
Filing Date:	07-Apr-2006
Title of Invention:	TWO-WAY LINK AGGREGATION
First Named Inventor/Applicant Name:	David Zelig
Filer:	Mitchell Bernstein/Judi Cordo
Attorney Docket Number:	06727/0204293-US0

Filed as Small Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Utility Appl issue fee	2501	1	755	755
Publ. Fee- early, voluntary, or normal	1504	1	300	300

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**1055**

Electronic Acknowledgement Receipt

EFS ID:	5266969
Application Number:	11279045
International Application Number:	
Confirmation Number:	7423
Title of Invention:	TWO-WAY LINK AGGREGATION
First Named Inventor/Applicant Name:	David Zelig
Customer Number:	07278
Filer:	Mitchell Bernstein/Judi Cordo
Filer Authorized By:	Mitchell Bernstein
Attorney Docket Number:	06727/0204293-US0
Receipt Date:	04-MAY-2009
Filing Date:	07-APR-2006
Time Stamp:	13:10:23
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$1055
RAM confirmation Number	7877
Deposit Account	040100
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	ISSUE_FEE_TRANSMITTAL_for_filing.PDF	84164 53d20d84101003a601dfc8abefb61fb567d2ff7a	no	1
Warnings:					
Information:					
2	Fee Worksheet (PTO-875)	fee-info.pdf	32009 dcd5f6b7d78a7828a9835a46f1f68ad0a0aa7d18	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	116173		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

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New International Application Filed with the USPTO as a Receiving Office
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UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

7278 7590 02/02/2009

DARBY & DARBY P.C.
P.O. BOX 770
Church Street Station
New York, NY 10008-0770

EXAMINER	
HYUN, SOON D	
ART UNIT	PAPER NUMBER
2416	

DATE MAILED: 02/02/2009

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/279,045	04/07/2006	David Zelig	06727/0204293-US0	7423

TITLE OF INVENTION: TWO-WAY LINK AGGREGATION

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	$755	$300	$0	$1055	05/04/2009

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PTOL-85 (Rev. 08/07) Approved for use through 08/31/2010.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

7278 7590 02/02/2009

DARBY & DARBY P.C.
P.O. BOX 770
Church Street Station
New York, NY 10008-0770

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/279,045	04/07/2006	David Zelig	06727/0204293-US0	7423

TITLE OF INVENTION: TWO-WAY LINK AGGREGATION

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	$755	$300	$0	$1055	05/04/2009

EXAMINER	ART UNIT	CLASS-SUBCLASS
HYUN, SOON D	2416	370-465000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____

2 _____

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:

❑ Issue Fee

❑ Publication Fee (No small entity discount permitted)

❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**

❑ A check is enclosed.

❑ Payment by credit card. Form PTO-2038 is attached.

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

❑ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.

❑ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/279,045	04/07/2006	David Zelig	06727/0204293-US0	7423

7278 7590 02/02/2009

DARBY & DARBY P.C.
P.O. BOX 770
Church Street Station
New York, NY 10008-0770

EXAMINER	
HYUN, SOON D	
ART UNIT	PAPER NUMBER
2416	

DATE MAILED: 02/02/2009

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 463 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 463 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

PTOL-85 (Rev. 08/07) Approved for use through 08/31/2010.

Notice of Allowability	Application No.	Applicant(s)	
	11/279,045	ZELIG ET AL.	
	Examiner	Art Unit	
	SOON-DONG D. HYUN	2416	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *31 December 2008*.

2. ☒ The allowed claim(s) is/are *1-31*.

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 1/20/09
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☐ Examiner's Amendment/Comment
8. ☐ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

/Chi H Pham/
Supervisory Patent Examiner, Art Unit 2416
1/29/09

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11279045	ZELIG ET AL.
	Examiner	Art Unit
	SOON-DONG D HYUN	2416

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☒ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	09/26/2008	01/28/2009							
	1	✓	=							
	2	✓	=							
	3	✓	=							
	4	O	=							
	5	O	=							
	6	✓	=							
	7	✓	=							
	8	✓	=							
	9	✓	=							
	10	✓	=							
	11	✓	=							
	12	✓	=							
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	21	✓	=							
	22	✓	=							
	23	✓	=							
	24	✓	=							
	25	✓	=							
	26	✓	=							
	27	✓	=							
	28	O	=							
	29	✓	=							
	30	O	=							
	31	✓	=							

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11279045	ZELIG ET AL.
	Examiner	Art Unit
	SOON-DONG D HYUN	2416

SEARCHED			
Class	Subclass	Date	Examiner
	see attached file	1/28/2009	hyun

SEARCH NOTES		
Search Notes	Date	Examiner
EAST search for class, sub-class, text: see attached file	9/26/2008	hyun
updated EAST seaerch for class, sub-class, and text: see attached file	1/28/2009	hyun

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner
	ESAT search for inventors and claims: see attached file	1/28/2009	hyun

PTO/SB/08b (12-08)
Approved for use through 01/31/2009. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 1 of 1

Complete if Known	
Application Number	11/279,045-Conf. #7423
Filing Date	April 7, 2006
First Named Inventor	David Zelig
Art Unit	2616
Examiner Name	S. D. Hyun
Attorney Docket Number	06727/0204293-US0

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
/SH/	AA*	US-6,553,029	04-22-2003	Alexander	
	AB*	US-6,665,273	12-16-2003	Goguen et al.	
	AC*	US-20040107285	06-03-2004	Larson et al.	
	AD*	US-20040156313	08-12-2004	Hofmeister et al.	
	AE*	US-20040228278	11-18-2004	Bruckman et al.	
	AF*	US-20050180171	08-18-2005	Huang et al.	
	AG*	US-6,735,198	05-11-2004	Edsall et al.	
	AH*	US-6,788,681	09-07-2004	Hurren et al.	
	AI*	US-6,147,993	11-14-2000	Kloth et al.	
/SH/	AJ*	US-6,151,297	11-21-2000	Congdon et al.	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]

NON PATENT LITERATURE DOCUMENTS

Examiner Initials	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]

Examiner Signature	/Soon Hyun/	Date Considered	01/27/2009

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. * CITE NO.: Those application(s) which are marked with an single asterisk (*) next to the Cite No. are not supplied (under 37 CFR 1.98(a)(2)(iii)) because that application was filed after June 30, 2003 or is available in the IFW. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	34	(david near2 zelig).in.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/01/28 08:17
L2	15	(solomon near2 ronen).in.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/01/28 08:17
L3	10	1 and 2	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/01/28 08:17
L4	13	(node and group and link$1 and parallel and attribute$1).clm.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/01/28 08:21
L5	4	(node and interface and group and link$1 and parallel and attribute$1).clm.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/01/28 08:21
L6	1	(node and interface and frame and group and link$1 and parallel and attribute$1).clm.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/01/28 08:23
L8	67	(link adj aggregat$3) with (load adj balanc$3)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/01/28 08:23
S1	161	(link adj aggregation) with ethernet	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/08/14 15:43
S2	8	(link adj aggregation) with ethernet with (load adj balanc $3)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/08/15 09:55

S3	372	select$3 with (first adj link) with (second adj link)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/09/25 16:03
S4	7	switch$3 with input with output with interface$3 with map$5 with table	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/09/25 16:48
S5	11856	router with table	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/09/25 16:50
S6	52	router with map$3 with input with output	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/09/25 16:51
S7	4997	router with (routing adj table)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/09/25 17:01
S8	111	router with (routing adj table) with map$3	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/09/25 17:01
S9	18825	370/229-231,235,389,401.ccls.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/09/26 08:14
S10	20183	370/229-231,235,389,401,445.ccls.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/09/26 08:15
S11	223	(link adj aggregation) same ethernet	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/09/26 08:15
S12	203	(link adj aggregation) and S10	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/09/26 08:15

S13	2	"6963578".pn.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/09/26 09:50
S14	1	map$4 and S13	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/09/26 09:50
S15	1	hash$3 and S13	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/09/26 09:53
S16	21181	370/229-231,235,389,401,445.ccls.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/01/27 14:58
S17	195	(link adj aggregation) with ethernet	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/01/27 14:58
S18	40	S16 and S17	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/01/27 14:58
S19	262	(link adj aggregation) same ethernet	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/01/27 15:17
S20	68	S16 and S19	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/01/27 15:17
S21	11	(link adj aggregation) with ethernet with balanc$3	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/01/27 17:30
S22	67	(link adj aggregat$3) with (load adj balanc$3)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/01/27 17:31

1/28/2009 8:54:05 AM
C:\Documents and Settings\shyun\My Documents\EAST\Workspaces\11279045.wsp

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

BIB DATA SHEET

CONFIRMATION NO. 7423

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
11/279,045	04/07/2006 RULE	370	2416	06727/0204293-US0

APPLICANTS

David Zelig, Givatayim, ISRAEL;
Ronen Solomon, Givatayim, ISRAEL;
Uzi Khill, Netanya, ISRAEL;

**** CONTINUING DATA **************************

**** FOREIGN APPLICATIONS **************************

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED **** ** SMALL ENTITY **
04/17/2006

Foreign Priority claimed	35 USC 119(a-d) conditions met	Verified and Acknowledged	Met after Allowance	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
☐ Yes ☑ No	☐ Yes ☑ No	/SOON-DONG D HYUN/ Examiner's Signature	☐ Initials	ISRAEL	3	31	4

ADDRESS

DARBY & DARBY P.C.
P.O. BOX 770
Church Street Station
New York, NY 10008-0770
UNITED STATES

TITLE

TWO-WAY LINK AGGREGATION

FILING FEE RECEIVED		
1680	FEES: Authority has been given in Paper No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

Application Number	Application/Control No.	Applicant(s)/Patent under Reexamination	
	11/279,045	ZELIG ET AL.	
	Examiner	Art Unit	
	SOON-DONG D. HYUN	2416	

Issue Classification	Application/Control No. 11/279,045	Applicant(s)/Patent under Reexamination ZELIG ET AL.
	Examiner SOON-DONG D. HYUN	Art Unit 2416

ISSUE CLASSIFICATION

ORIGINAL		INTERNATIONAL CLASSIFICATION											
CLASS	SUBCLASS	CLAIMED							NON-CLAIMED				
370	230	H	04	L	12	/56							/
CROSS REFERENCES						/							/
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)												
370	235	445				/							/
						/							/
						/							/
						/							/
						/							/

Soon D Hyun 1/27/2009 (Assistant Examiner) (Date)	/Chi H. Pham/ 1/29/09 (Primary Examiner) (Date)	Total Claims Allowed: 31	
(Legal Instruments Examiner) (Date)		O.G. Print Claim(s) 1	O.G. Print Fig. 1

☒ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	31	31		61		91		121		151		181
2	2		32		62		92		122		152		182
3	3		33		63		93		123		153		183
4	4		34		64		94		124		154		184
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9	9		39		69		99		129		159		189
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12	12		42		72		102		132		162		192
13	13		43		73		103		133		163		193
14	14		44		74		104		134		164		194
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24	24		54		84		114		144		174		204
25	25		55		85		115		145		175		205
26	26		56		86		116		146		176		206
27	27		57		87		117		147		177		207
28	28		58		88		118		148		178		208
29	29		59		89		119		149		179		209
30	30		60		90		120		150		180		210

Docket No.: 06727/0204293-US0
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
David Zelig et al.

Application No.: 11/279,045 Confirmation No.: 7423

Filed: April 7, 2006 Art Unit: 2616

For: TWO-WAY LINK AGGREGATION Examiner: S. D. Hyun

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT (IDS)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Madam:

This Information Disclosure Statement is submitted in accordance with 37 C.F.R. 1.97, 1.98, and it is requested that the information set forth in this statement and in the listed documents be considered during the pendency of the above-identified application, and any other application relying on the filing date of the above-identified application or cross-referencing it as a related application.

1. This IDS should be considered, in accordance with 37 C.F.R. 1.97, as it is filed: (Check one of the boxes A-D)

- [ ] A. within three months of the filing date of the above-identified national application or within three months of the entry into the national stage of the above identified national application
- [ ] B. before the mailing date of a first office action on the merits, or a first office action after filing a request for continued examination.
- [x] C. after (A) and (B) above, but before final rejection or allowance, and Applicants have made the necessary statement in box "i" below or paid the necessary fee in box "ii" below.

(check one of the boxes "i" and "ii" below:)

[x] i. Counsel states that, upon information and belief, each item of information listed herein was (check one of boxes (a) or (b))

[ ] (a) first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this IDS; or

[x] (b) not cited in a communication from a foreign patent office in a counterpart foreign application and, to the knowledge of undersigned after making reasonable inquiry, was not known to any individual designated in 1.56(c) more than three months prior to the filing of this IDS.

[ ] ii. Payment in the amount of the fee set forth in 1.17(p), presently $180, is enclosed.

[ ] D. after (A), (B) and (C) above, but before payment of the issue fee: Applicant petitions under 37 C.F.R. 1.97(d) for the consideration of this IDS. Payment in the amount of the fee set forth in 1.17(p), presently $180.00 is enclosed. Counsel certifies that, upon information and belief, each item of information listed herein was

(check one of the boxes "a" and "b" below:)

[ ] (a) first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this IDS; or

[ ] (b) was not cited in a communication from a foreign patent office in a counterpart foreign application and, to the knowledge of undersigned after making reasonable inquiry, was not known to any individual designated in 1.56(c) more than three months prior to the filing of this IDS.

2. In accordance with 37 C.F.R. 1.98, this IDS includes a list (e.g., form PTO/SB/08) of all patents, publications, or other information submitted for consideration by the office, either incorporated into this IDS or as an attachment hereto. A copy of each document listed is attached, except for U.S. patents or U.S. patent applications or as explained below.

(check box A or B and fill in blanks, if appropriate.)

☐ A. Document(s) _____is (are) deemed substantially cumulative to document(s) _____ , and, in accordance with 1.98(c), only a copy of each of the latter documents is enclosed.

☐ B. Certain documents were previously cited by or submitted to the Office in the following prior applications, which are relied upon under 35 U.S.C. 120:

<<INSERT SERIAL NO. & FILING DATE>>

Applicant identifies these documents by attaching hereto copies of the forms PTO-892, PTO-1449 and/or PTO/SB/08 from the files of the prior application(s) or a fresh PTO/SB/08 listing these documents, and request that they be considered and made of record in accordance with 1.98(d). Per 37 CFR 1.98(d), copies of these documents need not be filed in this application.

☐ 3. Cite Nos. _____ are not in the English language. In accordance with 1.98(b)(3), Applicant states:

☐ An English translation of each document (or of the pertinent portions thereof), or a copy of each corresponding English-language patent or application , or English-language abstract (or claim) is enclosed.

☐ The requirement for a concise explanation of the relevance of any foreign language document is satisfied by the attached search report; citation of the documents cited in the search report shall not be construed as an admission that they are or are considered to be, material to patentability of the subject matter claimed herein (See MPEP §609).

☐ A concise explanation of the relevance of document(s) _____ is set forth as follows: [Insert concise explanation of relevance]

☐ A concise explanation of the relevance of document(s) _____ can be found on page(s) _____ of the specification.

☐ A concise explanation of document(s) _____ can be found on the attached sheet.

☐ 4. No explanation of relevance is necessary for documents in the English language (see reply to Comments 67 in the preamble to the final rules; 1135 OG 13 at 20).

☒ 5. Other information being provided for the examiner's consideration follows:

An Office Action dated December 11, 2008, which issued during the prosecution of Applicant's U.S. Patent Application Number 11/123,801.

An Office Action dated December 12, 2008, which issued during the prosecution of Applicant's U.S. Patent Application Number 11/419,444.

6. In accordance with 37 C.F.R. 1.97(g) and (h), the filing of this IDS should not be construed as a representation that a search has been made or that information cited is, or is considered to be, material to patentability as defined in §1.56 (b), or that any cited document listed or attached is (or constitutes) prior art. Unless other-wise indicated, the date of publication indicated for an item is taken from the face of the item and Applicant reserves the right to prove that the date of publication is in fact different.

Early and favorable consideration is earnestly solicited.

The Commissioner is authorized to charge any deficiency of up to $300.00 or credit any excess in this fee due with this submission to Deposit Account No. 04-0100.

Dated: January 19, 2009

Respectfully submitted,

By _____
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Registration No.: 25,351
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Church Street Station
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(212) 527-7700
(212) 527-7701 (Fax)
Attorneys/Agents For Applicant

PTO/SB/08b (12-08)
Approved for use through 01/31/2009. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 1 of 1

Complete if Known	
Application Number	11/279,045-Conf. #7423
Filing Date	April 7, 2006
First Named Inventor	David Zelig
Art Unit	2616
Examiner Name	S. D. Hyun
Attorney Docket Number	06727/0204293-US0

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	AA*	US-6,553,029	04-22-2003	Alexander	
	AB*	US-6,665,273	12-16-2003	Goguen et al.	
	AC*	US-20040107285	06-03-2004	Larson et al.	
	AD*	US-20040156313	08-12-2004	Hofmeister et al.	
	AE*	US-20040228278	11-18-2004	Bruckman et al.	
	AF*	US-20050180171	08-18-2005	Huang et al.	
	AG*	US-6,735,198	05-11-2004	Edsall et al.	
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	AI*	US-6,147,993	11-14-2000	Kloth et al.	
	AJ*	US-6,151,297	11-21-2000	Congdon et al.	

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Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] (*if known*)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]

NON PATENT LITERATURE DOCUMENTS

Examiner Initials	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s) , volume-issue number(s), publisher, city and/or country where published.	T[2]

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. * CITE NO.: Those application(s) which are marked with an single asterisk (*) next to the Cite No. are not supplied (under 37 CFR 1.98(a)(2)(iii)) because that application was filed after June 30, 2003 or is available in the IFW. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

Electronic Acknowledgement Receipt

EFS ID:	4637784
Application Number:	11279045
International Application Number:	
Confirmation Number:	7423
Title of Invention:	TWO-WAY LINK AGGREGATION
First Named Inventor/Applicant Name:	David Zelig
Customer Number:	07278
Filer:	Marie Louise Collazo/Judi Cordo
Filer Authorized By:	Marie Louise Collazo
Attorney Docket Number:	06727/0204293-US0
Receipt Date:	20-JAN-2009
Filing Date:	07-APR-2006
Time Stamp:	08:28:06
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		IDS_for_filing.PDF	1103193 7c64701d39b9d4cf16e1fead299cb4b42271be55	yes	32

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Information Disclosure Statement Letter	1	4
	Information Disclosure Statement (IDS) Filed (SB/08)	5	5
	NPL Documents	6	32
Warnings:			
Information:			
	Total Files Size (in bytes):	1103193	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Express Mail Label No. _____ Dated: _____

Docket No.: 06727/0204293-US0
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
David Zelig et al.

Application No.: 11/279,045 Confirmation No.: 7423

Filed: April 7, 2006 Art Unit: 2616

For: TWO-WAY LINK AGGREGATION Examiner: S. D. Hyun

AMENDMENT IN RESPONSE TO NON-FINAL OFFICE ACTION

MS Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Madam:

INTRODUCTORY COMMENTS

In response to the Office Action dated October 2, 2008, please amend the above-identified U.S. patent application as follows:

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this paper.

Remarks/Arguments begin on page 13 of this paper.

AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A method for communication, comprising:

coupling a network node to one or more interface modules using a first group of first physical links arranged in parallel, at least one of said first physical links being a bi-directional link operative to communicate in both an upstream direction and a downstream direction;

coupling each of the one or more interface modules to a communication network using a second group of second physical links arranged in parallel, at least one of said second physical links being a bi-directional link operative to communicate in both an upstream direction and a downstream direction;

receiving a data frame having frame attributes sent between the communication network and the network node;

selecting, in a single computation based on at least one of the frame attributes, a first physical link out of the first group and a second physical link out of the second group; and

sending the data frame over the selected first and second physical links,

said sending comprising communicating along at least one of said bi-directional links.

2. (Original) The method according to claim 1, wherein the network node comprises a user node, and wherein sending the data frame comprises establishing a communication service between the user node and the communication network.

3. (Original) The method according to claim 1, wherein the second physical links comprise backplane traces formed on a backplane to which the one or more interface modules are coupled.

4. (Currently Amended) A ~~The~~ method ~~according to claim 1,~~ for communication, comprising:

coupling a network node to one or more interface modules using a first group of first physical links arranged in parallel;

coupling each of the one or more interface modules to a communication network using a second group of second physical links arranged in parallel;

receiving a data frame having frame attributes sent between the communication network and the network node;

selecting, in a single computation based on at least one of the frame attributes, a first physical link out of the first group and a second physical link out of the second group; and

sending the data frame over the selected first and second physical links,

~~wherein~~ at least one of the first and second groups of physical links ~~comprises~~ comprising an Ethernet link aggregation (LAG) group.

5. (Currently Amended) A ~~The~~ method ~~according to claim 1,~~ for communication, comprising:

coupling a network node to one or more interface modules using a first group of first physical links arranged in parallel;

coupling each of the one or more interface modules to a communication network using a second group of second physical links arranged in parallel;

receiving a data frame having frame attributes sent between the communication network and the network node;

selecting, in a single computation based on at least one of the frame attributes, a first physical link out of the first group and a second physical link out of the second group; and

sending the data frame over the selected first and second physical links,

~~wherein~~ coupling the network node to the one or more interface modules comprises aggregating two or more of the first physical links into an external Ethernet link aggregation (LAG) group so as to increase a data bandwidth provided to the network node.

6. (Original) The method according to claim 1, wherein coupling each of the one or more interface modules to the communication network comprises at least one of multiplexing upstream data frames sent from the network node to the communication network, and demultiplexing downstream data frames sent from the communication network to the network node.

7. (Original) The method according to claim 1, wherein selecting the first and second physical links comprises balancing a frame data rate among at least some of the first and second physical links.

8. (Original) The method according to claim 1, wherein selecting the first and second physical links comprises applying a mapping function to the at least one of the frame attributes.

9. (Original) The method according to claim 8, wherein applying the mapping function comprises applying a hashing function.

10. (Original) The method according to claim 9, wherein applying the hashing function comprises determining a hashing size responsively to a number of at least some of the first and second physical links, applying the hashing function to the at least one of the frame attributes to produce a hashing key, calculating a modulo of a division operation of the hashing key by the hashing size, and selecting the first and second physical links responsively to the modulo.

11. (Original) The method according to claim 10, wherein selecting the first and second physical links responsively to the modulo comprises selecting the first and second physical links responsively to respective first and second subsets of bits in a binary representation of the modulo.

12. (Original) The method according to claim 1, wherein the at least one of the frame attributes comprises at least one of a layer 2 header field, a layer 3 header field, a layer 4 header field, a source Internet Protocol (IP) address, a destination IP address, a source medium access control (MAC) address, a destination MAC address, a source Transmission Control Protocol (TCP) port and a destination TCP port.

13. (Currently Amended) A ~~The~~ method ~~according to claim 1,~~ for communication, comprising:

coupling a network node to one or more interface modules using a first group of first physical links arranged in parallel;

coupling each of the one or more interface modules to a communication network using a second group of second physical links arranged in parallel;

receiving a data frame having frame attributes sent between the communication network and the network node;

selecting, in a single computation based on at least one of the frame attributes, a first physical link out of the first group and a second physical link out of the second group; and

sending the data frame over the selected first and second physical links,

~~wherein~~ coupling the network node to the one or more interface modules and coupling each of the one or more interface modules to the communication network ~~comprise~~ comprising specifying bandwidth requirements comprising at least one of a committed information rate (CIR), a peak information rate (PIR) and an excess information rate (EIR) of a communication service provided by the communication network to the network node, and allocating a bandwidth

for the communication service over the first and second physical links responsively to the bandwidth requirements.

14. (Currently Amended) A method for connecting user ports to a communication network, comprising:

coupling the user ports to one or more user interface modules;

coupling each user interface module to the communication network via a backplane using two or more backplane traces arranged in parallel, at least one of said backplane traces being bi-directional and operative to communicate in both an upstream direction and a downstream direction;

receiving data frames sent between the user ports and the communication network, the data frames having respective frame attributes;

for each data frame, selecting responsively to at least one of the respective frame attributes a backplane trace from the two or more backplane traces; and

sending the data frame over the selected backplane trace;

said sending comprising communicating along said at least one of said backplane traces.

15. (Currently Amended) A ~~The~~ method ~~according to claim 14,~~ for connecting user ports to a communication network, comprising:

coupling the user ports to one or more user interface modules;

coupling each user interface module to the communication network via a backplane using two or more backplane traces arranged in parallel;

receiving data frames sent between the user ports and the communication network, the data frames having respective frame attributes;

for each data frame, selecting responsively to at least one of the respective frame attributes a backplane trace from the two or more backplane traces; and

sending the data frame over the selected backplane trace,

~~wherein~~ at least some of the backplane traces being ~~are~~ aggregated into an Ethernet link aggregation (LAG) group.

16. (Original) The method according to claim 14, wherein selecting the backplane trace comprises applying a hashing function to the at least one of the frame attributes.

17. (Currently Amended) Apparatus for connecting a network node with a communication network, comprising:

one or more interface modules, which are arranged to process data frames having frame attributes sent between the network node and the communication network, at least one of said interface modules being operative to communicate in both an upstream direction and a downstream direction;

a first group of first physical links arranged in parallel so as to couple the network node to the one or more interface modules;

a second group of second physical links arranged in parallel so as to couple the one or more interface modules to the communication network; and

a control module, which is arranged to select for each data frame sent between the communication network and the network node, in a single computation based on at least one of the frame attributes, a first physical link out of the first group and a second physical link out of the second group over which to send the data frame;

at least one of said first physical links and at least one of said second links being bi-directional links operative to communicate in both said upstream direction and said downstream direction.

18. (Original) The apparatus according to claim 17, and comprising a backplane to which the one or more interface modules are coupled, wherein the second physical links comprise backplane traces formed on the backplane.

19. (Currently Amended) ~~The apparatus according to claim 17,~~ Apparatus for connecting a network node with a communication network, comprising:

one or more interface modules, which are arranged to process data frames having frame attributes sent between the network node and the communication network;

a first group of first physical links arranged in parallel so as to couple the network node to the one or more interface modules;

a second group of second physical links arranged in parallel so as to couple the one or more interface modules to the communication network; and

a control module, which is arranged to select for each data frame sent between the communication network and the network node, in a single computation based on at least one of the frame attributes, a first physical link out of the first group and a second physical link out of the second group over which to send the data frame,

~~wherein~~ at least one of the first and second groups of physical links ~~comprises~~ comprising an Ethernet link aggregation (LAG) group.

20. (Currently Amended) ~~The apparatus according to claim 17,~~ Apparatus for connecting a network node with a communication network, comprising:

one or more interface modules, which are arranged to process data frames having frame attributes sent between the network node and the communication network;

a first group of first physical links arranged in parallel so as to couple the network node to the one or more interface modules;

a second group of second physical links arranged in parallel so as to couple the one or more interface modules to the communication network; and

a control module, which is arranged to select for each data frame sent between the communication network and the network node, in a single computation based on at least one of the frame attributes, a first physical link out of the first group and a second physical link out of the second group over which to send the data frame,

~~wherein~~ two or more of the first physical links being ~~are~~ aggregated into an external Ethernet link aggregation (LAG) group so as to increase a data bandwidth provided to the network node.

21. (Original) The apparatus according to claim 17, and comprising a multiplexer, which is arranged to perform at least one of multiplexing upstream data frames sent from the network node to the communication network, and demultiplexing downstream data frames sent from the communication network to the network node.

22. (Original) The apparatus according to claim 17, wherein the control module is arranged to balance a frame data rate among at least some of the first and second physical links.

23. (Original) The apparatus according to claim 17, wherein the control module is arranged to apply a mapping function to the at least one of the frame attributes so as to select the first and second physical links.

24. (Original) The apparatus according to claim 23, wherein the mapping function comprises a hashing function.

25. (Original) The apparatus according to claim 24, wherein the control module is arranged to determine a hashing size responsively to a number of at least some of the first and second physical links, to apply the hashing function to the at least one of the frame attributes to produce a hashing key, to calculate a modulo of a division operation of the hashing key by the hashing size, and to select the first and second physical links responsively to the modulo.

26. (Original) The apparatus according to claim 25, wherein the control module is arranged to select the first and second physical links responsively to respective first and second subsets of bits in a binary representation of the modulo.

27. (Original) The apparatus according to claim 17, wherein the at least one of the frame attributes comprises at least one of a layer 2 header field, a layer 3 header field, a layer 4 header field, a source Internet Protocol (IP) address, a destination IP address, a source medium access control (MAC) address, a destination MAC address, a source Transmission Control Protocol (TCP) port and a destination TCP port.

28. (Currently Amended) ~~The apparatus according to claim 17,~~ Apparatus for connecting a network node with a communication network, comprising:

one or more interface modules, which are arranged to process data frames having frame attributes sent between the network node and the communication network;

a first group of first physical links arranged in parallel so as to couple the network node to the one or more interface modules;

a second group of second physical links arranged in parallel so as to couple the one or more interface modules to the communication network; and

a control module, which is arranged to select for each data frame sent between the communication network and the network node, in a single computation based on at least one of the

frame attributes, a first physical link out of the first group and a second physical link out of the second group over which to send the data frame,

~~wherein~~ the communication network being ~~is~~ arranged to provide a communication service to the network node, the service having specified bandwidth requirements comprising at least one of a committed information rate (CIR), a peak information rate (PIR) and an excess information rate (EIR), and ~~wherein~~ the first and second groups of physical links being ~~are~~ dimensioned to provide an allocated bandwidth for the communication service responsively to the bandwidth requirements.

29. (Currently Amended) Apparatus for connecting user ports to a communication network, comprising:

one or more user interface modules coupled to the user ports, which are arranged to process data frames having frame attributes sent between the user ports and the communication network, at least one of said user interface modules being bi-directional and operative to communicate in both an upstream direction and a downstream direction;

a backplane having the one or more user interface modules coupled thereto and comprising a plurality of backplane traces arranged in parallel so as to transfer the data frames between the one or more user interface modules and the communication network, at least one of said backplane traces being bi-directional and operative to communicate in both said upstream direction and said downstream direction; and

a control module, which is arranged to select, for each data frame, responsively to at least one of the frame attributes, a backplane trace from the plurality of backplane traces over which to send the data frame.

30. (Currently Amended) ~~The apparatus according to claim 29,~~ Apparatus for connecting user ports to a communication network, comprising:

one or more user interface modules coupled to the user ports, which are arranged to process data frames having frame attributes sent between the user ports and the communication network;

a backplane having the one or more user interface modules coupled thereto and comprising a plurality of backplane traces arranged in parallel so as to transfer the data frames between the one or more user interface modules and the communication network;

a control module, which is arranged to select, for each data frame, responsively to at least one of the frame attributes, a backplane trace from the plurality of backplane traces over which to send the data frame;

~~wherein~~ at least some of the backplane traces are aggregated into an Ethernet link aggregation (LAG) group.

31. (Original) The apparatus according to claim 29, wherein the control module is arranged to apply a hashing function to the at least one of the frame attributes so as to select the backplane trace.

Electronic Patent Application Fee Transmittal

Application Number:	11279045
Filing Date:	07-Apr-2006
Title of Invention:	TWO-WAY LINK AGGREGATION
First Named Inventor/Applicant Name:	David Zelig
Filer:	Marie Louise Collazo/Laurie Olds
Attorney Docket Number:	06727/0204293-US0

Filed as Small Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Independent claims in excess of 3	2201	8	110	880
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
		Total in USD ($)		**880**

Electronic Acknowledgement Receipt

EFS ID:	4546250
Application Number:	11279045
International Application Number:	
Confirmation Number:	7423
Title of Invention:	TWO-WAY LINK AGGREGATION
First Named Inventor/Applicant Name:	David Zelig
Customer Number:	07278
Filer:	Marie Louise Collazo/Laurie Olds
Filer Authorized By:	Marie Louise Collazo
Attorney Docket Number:	06727/0204293-US0
Receipt Date:	31-DEC-2008
Filing Date:	07-APR-2006
Time Stamp:	19:21:12
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$880
RAM confirmation Number	3814
Deposit Account	040100
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1		AMENDMENT_TRANSMITTAL_FEE_TRANSMITTAL7.PDF	1064836 905e3c6fc2341338464017435a6fe2ca5718df82	yes	17

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Fee Worksheet (PTO-06)	1	1
Miscellaneous Incoming Letter	2	2
Amendment/Req. Reconsideration-After Non-Final Reject	3	3
Claims	4	14
Applicant Arguments/Remarks Made in an Amendment	15	17

Warnings:

Information:

2	Fee Worksheet (PTO-06)	fee-info.pdf	30504 546b74a162e22a13d58e15d16153f23286c9d58f	no	2

Warnings:

Information:

Total Files Size (in bytes):	1095340

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/17 (10-08)
Approved for use through 06/30/2010. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no person are required to respond to a collection of information unless it displays a valid OMB control number

Effective on 12/08/2004.
Fees pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).

FEE TRANSMITTAL
For FY 2009

[X] Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($) 880.00

Complete if Known	
Application Number	11/279,045-Conf. #7423
Filing Date	April 7, 2006
First Named Inventor	David Zelig
Examiner Name	S. D. Hyun
Art Unit	2616
Attorney Docket No.	06727/0204293-US0

METHOD OF PAYMENT (check all that apply)

[ ] Check [ ] Credit Card [ ] Money Order [ ] None [ ] Other (please identify): _____

[X] Deposit Account Deposit Account Number: 04-0100 Deposit Account Name: Darby & Darby P.C.

For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)

[X] Charge fee(s) indicated below [ ] Charge fee(s) indicated below, **except for the filing fee**

[X] Charge any additional fee(s) or underpayments of fee(s) under 37 CFR 1.16 and 1.17 [X] Credit any overpayments

FEE CALCULATION

1. BASIC FILING, SEARCH, AND EXAMINATION FEES

	FILING FEES		SEARCH FEES		EXAMINATION FEES		
Application Type	Fee ($)	Small Entity Fee ($)	Fee ($)	Small Entity Fee ($)	Fee ($)	Small Entity Fee ($)	Fees Paid ($)
Utility	330	165	540	270	220	110	
Design	220	110	100	50	140	70	
Plant	220	110	330	165	170	85	
Reissue	330	165	540	270	650	325	
Provisional	220	110	0	0	0	0	

2. EXCESS CLAIM FEES

Fee Description	Fee ($)	Small Entity Fee ($)
Each claim over 20 (including Reissues)	52	26
Each independent claim over 3 (including Reissues)	220	110
Multiple dependent claims	390	195

Total Claims	Extra Claims	Fee ($)	Fee Paid ($)
31 - 31 or HP =	0 x	26.00 =	0.00

HP = highest number of total claims paid for, if greater than 20.

Multiple Dependent Claims: Fee ($) _____ Fee Paid ($) _____

Indep. Claims	Extra Claims	Fee ($)	Fee Paid ($)
12 - 4 or HP =	8 x	110.00 =	880.00

HP = highest number of independent claims paid for, if greater than 3.

3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper (excluding electronically filed sequence or computer listings under 37 CFR 1.52(e)), the application size fee due is $270 ($135 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

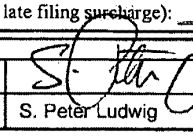
Total Sheets	Extra Sheets	Number of each additional 50 or fraction thereof	Fee ($)	Fee Paid ($)
_____ - 100 =	_____ /50 =	_____ (round up to a whole number) x	_____ =	_____

4. OTHER FEE(S) Fees Paid ($)

Non-English Specification, $130 fee (no small entity discount)

Other (e.g., late filing surcharge): _____

SUBMITTED BY

Signature		Registration No. (Attorney/Agent)	25,351	Telephone	(212) 527-7700
Name (Print/Type)	S. Peter Ludwig			Date	December 31, 2008

Express Mail Label No. _____ Dated: _____

AMENDMENT TRANSMITTAL LETTER

Docket No. 06727/0204293-US0

Application No.	Filing Date	Examiner	Art Unit
11/279,045-Conf. #7423	April 7, 2006	S. D. Hyun	2616

Applicant(s): David Zelig et al.

Invention: TWO-WAY LINK AGGREGATION

TO THE COMMISSIONER FOR PATENTS

Transmitted herewith is an amendment in the above-identified application.

The fee has been calculated and is transmitted as shown below.

CLAIMS AS AMENDED

	Claims Remaining After Amendment	Highest Number Previously Paid	Number Extra Claims Present	Rate	
Total Claims	31	- 31 =	0	x 26.00	0.00
Independent Claims	12	- 4 =	8	x 110.00	880.00
Multiple Dependent Claims (check if applicable)	☐				
Other fee (please specify):					
TOTAL ADDITIONAL FEE FOR THIS AMENDMENT:					880.00

☐ Large Entity ☒ Small Entity

☐ No additional fee is required for this amendment.

☒ Please charge Deposit Account No. 04-0100 in the amount of $ 880.00 . A duplicate copy of this sheet is enclosed.

☐ A check in the amount of $ _____ to cover the filing fee is enclosed.

☐ Payment by credit card. Form PTO-2038 is attached.

☒ The Director is hereby authorized to charge and credit Deposit Account No. 04-0100 as described below. A duplicate copy of this sheet is enclosed.

☒ Credit any overpayment.

☒ Charge any additional filing or application processing fees required under 37 CFR 1.16 and 1.17.

Dated: December 31, 2008

S. Peter Ludwig
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Express Mail Label No. _____ Dated: _____

REMARKS

Applicants have carefully studied the outstanding Official Action. The present response is intended to be fully responsive to all points of rejection raised by the Examiner and is believed to place the application in condition for allowance. Favorable reconsideration and allowance of the application is respectfully requested.

Application as examined included claims 1 - 31. In the present response, claims 1, 4 - 5, 13 - 15, 17, 19 - 20 and 28 - 30 have been amended. Claims 2 - 3, 6 - 12, 16, 18, 21 - 27 and 31 are unchanged.

Claims 1 - 3, 6 - 12, 14, 16 - 18, 21 - 27, 29 and 31 stand rejected under 35 U.S.C. 102(e) as being anticipated by Akahane et al(U.S. Patent No. 6,963,578).

The allowability of claims 4 - 5, 13, 15, 19 - 20, 28 and 30 is noted with appreciation. Each of allowable claims 4 - 5, 13, 15, 19 - 20, 28 and 30 have been rewritten as an independent claim.

In the present response, Applicants have amended the claims to more clearly recite the novel and inventive features of the present invention.

Independent method claim 1 has been amended to include the recitations "at least one of said first physical links being a bi-directional link operative to communicate in both an upstream direction and a downstream direction", "at least one of said second physical links being a bi-directional link operative to communicate in both an upstream direction and a downstream direction" and "said sending comprising communicating along at least one of said bi-directional links." Support for the amendment to claim 1 is found, inter alia, in paragraphs 39 and 42 of the application as published (U.S. Published Patent Application 2007/0237172). Amendments similar in scope have been made to claim 14.

Independent system claim 17 has been amended to include the recitations "at least one of said interface modules being operative to communicate in both an upstream direction and a downstream direction" and "at least one of said first physical links and at least one of said second links being bi-directional links operative to communicate in both said upstream direction and said

downstream direction." Support for the amendment to claim 1 is found, inter alia, in paragraph 39 of the application as published (U.S. Published Patent Application 2007/0237172). Amendments similar in scope have been made to claim 29.

Akahane describes a router comprising a priority level distinguishing means for distinguishing the priority level of a packet by referring to the information contained in the header of the packet, a routing table where an output path comprising one or more output lines can be mapped to each level of priority, an output path determining unit that searches the routing table and determines an output path to be used for sending out packets, and a preferential delivery controller that executes delivery control in accordance with the priority level for each output line corresponding to the output path.

The router described by Akhane includes separate and dedicated input lines and output lines, where the input lines go to dedicated receiving units and the output lines come from separate dedicated transmitting units. (Fig. 1, Fig. 11)

Applicants respectfully submit that Akhane does not show or suggest a method for communication, as recited in amended claim 1, including, inter alia, "at least one of said first physical links being a bi-directional link operative to communicate in both an upstream direction and a downstream direction," "at least one of said second physical links being a bi-directional link operative to communicate in both an upstream direction and a downstream direction" and "communicating along at least one of said bi-directional links in both said upstream direction and said downstream direction," and that amended claim 1 is therefore patentable. Claim 14 has been amended to include recitations similar in scope to the amendment to claim 1 and is also patentable.

Applicants respectfully submit that Akhane does not show or suggest a method for communication, as recited in amended claim 17, including, inter alia, "at least one of said interface modules being operative to communicate in both an upstream direction and a downstream direction" and "at least one of said first physical links and at least one of said second links being bi-directional links operative to communicate in both said upstream direction and said downstream direction" and that amended claim 17 is therefore patentable. Claim 29 has been amended to include recitations similar in scope to the amendment to claim 17 and is also patentable.

Applicants respectfully submit that even if one were to modify the router of Akhane to include two routers in opposite directions, one would still not arrive at the present invention since the present invention includes bi-directional internal links as opposed to the uni-directional internal links described by Akhane.

Claims 2 - 3 and 6 - 12 each depend directly or ultimately from claim 1 and are therefore patentable. Claim 16 depends from claim 14 and is therefore patentable.

Claims 18 and 21 - 27 each depend directly or ultimately from claim 12 and are therefore patentable. Claim 31 depends from claim 29 and is therefore patentable.

Applicants have carefully studied the remaining prior art of record herein and conclude that the invention as described and claimed in the present application is neither shown in nor suggested by the cited art.

Applicants reserve the right to pursue the claims as filed in the context of a continuation application.

In view of the foregoing remarks, all of the claims are believed to be in condition for allowance. Favorable reconsideration and allowance of the application is respectfully requested.

Dated: December 31, 2008

Respectfully submitted,

By _____
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PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
11/279,045	04/07/2006	

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)	SMALL ENTITY ☒		OR	OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE ($)	FEE ($)		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	12/31/2008	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 31	Minus	** 31	= 0	X $26 =	0	OR	X $ =	
	Independent (37 CFR 1.16(h))	* 12	Minus	***4	= 8	X $110 =	880	OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE	880	OR	TOTAL ADD'L FEE	

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/LAVINIA JOHNSON/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
11/279,045	04/07/2006	

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)	SMALL ENTITY ☒		OR	OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE ($)	FEE ($)		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	12/31/2008	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 31	Minus	** 31	= 0	X $26 =	0	OR	X $ =	
	Independent (37 CFR 1.16(h))	* 12	Minus	***4	= 8	X $110 =	880	OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE	880	OR	TOTAL ADD'L FEE	

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/STEFANIE BRYCE/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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UNITED STATES PATENT AND TRADEMARK OFFICE

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United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/279,045	04/07/2006	David Zelig	06727/0204293-US0	7423

7278 7590 10/02/2008

DARBY & DARBY P.C.
P.O. BOX 770
Church Street Station
New York, NY 10008-0770

EXAMINER	
HYUN, SOON D	
ART UNIT	**PAPER NUMBER**
2616	

MAIL DATE	DELIVERY MODE
10/02/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	11/279,045	ZELIG ET AL.	
	Examiner	Art Unit	
	SOON-DONG D. HYUN	2616	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 April 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-31* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,6-12,14,16-18,21-27,29 and 31* is/are rejected.

7)☒ Claim(s) *4,5,13,15,19,20,28 and 30* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *11/16, 8/16, 6/27, 7/7, 8/14*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-3, 6-12, 14, 16-18, 21-27, 29, and 31are rejected under 35 U.S.C. 102(e) as being anticipated by Akahane et al (U.S. Patent No. 6,963,578).

Regarding claims 1-3, 14, 17, 18, and 29, Akahane et al discloses a method for communication, comprising:

coupling a network node (a terminal 411 in FIG. 4) to an interface module (a switch fabric140 in FIG. 1) using a first group of first physical links (a plurality of input links to the switch fabric) arranged in parallel;

coupling the interface module to a communication network (a network 400 in FIG. 4) using a second group of second physical links (a plurality of output links form the switch fabric) arranged in parallel;

receiving (by a packet forwarding unit 130 in FIG. 1) a data frame having frame attributes (FIG. 2 and 3) sent between the communication network and the network node;

selecting, in a single computation based on at least one of the frame attributes, a first physical link out of the first group and a second physical link out of the second group (col. 4, lines 28-59; and

sending the data frame over the selected first and second physical links.

Regarding claims 6 and 21, Akahane et al further discloses that coupling the interface module to the communication network comprises at least one of multiplexing upstream data frames sent from the network node to the communication network, and demultiplexing downstream data frames sent from the communication network to the network node (FIG. 11).

Regarding claims 7 and 22, Akahane et al further discloses that selecting the first and second physical links comprises balancing a frame data rate among at least some of the first and second physical links (col. 4, line 28-col. 5, line 53).

Regarding claims 8 and 23, Akahane et al further discloses that selecting the first and second physical links comprises applying a mapping function to the at least one of the frame attributes (col. 13, lines 15-29).

Regarding claims 9-11, 16, 24-26, and 31, Akahane et al further discloses that applying the mapping function comprises applying a hashing function (col. 7, lines 48-67) as recited in claims.

Regarding claims 12 and 27, Akahane et al further discloses that the at least one of the frame attributes comprises at least one of a layer 2 header field, a layer 3 header field, a layer 4 header field, a source Internet Protocol (IP) address, a destination IP address, a source medium access control (MAC) address, a destination MAC address,

a source Transmission Control Protocol (TCP) port and a destination TCP port (FIG. 2 and 3).

Allowable Subject Matter

3. Claims 4, 5, 13, 15, 19, 20, 28, and 30 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to SOON-DONG D. HYUN whose telephone number is (571)272-3121. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chi H. Pham can be reached on 571-272-3179. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Chi H Pham/
Supervisory Patent Examiner, Art Unit 2616

/Soon D Hyun/
Examiner, Art Unit 2616

Notice of References Cited	Application/Control No. 11/279,045	Applicant(s)/Patent Under Reexamination ZELIG ET AL.	
	Examiner SOON-DONG D. HYUN	Art Unit 2616	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-6,963,578	11-2005	Akahane et al.	370/417
	B	US-			
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

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BIB DATA SHEET

CONFIRMATION NO. 7423

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
11/279,045	04/07/2006 RULE	370	2616	06727/0204293-US0

APPLICANTS

David Zelig, Givatayim, ISRAEL;
Ronen Solomon, Givatayim, ISRAEL;
Uzi Khill, Netanya, ISRAEL;

**** CONTINUING DATA **************************

**** FOREIGN APPLICATIONS **************************

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED **** ** SMALL ENTITY **
04/17/2006

Foreign Priority claimed	35 USC 119(a-d) conditions met	Verified and Acknowledged	Met after Allowance	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
☐ Yes ☑ No	☐ Yes ☑ No	/SOON-DONG D HYUN/ Examiner's Signature	☐ Initials	ISRAEL	3	31	4

ADDRESS

DARBY & DARBY P.C.
P.O. BOX 770
Church Street Station
New York, NY 10008-0770
UNITED STATES

TITLE

TWO-WAY LINK AGGREGATION

FILING FEE RECEIVED		
800	FEES: Authority has been given in Paper No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

Doc code :IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (03-08)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	11279045
Filing Date	2006-04-07
First Named Inventor	David Zelig
Art Unit	2616
Examiner Name	S. Zaidi
Attorney Docket Number	06727/0204293-US0

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

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U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
/SH/	1	20050163115		2005-07-28	Dontu et al.	
/SH/	2	20080031263		2008-02-07	Ervin et al.	

If you wish to add additional U.S. Published Application citation information please click the Add button.

FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1							☐

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NON-PATENT LITERATURE DOCUMENTS

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	11279045
	Filing Date	2006-04-07
	First Named Inventor	David Zelig
	Art Unit	2616
	Examiner Name	S. Zaidi
	Attorney Docket Number	06727/0204293-US0

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1		☐

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EXAMINER SIGNATURE

Examiner Signature	/Soon Hyun/	Date Considered	09/26/2008

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	2	"6963578".pn.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/09/26 09:50
L2	1	map$4 and 1	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/09/26 09:50
L3	1	hash$3 and 1	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/09/26 09:53
S1	161	(link adj aggregation) with ethernet	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/08/14 15:43
S2	8	(link adj aggregation) with ethernet with (load adj balanc $3)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/08/15 09:55
S3	372	select$3 with (first adj link) with (second adj link)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/09/25 16:03
S4	7	switch$3 with input with output with interface$3 with map$5 with table	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/09/25 16:48
S5	11856	router with table	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/09/25 16:50
S6	52	router with map$3 with input with output	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/09/25 16:51

S7	4997	router with (routing adj table)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/09/25 17:01
S8	111	router with (routing adj table) with map$3	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/09/25 17:01
S9	18825	370/229-231,235,389,401.ccls.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/09/26 08:14
S10	20183	370/229-231,235,389,401,445.ccls.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/09/26 08:15
S11	223	(link adj aggregation) same ethernet	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/09/26 08:15
S12	203	(link adj aggregation) and S10	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/09/26 08:15

9/26/2008 10:35:23 AM
C:\Documents and Settings\shyun\My Documents\EAST\Workspaces\11279045.wsp

PTO/SB/08a (01-08)
Approved for use through 07/31/2008. OMB 0651-0031
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Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 1 of 2

Complete if Known	
Application Number	11/279,045-Conf. #7423
Filing Date	April 7, 2006
First Named Inventor	David Zelig
Art Unit	2616
Examiner Name	S. Zaidi
Attorney Docket Number	06727/0204293-US0

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
/SH/	AA*	US-20040017816	01-29-2004	Ishwar et al.	
	AB*	US-20040008687	01-15-2004	Matsubara	
	AC*	US-20050125490	06-09-2005	Ramia	
	AD*	US-20070038767	02-15-2007	Miles et al.	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]

Examiner Signature	/Soon Hyun/	Date Considered	09/26/2008

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. * CITE NO.: Those application(s) which are marked with an single asterisk (*) next to the Cite No. are not supplied (under 37 CFR 1.98(a)(2)(iii)) because that application was filed after June 30, 2003 or is available in the IFW. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

PTO/SB/08b (01-08)
Approved for use through 07/31/2008. OMB 0651-0031
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Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 2 of 2

Complete if Known	
Application Number	**11/279,045-Conf.** #7423
Filing Date	April 7, 2006
First Named Inventor	David Zelig
Art Unit	2616
Examiner Name	S. Zaidi
Attorney Docket Number	06727/0204293-US0

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]

Examiner Signature		Date Considered	

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[1]Applicant's unique citation designation number (optional). [2]Applicant is to place a check mark here if English language Translation is attached.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11279045	ZELIG ET AL.
	Examiner	Art Unit
	SOON-DONG D HYUN	2616

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	09/26/2008								
	1	✓								
	2	✓								
	3	✓								
	4	O								
	5	O								
	6	✓								
	7	✓								
	8	✓								
	9	✓								
	10	✓								
	11	✓								
	12	✓								
	13	O								
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	19	O								
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	21	✓								
	22	✓								
	23	✓								
	24	✓								
	25	✓								
	26	✓								
	27	✓								
	28	O								
	29	✓								
	30	O								
	31	✓								

Doc code :IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (03-08)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	11279045
Filing Date	2006-04-07
First Named Inventor	David Zelig
Art Unit	2616
Examiner Name	S. Zaidi
Attorney Docket Number	06727/0204293-US0

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
/SH/	1	5285441		1994-02-08	Bansal et al.	
/SH/	2	6600741		2003-07-29	Chrin et al.	

If you wish to add additional U.S. Patent citation information please click the Add button.

U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

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FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1							☐

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NON-PATENT LITERATURE DOCUMENTS

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	11279045
	Filing Date	2006-04-07
	First Named Inventor	David Zelig
	Art Unit	2616
	Examiner Name	S. Zaidi
	Attorney Docket Number	06727/0204293-US0

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1		☐

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EXAMINER SIGNATURE

Examiner Signature	/Soon Hyun/	Date Considered	09/26/2008

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	11279045
	Filing Date	2006-04-07
	First Named Inventor	David Zelig
	Art Unit	2616
	Examiner Name	L. D. Feild
	Attorney Docket Number	06727/0204293-US0

U.S.PATENTS						Remove
Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
/SH/	1	6560231		2003-05-06	Kawakami et al.	
/SH/	2	6624917		2003-09-23	Paschal et al.	
/SH/	3	6763025	A1	2004-07-13	Leatherbury et al.	
/SH/	4	7184402		2007-02-27	Sharma et al.	
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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					
If you wish to add additional U.S. Published Application citation information please click the Add button.						Add

FOREIGN PATENT DOCUMENTS								Remove
Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] ¡	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	11279045
	Filing Date	2006-04-07
	First Named Inventor	David Zelig
	Art Unit	2616
	Examiner Name	L. D. Feild
	Attorney Docket Number	06727/0204293-US0

	1							☐

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NON-PATENT LITERATURE DOCUMENTS **Remove**

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1		☐

If you wish to add additional non-patent literature document citation information please click the Add button **Add**

EXAMINER SIGNATURE

Examiner Signature	/Soon Hyun/	Date Considered	09/26/2008

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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	Application Number	11279045
	Filing Date	2006-04-07
	First Named Inventor	David Zelig
	Art Unit	2616
	Examiner Name	L. D. Feild
	Attorney Docket Number	06727/0204293-US0

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ None

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/FB/ Flynn Barrison (53,970)	Date (YYYY-MM-DD)	2007-08-15
Name/Print	S. Peter Ludwig	Registration Number	25351

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Application Number	Application/Control No.	Applicant(s)/Patent under Reexamination	
	11/279,045	ZELIG ET AL.	
	Examiner	Art Unit	
	SOON-DONG D. HYUN	2616	

Docket No.: 06727/0204293-US0
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
David Zelig et al.

Application No.: 11/279,045 Confirmation No.: 7423

Filed: April 7, 2006 Art Unit: N/A

For: TWO-WAY LINK AGGREGATION Examiner: Not Yet Assigned

INFORMATION DISCLOSURE STATEMENT (IDS)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This Information Disclosure Statement is submitted in accordance with 37 C.F.R. 1.97, 1.98, and it is requested that the information set forth in this statement and in the listed documents be considered during the pendency of the above-identified application, and any other application relying on the filing date of the above-identified application or cross-referencing it as a related application.

1. This IDS should be considered, in accordance with 37 C.F.R. 1.97, as it is filed: (Check one of the boxes A-D)

- [ ] A. within three months of the filing date of the above-identified national application or within three months of the entry into the national stage of the above identified national application
- [x] B. before the mailing date of a first office action on the merits, or a first office action after filing a request for continued examination.
- [ ] C. after (A) and (B) above, but before final rejection or allowance, and Applicants have made the necessary statement in box "i" below or paid the necessary fee in box "ii" below.

(check one of the boxes "i" and "ii" below:)

☐ i. Counsel states that, upon information and belief, each item of information listed herein was (check one of boxes (a) or (b))

☐ (a) first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this IDS; or

☐ (b) not cited in a communication from a foreign patent office in a counterpart foreign application and, to the knowledge of undersigned after making reasonable inquiry, was not known to any individual designated in 1.56(c) more than three months prior to the filing of this IDS.

☐ ii. A check for the fee set forth in 1. 17(p), presently believed to be $180, is enclosed.

☐ D. after (A), (B) and (C) above, but before payment of the issue fee: Applicant petitions under 37 C.F.R. 1.97(d) for the consideration of this IDS. Under 37 CFR 1.17(i) a check in the amount of $180.00 is enclosed. Counsel certifies that, upon information and belief, each item of information listed herein was

(check one of the boxes "a" and "b" below:)

☐ (a) first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this IDS; or

☐ (b) was not cited in a communication from a foreign patent office in a counterpart foreign application and, to the knowledge of undersigned after making reasonable inquiry, was not known to any individual designated in 1.56(c) more than three months prior to the filing of this IDS.

2. In accordance with 37 C.F.R. 1.98, this IDS includes a list (e.g., form PTO/SB/08) of all patents, publications, or other information submitted for consideration by the office, either incorporated into this IDS or as an attachment hereto. A copy of each document listed is attached, except as explained below.

(check boxes A, B and/or C and fill in blanks, if appropriate.)

[x] A. Pursuant to the Notice issued by the United States Patent and Trademark Office dated July 11, 2003 waiving the requirements of 37 C.F.R. § 1.98(a)(2)(i), a copy/copies of the United States Patent on PTO/SB08 is/are not being submitted.

[ ] B. Document(s) _____is (are) deemed substantially cumulative to document(s) _____ , and, in accordance with 1.98(c), only a copy of each of the latter documents is enclosed.

[ ] C. Certain documents were previously cited by or submitted to the Office in the following prior applications, which are relied upon under 35 U.S.C. 120:

<<INSERT SERIAL NO. & FILING DATE>>

Applicant identifies these documents by attaching hereto copies of the forms PTO-892, PTO-1449 and/or PTO/SB/08 from the files of the prior application(s) or a fresh PTO/SB/08 listing these documents, and request that they be considered and made of record in accordance with 1.98(d). Per 37 CFR 1.98(d), copies of these documents need not be filed in this application.

[ ] 3. Cite No(s). _____ are not in the English language. In accordance with 1.98(c), Applicant states:

[ ] An English translation of each document (or of the pertinent portions thereof), or a copy of each corresponding English-language patent or application , or English-language abstract (or claim) is enclosed.

[ ] The requirement for a concise explanation of the relevance of any foreign language document is satisfied by the attached search report; citation of the documents cited in the search report shall not be construed as an admission that they are or are considered to be, material to patentability of the subject matter claimed herein (See MPEP §609).

[ ] A concise explanation of the relevance of document(s) _____ is set forth as follows: [Insert concise explanation of relevance]

[ ] A concise explanation of the relevance of document(s) _____ can be found on page(s) _____ of the specification.

[ ] A concise explanation of document(s) _____ can be found on the attached sheet.

[x] 4. No explanation of relevance is necessary for documents in the English language (see reply to Comments 67 in the preamble to the final rules; 1135 OG 13 at 20).

[ ] 5. Other information being provided for the examiner's consideration follows:

[A/An _____ Search Report, dated_____, which issued during the prosecution of _____Application No._____ which corresponds to the present application.]

6. In accordance with 37 C.F.R. 1.97(g) and (h), the filing of this IDS should not be construed as a representation that a search has been made or that information cited is, or is considered to be, material to patentability as defined in §1.56 (b), or that any cited document listed or attached is (or constitutes) prior art. Unless other-wise indicated, the date of publication indicated for an item is taken from the face of the item and Applicant reserves the right to prove that the date of publication is in fact different.

Early and favorable consideration is earnestly solicited.

The Commissioner is authorized to charge any deficiency of up to $300.00 or credit any excess in this fee to Deposit Account No. 04-0100.

Dated: November 14, 2006

Respectfully submitted,

By_____
S. Peter Ludwig
Registration No.: 25,351
DARBY & DARBY P.C.
P.O. Box 5257
New York, New York 10150-5257
(212) 527-7700
(212) 527-7701 (Fax)
Attorneys/Agents For Applicant

PTO/SB/08A/B (09-06)
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Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 1 of 2

Complete if Known	
Application Number	11/279,045-Conf. #7423
Filing Date	April 7, 2006
First Named Inventor	David Zelig
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	06727/0204293-US0

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
/SH/	AA*	US-5,540,730-B1	07-30-1996	Terry, Jr.	
	AB*	US-5,188,104-B1	02-23-1993	Wernicke	
	AC*	US-5,263,480-B1	11-23-1993	Wernicke	
	AD*	US-5,571,150-B1	11-05-1996	Wernicke	
	AE*	US-4,702,254-B1	10-27-1987	Zabara	
	AF*	US-4,867,164-B1	09-19-1989	Zabara	
	AG*	US-5,025,807-B1	06-25-1991	Zabara	
	AH*	US-6,205,359-B1	03-20-2001	Boveja	
	AI*	US-5,205,285-B1	04-27-1993	Baker, Jr.	
	AJ*	US-5,299,569-B1	04-05-1994	Wernicke	
	AK*	US-5,335,657-B1	08-09-1994	Terry, Jr.	
	AL*	US-5,707,400-B1	01-13-1998	Terry, Jr.	
	AM*	US-5,282,468-B1	02-01-1994	Klepinski	
	AN*	US-4,628,942-B1	12/1986	Sweeney et al.	
	AO*	US-4,535,785-B1	08-20-1985	van den Honert	
	AP*	US-4,602,624-B1	07/1986	Naples et al.	
	AQ*	US-5,199,430-B1	04-06-1993	Fang	
	AR*	US-5,215,086-B1	06-01-1993	Terry, Jr.	
	AS*	US-5,755,750-B1	05-26-1998	Petruska	
	AT*	US-4,649,936-B1	03-17-1987	Ungar	
	AU*	US-4,608,985-B1	09-02-1986	Crish	
	AV*	US-5,423,872-B1	06-13-1995	Cigaina	
	AW*	US-5,716,385-B1	02-10-1998	Mittal	
	AX*	US-6,097,984-B1	08-01-2000	Douglas	
	AY*	US-6,104,955-B1	08-15-2000	Bourgeois	
	AZ*	US-6,091,992	07-18-2000	Bourgeois et al.	
	AA1*	US-5,836,994-B1	11-17-1998	Bourgeois	
	AB1*	US-6,026,326-B1	02-15-2000	Bardy	
	AC1*	US-6,083,249	07-04-2000	Familoni	
	AD1*	US-5,690,691-B1	11/1997	Chen et al.	
	AE1*	US-5,292,344-B1	03-08-1994	Douglas	
	AF1*	US-3,411,507-B1	11-19-1968	Wingrove	
	AG1*	US-4,962,751-B1	10-16-1990	Krauter	
	AH1*	US-4,739,764-B1	04/1988	Lue et al.	
	AI1*	US-4,573,481-B1	03-04-1986	Bullara	
	AJ1*	US-5,540,734-B1	07-30-1996	Zabara	
	AK1*	US-20030103449-A1	06-05-2003	Barsheshet et al.	
	AL1*	US-6,339,595	01-15-2002	Rekhter et al.	
	AM1*	US-6,205,488	03-20-2001	Casey et al.	
	AN1*	US-6,765,921	07-20-2004	Stacey et al.	
	AO1*	US-6,628,624	09-30-2003	Mahajan et al.	
	AP1*	US-20040202171-A1	07-04-2006	Hama	
	AQ1*	US-6,886,043	04-26-2005	Mauger et al.	
	AR1*	US-20020176450-A1	11-28-2002	Kong et al.	
/SH/	AS1*	US-6,778,496	08-17-2004	Meempat et al.	

Examiner Signature	/Soon Hyun/	Date Considered	09/26/2008

00915253.doc

PTO/SB/08A/B (09-06)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 2 of 2

Complete if Known	
Application Number	11/279,045-Conf. #7423
Filing Date	April 7, 2006
First Named Inventor	David Zelig
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	06727/0204293-US0

/SH/	AT1*	US-6,604,136	08-05-2003	Chang et al.	
	AU1*	US-6,275,493	08-14-2001	Morris et al.	
	AV1*	US-6,760,775	07-06-2004	Anerousis et al.	
	AW1*	US-6,304,575	10-16-2001	Carroll et al.	
	AX1*	US-6,466,985	10-15-2002	Goyal et al.	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document: Country Code[3]-Number[4]-Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
/SH/	BA	WO-01/10375-A2	02-15-2001	Impulse Dynamics Nv et al.		

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
/SH/	CA	MAMAKOS, et al., " A Method for Transmitting PPP Over Ethernet (PPPoE)", in IETF RFC 2516, February 1999 pg. 1-15.	
	CB	ROSEN, et al., "Multiprotocol Label Switching Architecture" in Request for Comments (RFC) 3031 of the Internet Engineering Task Force (IETF), January 2001 pg. 1-54. Also available at www.ietf.org/rfc.html.	
	CC	TSIANG, D. et al., "The Cisco SRP MAC Layer Protocol" in Request for Comments (RFC) 2892 of the Internet Engineering Task Force (IETF), August 2000 pg. 1-46.	
	CD	MALKIN, G. "RIP version 2", RFC 2453, November 1998, pg. 1-39	
	CE	FINLAYSON, R. et al, "A Reverse Address Resolution Protocol", RFC 903, June 1984, pg. 1-5.	
	CF	BRADLEY, et al., "Multiprotocol Interconnect over Frame Relay" in IETF RFC 1490, July 1993, pg. 1-31.	
	CG	BAKER, et al., "PPP Bridging Control Protocol (BCP)", in IETF RFC 1638, June 1994, pg. 1-25.	
	CH	DEERING, S., "Host Extensions for IP Multicasting", in RFC 1112, August 1989, pg. 1-15.	
	CI	PLUMMER, D., "An Ethernet Address Resolution Protocol", in RFC 826, November 1982, pg. 1-8.	
/SH/	CJ	Clause 43 of IEEE Standard 802.3a, "Carrier Sense Multiple Access Method with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications" 2002 Edition.	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] Applicant's unique citation designation number (optional). [2] Applicant is to place a check mark here if English language Translation is attached.

Examiner Signature	/Soon Hyun/	Date Considered	09/26/2008

00915253.doc

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11279045	ZELIG ET AL.
	Examiner	Art Unit
	SOON-DONG D HYUN	2616

SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES		
Search Notes	Date	Examiner
EAST search for class, sub-class, text: see attached file	9/26/2008	hyun

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

Docket No.: 06727/0204293-US0
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
David Zelig et al.

Application No.: 11/279,045 Confirmation No.: 7423

Filed: April 7, 2006 Art Unit: 2616

For: TWO-WAY LINK AGGREGATION Examiner: S. Zaidi

INFORMATION DISCLOSURE STATEMENT (IDS)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This Information Disclosure Statement is submitted in accordance with 37 C.F.R. 1.97, 1.98, and it is requested that the information set forth in this statement and in the listed documents be considered during the pendency of the above-identified application, and any other application relying on the filing date of the above-identified application or cross-referencing it as a related application.

1. This IDS should be considered, in accordance with 37 C.F.R. 1.97, as it is filed: (Check one of the boxes A-D)

- [ ] A. within three months of the filing date of the above-identified national application or within three months of the entry into the national stage of the above identified national application
- [x] B. before the mailing date of a first office action on the merits, or a first office action after filing a request for continued examination.
- [ ] C. after (A) and (B) above, but before final rejection or allowance, and Applicants have made the necessary statement in box "i" below or paid the necessary fee in box "ii" below.

(check one of the boxes "i" and "ii" below:)

☐ i. Counsel states that, upon information and belief, each item of information listed herein was (check one of boxes (a) or (b))

☐ (a) first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this IDS; or

☐ (b) not cited in a communication from a foreign patent office in a counterpart foreign application and, to the knowledge of undersigned after making reasonable inquiry, was not known to any individual designated in 1.56(c) more than three months prior to the filing of this IDS.

☐ ii. Payment in the amount of the fee set forth in 1. 17(p), presently believed to be $180, is enclosed.

☐ D. after (A), (B) and (C) above, but before payment of the issue fee: Applicant petitions under 37 C.F.R. 1.97(d) for the consideration of this IDS. Under 37 CFR 1.17(p) payment in the amount of $180.00 is enclosed. Counsel certifies that, upon information and belief, each item of information listed herein was

(check one of the boxes "a" and "b" below:)

☐ (a) first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this IDS; or

☐ (b) was not cited in a communication from a foreign patent office in a counterpart foreign application and, to the knowledge of undersigned after making reasonable inquiry, was not known to any individual designated in 1.56(c) more than three months prior to the filing of this IDS.

2. In accordance with 37 C.F.R. 1.98, this IDS includes a list (e.g., form PTO/SB/08) of all patents, publications, or other information submitted for consideration by the office, either incorporated into this IDS or as an attachment hereto. A copy of each document listed is attached, except as explained below.

(check boxes A, B and/or C and fill in blanks, if appropriate.)

[x] A. Pursuant to the Notice issued by the United States Patent and Trademark Office dated August 5, 2003 waiving the requirements of 37 C.F.R. § 1.98(a)(2)(ii), a copy/copies of the U.S. Patent(s) and/or U.S. Patent Application Publication(s) on PTO/SB/08 is/are not being submitted.

[ ] B. Document(s) _____is (are) deemed substantially cumulative to document(s) _____ , and, in accordance with 1.98(c), only a copy of each of the latter documents is enclosed.

[ ] C. Certain documents were previously cited by or submitted to the Office in the following prior applications, which are relied upon under 35 U.S.C. 120:

<<INSERT SERIAL NO. & FILING DATE>>

Applicant identifies these documents by attaching hereto copies of the forms PTO-892, PTO-1449 and/or PTO/SB/08 from the files of the prior application(s) or a fresh PTO/SB/08 listing these documents, and request that they be considered and made of record in accordance with 1.98(d). Per 37 CFR 1.98(d), copies of these documents need not be filed in this application.

[ ] 3. Cite Nos. _____ are not in the English language. In accordance with 1.98(c), Applicant states:

[ ] An English translation of each document (or of the pertinent portions thereof), or a copy of each corresponding English-language patent or application , or English-language abstract (or claim) is enclosed.

[ ] The requirement for a concise explanation of the relevance of any foreign language document is satisfied by the attached search report; citation of the documents cited in the search report shall not be construed as an admission that they are or are considered to be, material to patentability of the subject matter claimed herein (See MPEP §609).

[ ] A concise explanation of the relevance of document(s) _____ is set forth as follows: [Insert concise explanation of relevance]

[ ] A concise explanation of the relevance of document(s) _____ can be found on page(s) _____ of the specification.

[ ] A concise explanation of document(s) _____ can be found on the attached sheet.

☐ 4. No explanation of relevance is necessary for documents in the English language (see reply to Comments 67 in the preamble to the final rules; 1135 OG 13 at 20).

☒ 5. Other information being provided for the examiner's consideration follows:
International Search Report dated July 8, 2008 issued in connection with PCT/IL07/01385

6. In accordance with 37 C.F.R. 1.97(g) and (h), the filing of this IDS should not be construed as a representation that a search has been made or that information cited is, or is considered to be, material to patentability as defined in §1.56 (b), or that any cited document listed or attached is (or constitutes) prior art. Unless other-wise indicated, the date of publication indicated for an item is taken from the face of' the item and Applicant reserves the right to prove that the date of publication is in fact different.

Early and favorable consideration is earnestly solicited.

The Commissioner is authorized to charge any deficiency of up to $300.00 or credit any excess in this fee to Deposit Account No. 04-0100.

Dated: August 14, 2008

Respectfully submitted,

By _____
S. Peter Ludwig
Registration No.: 25,351
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P.O. Box 770
Church Street Station
New York, New York 10008-0770
(212) 527-7700
(212) 527-7701 (Fax)
Attorneys/Agents For Applicant

Doc code :IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (03-08)
Approved for use through 07/31/2008. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99**)		
	Application Number	11279045
	Filing Date	2006-04-07
	First Named Inventor	David Zelig
	Art Unit	2616
	Examiner Name	S. Zaidi
	Attorney Docket Number	06727/0204293-US0

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	5285441		1994-02-08	Bansal et al.	
	2	6600741		2003-07-29	Chrin et al.	

If you wish to add additional U.S. Patent citation information please click the Add button.

U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

If you wish to add additional U.S. Published Application citation information please click the Add button.

FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1							☐

If you wish to add additional Foreign Patent Document citation information please click the Add button

NON-PATENT LITERATURE DOCUMENTS

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	11279045
	Filing Date	2006-04-07
	First Named Inventor	David Zelig
	Art Unit	2616
	Examiner Name	S. Zaidi
	Attorney Docket Number	06727/0204293-US0

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1		☐

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	11279045
	Filing Date	2006-04-07
	First Named Inventor	David Zelig
	Art Unit	2616
	Examiner Name	S. Zaidi
	Attorney Docket Number	06727/0204293-US0

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ None

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature		Date (YYYY-MM-DD)	2008-08-14
Name/Print	S. Peter Ludwig	Registration Number	25351

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	3783786
Application Number:	11279045
International Application Number:	
Confirmation Number:	7423
Title of Invention:	TWO-WAY LINK AGGREGATION
First Named Inventor/Applicant Name:	David Zelig
Customer Number:	7278
Filer:	Jay Philip Lessler/Stanley Jean-Francois
Filer Authorized By:	Jay Philip Lessler
Attorney Docket Number:	06727/0204293-US0
Receipt Date:	14-AUG-2008
Filing Date:	07-APR-2006
Time Stamp:	17:16:14
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
1		01642742.pdf	102947 8920eb21acbcf4e3ecf9a7ead9a75a3a9652ec8c	yes	9

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Information Disclosure Statement Letter	1	4
	Information Disclosure Statement (IDS) Filed (SB/08)	5	8
	NPL Documents	9	9
Warnings:			
Information:			
	Total Files Size (in bytes):	102947	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Docket No.: 06727/0204293-US0
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
David Zelig et al.

Application No.: 11/279,045 Confirmation No.: 7423

Filed: April 7, 2006 Art Unit: 2616

For: TWO-WAY LINK AGGREGATION Examiner: S. Zaidi

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT (IDS)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This Supplemental Information Disclosure Statement is submitted in accordance with 37 C.F.R. 1.97, 1.98, and it is requested that the information set forth in this statement and in the listed documents be considered during the pendency of the above-identified application, and any other application relying on the filing date of the above-identified application or cross-referencing it as a related application.

1. This IDS should be considered, in accordance with 37 C.F.R. 1.97, as it is filed: (Check one of the boxes A-D)

- [ ] A. within three months of the filing date of the above-identified national application or within three months of the entry into the national stage of the above identified national application
- [x] B. before the mailing date of a first office action on the merits, or a first office action after filing a request for continued examination.
- [ ] C. after (A) and (B) above, but before final rejection or allowance, and Applicants have made the necessary statement in box "i" below or paid the necessary fee in box "ii" below.

(check one of the boxes "i" and "ii" below:)

☐ i. Counsel states that, upon information and belief, each item of information listed herein was (check one of boxes (a) or (b))

☐ (a) first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this IDS; or

☐ (b) not cited in a communication from a foreign patent office in a counterpart foreign application and, to the knowledge of undersigned after making reasonable inquiry, was not known to any individual designated in 1.56(c) more than three months prior to the filing of this IDS.

☐ ii. Payment in the amount of the fee set forth in 1. 17(p), presently believed to be $180, is enclosed.

☐ D. after (A), (B) and (C) above, but before payment of the issue fee: Applicant petitions under 37 C.F.R. 1.97(d) for the consideration of this IDS. Under 37 CFR 1.17(p) payment in the amount of $180.00 is enclosed. Counsel certifies that, upon information and belief, each item of information listed herein was

(check one of the boxes "a" and "b" below:)

☐ (a) first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this IDS; or

☐ (b) was not cited in a communication from a foreign patent office in a counterpart foreign application and, to the knowledge of undersigned after making reasonable inquiry, was not known to any individual designated in 1.56(c) more than three months prior to the filing of this IDS.

2. In accordance with 37 C.F.R. 1.98, this IDS includes a list (e.g., form PTO/SB/08) of all patents, publications, or other information submitted for consideration by the office, either incorporated into this IDS or as an attachment hereto. A copy of each document listed is attached, except as explained below.

(check boxes A, B and/or C and fill in blanks, if appropriate.)

[x] A. Pursuant to the Notice issued by the United States Patent and Trademark Office dated August 5, 2003 waiving the requirements of 37 C.F.R. § 1.98(a)(2)(ii), a copy/copies of the U.S. Patent(s) and/or U.S. Patent Application Publication(s) on PTO/SB/08 is/are not being submitted.

[ ] B. Document(s) _____is (are) deemed substantially cumulative to document(s) _____ , and, in accordance with 1.98(c), only a copy of each of the latter documents is enclosed.

[ ] C. Certain documents were previously cited by or submitted to the Office in the following prior applications, which are relied upon under 35 U.S.C. 120:

<<INSERT SERIAL NO. & FILING DATE>>

Applicant identifies these documents by attaching hereto copies of the forms PTO-892, PTO-1449 and/or PTO/SB/08 from the files of the prior application(s) or a fresh PTO/SB/08 listing these documents, and request that they be considered and made of record in accordance with 1.98(d). Per 37 CFR 1.98(d), copies of these documents need not be filed in this application.

[ ] 3. Cite Nos. _____ are not in the English language. In accordance with 1.98(c), Applicant states:

[ ] An English translation of each document (or of the pertinent portions thereof), or a copy of each corresponding English-language patent or application , or English-language abstract (or claim) is enclosed.

[ ] The requirement for a concise explanation of the relevance of any foreign language document is satisfied by the attached search report; citation of the documents cited in the search report shall not be construed as an admission that they are or are considered to be, material to patentability of the subject matter claimed herein (See MPEP §609).

[ ] A concise explanation of the relevance of document(s) _____ is set forth as follows: [Insert concise explanation of relevance]

[ ] A concise explanation of the relevance of document(s) _____ can be found on page(s) _____ of the specification.

[ ] A concise explanation of document(s) _____ can be found on the attached sheet.

☐ 4. No explanation of relevance is necessary for documents in the English language (see reply to Comments 67 in the preamble to the final rules; 1135 OG 13 at 20).

☐ 5. Other information being provided for the examiner's consideration follows:

6. In accordance with 37 C.F.R. 1.97(g) and (h), the filing of this IDS should not be construed as a representation that a search has been made or that information cited is, or is considered to be, material to patentability as defined in §1.56 (b), or that any cited document listed or attached is (or constitutes) prior art. Unless other-wise indicated, the date of publication indicated for an item is taken from the face of' the item and Applicant reserves the right to prove that the date of publication is in fact different.

Early and favorable consideration is earnestly solicited.

The Commissioner is authorized to charge any deficiency of up to $300.00 or credit any excess in this fee to Deposit Account No. 04-0100.

Dated: July 7, 2008

Respectfully submitted,

By_____
S. Peter Ludwig
Registration No.: 25,351
DARBY & DARBY P.C.
P.O. Box 770
Church Street Station
New York, New York 10008-0770
(Phone) 212-527-7700
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Attorneys/Agents For Applicant

PTO/SB/08a (01-08)
Approved for use through 07/31/2008. OMB 0651-0031
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Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 1 of 2

Complete if Known	
Application Number	11/279,045-Conf. #7423
Filing Date	April 7, 2006
First Named Inventor	David Zelig
Art Unit	2616
Examiner Name	S. Zaidi
Attorney Docket Number	06727/0204293-US0

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	AA*	US-20040017816	01-29-2004	Ishwar et al.	
	AB*	US-20040008687	01-15-2004	Matsubara	
	AC*	US-20050125490	06-09-2005	Ramia	
	AD*	US-20070038767	02-15-2007	Miles et al.	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. * CITE NO.: Those application(s) which are marked with an single asterisk (*) next to the Cite No. are not supplied (under 37 CFR 1.98(a)(2)(iii)) because that application was filed after June 30, 2003 or is available in the IFW. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

PTO/SB/08b (01-08)
Approved for use through 07/31/2008. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 2 of 2

Complete if Known	
Application Number	**11/279,045-Conf.** #7423
Filing Date	April 7, 2006
First Named Inventor	David Zelig
Art Unit	2616
Examiner Name	S. Zaidi
Attorney Docket Number	06727/0204293-US0

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1]Applicant's unique citation designation number (optional). [2]Applicant is to place a check mark here if English language Translation is attached.

Electronic Acknowledgement Receipt

EFS ID:	3574961
Application Number:	11279045
International Application Number:	
Confirmation Number:	7423
Title of Invention:	TWO-WAY LINK AGGREGATION
First Named Inventor/Applicant Name:	David Zelig
Customer Number:	7278
Filer:	Jay Philip Lessler/Angelina Stantini
Filer Authorized By:	Jay Philip Lessler
Attorney Docket Number:	06727/0204293-US0
Receipt Date:	07-JUL-2008
Filing Date:	07-APR-2006
Time Stamp:	16:44:57
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
1		01605677.pdf	57367 51e55a0b97d1be053981c748bce3db070c91d52e	yes	6

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Information Disclosure Statement Letter	1	4
	Information Disclosure Statement (IDS) Filed	5	6
Warnings:			
Information:			
	Total Files Size (in bytes):	57367	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Docket No.: 06727/0204293-US0
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
David Zelig et al.

Application No.: 11/279,045 Confirmation No.: 7423

Filed: April 7, 2006 Art Unit: 2616

For: TWO-WAY LINK AGGREGATION Examiner: S. Zaidi

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT (IDS)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This Supplemental Information Disclosure Statement is submitted in accordance with 37 C.F.R. 1.97, 1.98, and it is requested that the information set forth in this statement and in the listed documents be considered during the pendency of the above-identified application, and any other application relying on the filing date of the above-identified application or cross-referencing it as a related application.

1. This IDS should be considered, in accordance with 37 C.F.R. 1.97, as it is filed: (Check one of the boxes A-D)

- [ ] A. within three months of the filing date of the above-identified national application or within three months of the entry into the national stage of the above identified national application
- [x] B. before the mailing date of a first office action on the merits, or a first office action after filing a request for continued examination.
- [ ] C. after (A) and (B) above, but before final rejection or allowance, and Applicants have made the necessary statement in box "i" below or paid the necessary fee in box "ii" below.

(check one of the boxes "i" and "ii" below:)

☐ i. Counsel states that, upon information and belief, each item of information listed herein was (check one of boxes (a) or (b))

☐ (a) first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this IDS; or

☐ (b) not cited in a communication from a foreign patent office in a counterpart foreign application and, to the knowledge of undersigned after making reasonable inquiry, was not known to any individual designated in 1.56(c) more than three months prior to the filing of this IDS.

☐ ii. Payment in the amount of the fee set forth in 1. 17(p), presently believed to be $180, is enclosed.

☐ D. after (A), (B) and (C) above, but before payment of the issue fee: Applicant petitions under 37 C.F.R. 1.97(d) for the consideration of this IDS. Under 37 CFR 1.17(p) payment in the amount of $180.00 is enclosed. Counsel certifies that, upon information and belief, each item of information listed herein was

(check one of the boxes "a" and "b" below:)

☐ (a) first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this IDS; or

☐ (b) was not cited in a communication from a foreign patent office in a counterpart foreign application and, to the knowledge of undersigned after making reasonable inquiry, was not known to any individual designated in 1.56(c) more than three months prior to the filing of this IDS.

2. In accordance with 37 C.F.R. 1.98, this IDS includes a list (e.g., form PTO/SB/08) of all patents, publications, or other information submitted for consideration by the office, either incorporated into this IDS or as an attachment hereto. A copy of each document listed is attached, except as explained below.

(check boxes A, B and/or C and fill in blanks, if appropriate.)

[x] A. Pursuant to the Notice issued by the United States Patent and Trademark Office dated August 5, 2003 waiving the requirements of 37 C.F.R. § 1.98(a)(2)(ii), a copy/copies of the U.S. Patent(s) and/or U.S. Patent Application Publication(s) on PTO/SB/08 is/are not being submitted.

[ ] B. Document(s) _____is (are) deemed substantially cumulative to document(s) _____ , and, in accordance with 1.98(c), only a copy of each of the latter documents is enclosed.

[ ] C. Certain documents were previously cited by or submitted to the Office in the following prior applications, which are relied upon under 35 U.S.C. 120:

<<INSERT SERIAL NO. & FILING DATE>>

Applicant identifies these documents by attaching hereto copies of the forms PTO-892, PTO-1449 and/or PTO/SB/08 from the files of the prior application(s) or a fresh PTO/SB/08 listing these documents, and request that they be considered and made of record in accordance with 1.98(d). Per 37 CFR 1.98(d), copies of these documents need not be filed in this application.

[ ] 3. Cite Nos. _____ are not in the English language. In accordance with 1.98(c), Applicant states:

[ ] An English translation of each document (or of the pertinent portions thereof), or a copy of each corresponding English-language patent or application , or English-language abstract (or claim) is enclosed.

[ ] The requirement for a concise explanation of the relevance of any foreign language document is satisfied by the attached search report; citation of the documents cited in the search report shall not be construed as an admission that they are or are considered to be, material to patentability of the subject matter claimed herein (See MPEP §609).

[ ] A concise explanation of the relevance of document(s) _____ is set forth as follows: [Insert concise explanation of relevance]

[ ] A concise explanation of the relevance of document(s) _____ can be found on page(s) _____ of the specification.

[ ] A concise explanation of document(s) _____ can be found on the attached sheet.

☐ 4. No explanation of relevance is necessary for documents in the English language (see reply to Comments 67 in the preamble to the final rules; 1135 OG 13 at 20).

☒ 5. Other information being provided for the examiner's consideration follows:

An International Search Report, dated May 21, 2008, which issued during the prosecution of applicant's International Application No. PCT/IL07/01517.

6. In accordance with 37 C.F.R. 1.97(g) and (h), the filing of this IDS should not be construed as a representation that a search has been made or that information cited is, or is considered to be, material to patentability as defined in §1.56 (b), or that any cited document listed or attached is (or constitutes) prior art. Unless other-wise indicated, the date of publication indicated for an item is taken from the face of' the item and Applicant reserves the right to prove that the date of publication is in fact different.

Early and favorable consideration is earnestly solicited.

The Commissioner is authorized to charge any deficiency of up to $300.00 or credit any excess in this fee to Deposit Account No. 04-0100.

Dated: June 27, 2008

Respectfully submitted,

By _____
S. Peter Ludwig
Registration No.: 25,351
DARBY & DARBY P.C.
P.O. Box 770
Church Street Station
New York, New York 10008-0770
(212) 527-7700
(212) 527-7701 (Fax)
Attorneys/Agents For Applicant

Doc code :IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (03-08)
Approved for use through 06/30/2008. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	11279045
Filing Date	2006-04-07
First Named Inventor	David Zelig
Art Unit	2616
Examiner Name	S. Zaidi
Attorney Docket Number	06727/0204293-US0

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

If you wish to add additional U.S. Patent citation information please click the Add button.

U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20050163115		2005-07-28	Dontu et al.	
	2	20080031263		2008-02-07	Ervin et al.	

If you wish to add additional U.S. Published Application citation information please click the Add button.

FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1							☐

If you wish to add additional Foreign Patent Document citation information please click the Add button

NON-PATENT LITERATURE DOCUMENTS

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	11279045
	Filing Date	2006-04-07
	First Named Inventor	David Zelig
	Art Unit	2616
	Examiner Name	S. Zaidi
	Attorney Docket Number	06727/0204293-US0

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1		☐

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	11279045
	Filing Date	2006-04-07
	First Named Inventor	David Zelig
	Art Unit	2616
	Examiner Name	S. Zaidi
	Attorney Docket Number	06727/0204293-US0

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ None

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature		Date (YYYY-MM-DD)	2008-06-27
Name/Print	S. Peter Ludwig	Registration Number	25351

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	3530846
Application Number:	11279045
International Application Number:	
Confirmation Number:	7423
Title of Invention:	TWO-WAY LINK AGGREGATION
First Named Inventor/Applicant Name:	David Zelig
Customer Number:	7278
Filer:	Pierre Yanney/Dannielle Davis
Filer Authorized By:	Pierre Yanney
Attorney Docket Number:	06727/0204293-US0
Receipt Date:	27-JUN-2008
Filing Date:	07-APR-2006
Time Stamp:	13:21:44
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
1		01596044.pdf	74833 3db5fa618a418d2fc218c785f82b768e465531b9	yes	8

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Information Disclosure Statement Letter	1	4
	Information Disclosure Statement (IDS) Filed	5	8

Warnings:					
Information:					
2	NPL Documents	01596046.pdf	107911 cd2fee6839265c8a68ece2e33bb208e87609216a	no	4
Warnings:					
Information:					
		Total Files Size (in bytes):	182744		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
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UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(c) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/279,045	04/07/2006	David Zelig	06727/0204293-US0

CONFIRMATION NO. 7423

7278
DARBY & DARBY P.C.
P.O. BOX 770
Church Street Station
New York, NY10008-0770

Title: TWO-WAY LINK AGGREGATION

Publication No. US-2007-0237172-A1
Publication Date: 10/11/2007

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Office of Public Records. The Office of Public Records can be reached by telephone at (703) 308-9726 or (800) 972-6382, by facsimile at (703) 305-8759, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently http://pair.uspto.gov/. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Pre-Grant Publication Division, 703-605-4283

Docket No.: 06727/0204293-US0
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
David Zelig et al.

Application No.: 11/279,045 Confirmation No.: 7423

Filed: April 7, 2006 Art Unit: 2616

For: TWO-WAY LINK AGGREGATION Examiner: L. D. Feild

INFORMATION DISCLOSURE STATEMENT (IDS)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This Information Disclosure Statement is submitted in accordance with 37 C.F.R. 1.97, 1.98, and it is requested that the information set forth in this statement and in the listed documents be considered during the pendency of the above-identified application, and any other application relying on the filing date of the above-identified application or cross-referencing it as a related application.

1. This IDS should be considered, in accordance with 37 C.F.R. 1.97, as it is filed: (Check one of the boxes A-D)

- [ ] A. within three months of the filing date of the above-identified national application or within three months of the entry into the national stage of the above identified national application
- [x] B. before the mailing date of a first office action on the merits, or a first office action after filing a request for continued examination.
- [ ] C. after (A) and (B) above, but before final rejection or allowance, and Applicants have made the necessary statement in box "i" below or paid the necessary fee in box "ii" below.

(check one of the boxes "i" and "ii" below:)

☐ i. Counsel states that, upon information and belief, each item of information listed herein was (check one of boxes (a) or (b))

☐ (a) first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this IDS; or

☐ (b) not cited in a communication from a foreign patent office in a counterpart foreign application and, to the knowledge of undersigned after making reasonable inquiry, was not known to any individual designated in 1.56(c) more than three months prior to the filing of this IDS.

☐ ii. A check for the fee set forth in 1. 17(p), presently believed to be $180, is enclosed.

☐ D. after (A), (B) and (C) above, but before payment of the issue fee: Applicant petitions under 37 C.F.R. 1.97(d) for the consideration of this IDS. Under 37 CFR 1.17(p) a check in the amount of $180.00 is enclosed. Counsel certifies that, upon information and belief, each item of information listed herein was

(check one of the boxes "a" and "b" below:)

☐ (a) first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this IDS; or

☐ (b) was not cited in a communication from a foreign patent office in a counterpart foreign application and, to the knowledge of undersigned after making reasonable inquiry, was not known to any individual designated in 1.56(c) more than three months prior to the filing of this IDS.

2. In accordance with 37 C.F.R. 1.98, this IDS includes a list (e.g., form PTO/SB/08) of all patents, publications, or other information submitted for consideration by the office, either incorporated into this IDS or as an attachment hereto. A copy of each document listed is attached, except as explained below.

(check boxes A, B and/or C and fill in blanks, if appropriate.)

[x] A. Pursuant to the Notice issued by the United States Patent and Trademark Office dated July 11, 2003 waiving the requirements of 37 C.F.R. § 1.98(a)(2)(ii), a copy/copies of the United States Patent on PTO/SB08 is/are not being submitted.

[ ] B. Document(s) _____is (are) deemed substantially cumulative to document(s) _____ , and, in accordance with 1.98(c), only a copy of each of the latter documents is enclosed.

[ ] C. Certain documents were previously cited by or submitted to the Office in the following prior applications, which are relied upon under 35 U.S.C. 120:

<<INSERT SERIAL NO. & FILING DATE>>

Applicant identifies these documents by attaching hereto copies of the forms PTO-892, PTO-1449 and/or PTO/SB/08 from the files of the prior application(s) or a fresh PTO/SB/08 listing these documents, and request that they be considered and made of record in accordance with 1.98(d). Per 37 CFR 1.98(d), copies of these documents need not be filed in this application.

[ ] 3. Cite Nos. _____ are not in the English language. In accordance with 1.98(c), Applicant states:

[ ] An English translation of each document (or of the pertinent portions thereof), or a copy of each corresponding English-language patent or application , or English-language abstract (or claim) is enclosed.

[ ] The requirement for a concise explanation of the relevance of any foreign language document is satisfied by the attached search report; citation of the documents cited in the search report shall not be construed as an admission that they are or are considered to be, material to patentability of the subject matter claimed herein (See MPEP §609).

[ ] A concise explanation of the relevance of document(s) _____ is set forth as follows: [Insert concise explanation of relevance]

[ ] A concise explanation of the relevance of document(s) _____ can be found on page(s) _____ of the specification.

[ ] A concise explanation of document(s) _____ can be found on the attached sheet.

☐ 4. No explanation of relevance is necessary for documents in the English language (see reply to Comments 67 in the preamble to the final rules; 1135 OG 13 at 20).

☒ 5. Other information being provided for the examiner's consideration follows:

An Office Action, dated July 25, 2007, which issued during the prosecution of Applicant's U.S. Patent Application No. 10/436,516.

6. In accordance with 37 C.F.R. 1.97(g) and (h), the filing of this IDS should not be construed as a representation that a search has been made or that information cited is, or is considered to be, material to patentability as defined in §1.56 (b), or that any cited document listed or attached is (or constitutes) prior art. Unless other-wise indicated, the date of publication indicated for an item is taken from the face of' the item and Applicant reserves the right to prove that the date of publication is in fact different.

Early and favorable consideration is earnestly solicited.

The Commissioner is authorized to charge any deficiency of up to $300.00 or credit any excess in this fee to Deposit Account No. 04-0100.

Dated: August 15, 2007

Respectfully submitted,

By _____
S. Peter Ludwig
Registration No.: 25,351
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PTO/SB/08a (05-07)
Approved for use through 09/30/2007. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	11279045
	Filing Date	2006-04-07
	First Named Inventor	David Zelig
	Art Unit	2616
	Examiner Name	L. D. Feild
	Attorney Docket Number	06727/0204293-US0

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	6560231		2003-05-06	Kawakami et al.	
	2	6624917		2003-09-23	Paschal et al.	
	3	6763025	A1	2004-07-13	Leatherbury et al.	
	4	7184402		2007-02-27	Sharma et al.	

If you wish to add additional U.S. Patent citation information please click the Add button. Add

U.S.PATENT APPLICATION PUBLICATIONS Remove

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

If you wish to add additional U.S. Published Application citation information please click the Add button. Add

FOREIGN PATENT DOCUMENTS Remove

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] ¡	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	11279045
	Filing Date	2006-04-07
	First Named Inventor	David Zelig
	Art Unit	2616
	Examiner Name	L. D. Feild
	Attorney Docket Number	06727/0204293-US0

	1							☐

If you wish to add additional Foreign Patent Document citation information please click the Add button Add

NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1		☐

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	11279045
	Filing Date	2006-04-07
	First Named Inventor	David Zelig
	Art Unit	2616
	Examiner Name	L. D. Feild
	Attorney Docket Number	06727/0204293-US0

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ None

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/FB/ Flynn Barrison (53,970)	Date (YYYY-MM-DD)	2007-08-15
Name/Print	S. Peter Ludwig	Registration Number	25351

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	2090778
Application Number:	11279045
International Application Number:	
Confirmation Number:	7423
Title of Invention:	TWO-WAY LINK AGGREGATION
First Named Inventor/Applicant Name:	David Zelig
Customer Number:	7278
Filer:	Jay Philip Lessler/Stanley Jean-Francois
Filer Authorized By:	Jay Philip Lessler
Attorney Docket Number:	06727/0204293-US0
Receipt Date:	16-AUG-2007
Filing Date:	07-APR-2006
Time Stamp:	14:17:43
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Filed	01206620.pdf	163388 7e496f7e1e16035375903e747a4332defbe76c13	no	4
Warnings:					

Information:					
This is not an USPTO supplied IDS fillable form					
2	Information Disclosure Statement (IDS) Filed	01204690.pdf	838885 688ef62f51108157746ad36dee9e66e8e51f13bd	no	4
Warnings:					
Information:					
3	NPL Documents	01204689.PDF	44812 a1fbb4569275c78faab596f2b4f7343e0a67f197	no	1
Warnings:					
Information:					
			Total Files Size (in bytes):	1047085	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Docket No.: 06727/0204293-US0
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
David Zelig et al.

Application No.: 11/279,045 Confirmation No.: 7423

Filed: April 7, 2006 Art Unit: N/A

For: TWO-WAY LINK AGGREGATION Examiner: Not Yet Assigned

INFORMATION DISCLOSURE STATEMENT (IDS)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This Information Disclosure Statement is submitted in accordance with 37 C.F.R. 1.97, 1.98, and it is requested that the information set forth in this statement and in the listed documents be considered during the pendency of the above-identified application, and any other application relying on the filing date of the above-identified application or cross-referencing it as a related application.

1. This IDS should be considered, in accordance with 37 C.F.R. 1.97, as it is filed: (Check one of the boxes A-D)

- [ ] A. within three months of the filing date of the above-identified national application or within three months of the entry into the national stage of the above identified national application
- [x] B. before the mailing date of a first office action on the merits, or a first office action after filing a request for continued examination.
- [ ] C. after (A) and (B) above, but before final rejection or allowance, and Applicants have made the necessary statement in box "i" below or paid the necessary fee in box "ii" below.

(check one of the boxes "i" and "ii" below:)

☐ i. Counsel states that, upon information and belief, each item of information listed herein was (check one of boxes (a) or (b))

☐ (a) first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this IDS; or

☐ (b) not cited in a communication from a foreign patent office in a counterpart foreign application and, to the knowledge of undersigned after making reasonable inquiry, was not known to any individual designated in 1.56(c) more than three months prior to the filing of this IDS.

☐ ii. A check for the fee set forth in 1. 17(p), presently believed to be $180, is enclosed.

☐ D. after (A), (B) and (C) above, but before payment of the issue fee: Applicant petitions under 37 C.F.R. 1.97(d) for the consideration of this IDS. Under 37 CFR 1.17(i) a check in the amount of $180.00 is enclosed. Counsel certifies that, upon information and belief, each item of information listed herein was

(check one of the boxes "a" and "b" below:)

☐ (a) first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this IDS; or

☐ (b) was not cited in a communication from a foreign patent office in a counterpart foreign application and, to the knowledge of undersigned after making reasonable inquiry, was not known to any individual designated in 1.56(c) more than three months prior to the filing of this IDS.

2. In accordance with 37 C.F.R. 1.98, this IDS includes a list (e.g., form PTO/SB/08) of all patents, publications, or other information submitted for consideration by the office, either incorporated into this IDS or as an attachment hereto. A copy of each document listed is attached, except as explained below.

(check boxes A, B and/or C and fill in blanks, if appropriate.)

[x] A. Pursuant to the Notice issued by the United States Patent and Trademark Office dated July 11, 2003 waiving the requirements of 37 C.F.R. § 1.98(a)(2)(i), a copy/copies of the United States Patent on PTO/SB08 is/are not being submitted.

[ ] B. Document(s) _____is (are) deemed substantially cumulative to document(s) _____ , and, in accordance with 1.98(c), only a copy of each of the latter documents is enclosed.

[ ] C. Certain documents were previously cited by or submitted to the Office in the following prior applications, which are relied upon under 35 U.S.C. 120:

<<INSERT SERIAL NO. & FILING DATE>>

Applicant identifies these documents by attaching hereto copies of the forms PTO-892, PTO-1449 and/or PTO/SB/08 from the files of the prior application(s) or a fresh PTO/SB/08 listing these documents, and request that they be considered and made of record in accordance with 1.98(d). Per 37 CFR 1.98(d), copies of these documents need not be filed in this application.

[ ] 3. Cite No(s). _____ are not in the English language. In accordance with 1.98(c), Applicant states:

[ ] An English translation of each document (or of the pertinent portions thereof), or a copy of each corresponding English-language patent or application , or English-language abstract (or claim) is enclosed.

[ ] The requirement for a concise explanation of the relevance of any foreign language document is satisfied by the attached search report; citation of the documents cited in the search report shall not be construed as an admission that they are or are considered to be, material to patentability of the subject matter claimed herein (See MPEP §609).

[ ] A concise explanation of the relevance of document(s) _____ is set forth as follows: [Insert concise explanation of relevance]

[ ] A concise explanation of the relevance of document(s) _____ can be found on page(s) _____ of the specification.

[ ] A concise explanation of document(s) _____ can be found on the attached sheet.

[x] 4. No explanation of relevance is necessary for documents in the English language (see reply to Comments 67 in the preamble to the final rules; 1135 OG 13 at 20).

[ ] 5. Other information being provided for the examiner's consideration follows:

[A/An _____ Search Report, dated_____, which issued during the prosecution of _____Application No._____ which corresponds to the present application.]

6. In accordance with 37 C.F.R. 1.97(g) and (h), the filing of this IDS should not be construed as a representation that a search has been made or that information cited is, or is considered to be, material to patentability as defined in §1.56 (b), or that any cited document listed or attached is (or constitutes) prior art. Unless other-wise indicated, the date of publication indicated for an item is taken from the face of the item and Applicant reserves the right to prove that the date of publication is in fact different.

Early and favorable consideration is earnestly solicited.

The Commissioner is authorized to charge any deficiency of up to $300.00 or credit any excess in this fee to Deposit Account No. 04-0100.

Dated: November 14, 2006

Respectfully submitted,

By_____

S. Peter Ludwig
Registration No.: 25,351
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P.O. Box 5257
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(212) 527-7701 (Fax)
Attorneys/Agents For Applicant

PTO/SB/08A/B (09-06)
Approved for use through 03/31/2007. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 1 of 2

Complete if Known	
Application Number	11/279,045-Conf. #7423
Filing Date	April 7, 2006
First Named Inventor	David Zelig
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	06727/0204293-US0

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	AA*	US-5,540,730-B1	07-30-1996	Terry, Jr.	
	AB*	US-5,188,104-B1	02-23-1993	Wernicke	
	AC*	US-5,263,480-B1	11-23-1993	Wernicke	
	AD*	US-5,571,150-B1	11-05-1996	Wernicke	
	AE*	US-4,702,254-B1	10-27-1987	Zabara	
	AF*	US-4,867,164-B1	09-19-1989	Zabara	
	AG*	US-5,025,807-B1	06-25-1991	Zabara	
	AH*	US-6,205,359-B1	03-20-2001	Boveja	
	AI*	US-5,205,285-B1	04-27-1993	Baker, Jr.	
	AJ*	US-5,299,569-B1	04-05-1994	Wernicke	
	AK*	US-5,335,657-B1	08-09-1994	Terry, Jr.	
	AL*	US-5,707,400-B1	01-13-1998	Terry, Jr.	
	AM*	US-5,282,468-B1	02-01-1994	Klepinski	
	AN*	US-4,628,942-B1	12/1986	Sweeney et al.	
	AO*	US-4,535,785-B1	08-20-1985	van den Honert	
	AP*	US-4,602,624-B1	07/1986	Naples et al.	
	AQ*	US-5,199,430-B1	04-06-1993	Fang	
	AR*	US-5,215,086-B1	06-01-1993	Terry, Jr.	
	AS*	US-5,755,750-B1	05-26-1998	Petruska	
	AT*	US-4,649,936-B1	03-17-1987	Ungar	
	AU*	US-4,608,985-B1	09-02-1986	Crish	
	AV*	US-5,423,872-B1	06-13-1995	Cigaina	
	AW*	US-5,716,385-B1	02-10-1998	Mittal	
	AX*	US-6,097,984-B1	08-01-2000	Douglas	
	AY*	US-6,104,955-B1	08-15-2000	Bourgeois	
	AZ*	US-6,091,992	07-18-2000	Bourgeois et al.	
	AA1*	US-5,836,994-B1	11-17-1998	Bourgeois	
	AB1*	US-6,026,326-B1	02-15-2000	Bardy	
	AC1*	US-6,083,249	07-04-2000	Familoni	
	AD1*	US-5,690,691-B1	11/1997	Chen et al.	
	AE1*	US-5,292,344-B1	03-08-1994	Douglas	
	AF1*	US-3,411,507-B1	11-19-1968	Wingrove	
	AG1*	US-4,962,751-B1	10-16-1990	Krauter	
	AH1*	US-4,739,764-B1	04/1988	Lue et al.	
	AI1*	US-4,573,481-B1	03-04-1986	Bullara	
	AJ1*	US-5,540,734-B1	07-30-1996	Zabara	
	AK1*	US-20030103449-A1	06-05-2003	Barsheshet et al.	
	AL1*	US-6,339,595	01-15-2002	Rekhter et al.	
	AM1*	US-6,205,488	03-20-2001	Casey et al.	
	AN1*	US-6,765,921	07-20-2004	Stacey et al.	
	AO1*	US-6,628,624	09-30-2003	Mahajan et al.	
	AP1*	US-20040202171-A1	07-04-2006	Hama	
	AQ1*	US-6,886,043	04-26-2005	Mauger et al.	
	AR1*	US-20020176450-A1	11-28-2002	Kong et al.	
	AS1*	US-6,778,496	08-17-2004	Meempat et al.	

Examiner Signature		Date Considered	

00915253.doc

PTO/SB/08A/B (09-06)
Approved for use through 03/31/2007. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 2 of 2

Complete if Known	
Application Number	11/279,045-Conf. #7423
Filing Date	April 7, 2006
First Named Inventor	David Zelig
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	06727/0204293-US0

	AT1*	US-6,604,136	08-05-2003	Chang et al.	
	AU1*	US-6,275,493	08-14-2001	Morris et al.	
	AV1*	US-6,760,775	07-06-2004	Anerousis et al.	
	AW1*	US-6,304,575	10-16-2001	Carroll et al.	
	AX1*	US-6,466,985	10-15-2002	Goyal et al.	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document: Country Code[3]-Number[4]-Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
	BA	WO-01/10375-A2	02-15-2001	Impulse Dynamics Nv et al.		

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NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
	CA	MAMAKOS, et al., " A Method for Transmitting PPP Over Ethernet (PPPoE)", in IETF RFC 2516, February 1999 pg. 1-15.	
	CB	ROSEN, et al., "Multiprotocol Label Switching Architecture" in Request for Comments (RFC) 3031 of the Internet Engineering Task Force (IETF), January 2001 pg. 1-54. Also available at www.ietf.org/rfc.html.	
	CC	TSIANG, D. et al., "The Cisco SRP MAC Layer Protocol" in Request for Comments (RFC) 2892 of the Internet Engineering Task Force (IETF), August 2000 pg. 1-46.	
	CD	MALKIN, G. "RIP version 2", RFC 2453, November 1998, pg. 1-39	
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	CJ	Clause 43 of IEEE Standard 802.3a, "Carrier Sense Multiple Access Method with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications" 2002 Edition.	

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(54) Title: INHIBITION OF ACTION POTENTIALS

(57) Abstract: Apparatus (20) for modifying the electrical behavior of nervous tissue (30) in a human subject is provided. At least one inhibiting electrode (22) is placed in a vicinity of the subject's nervous tissue, and a control unit (40) drives the at least one inhibiting electrode to apply electrical energy to the nervous tissue to inhibit propagation therein of an action potential. Preferably, application of the electrical energy substantially does not cause generation of an action potential in at least a portion of the nervous tissue.

INHIBITION OF ACTION POTENTIALS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation-in-part of US Patent Application 09/368,124, filed August 4, 1999, entitled, "Inhibition of action potentials," which is assigned to the assignee of the present patent application and is incorporated herein by reference.

FIELD OF THE INVENTION

The present invention relates generally to control of electrophysiological behavior, and specifically to electrically-mediated inhibition of action potentials.

BACKGROUND OF THE INVENTION

In the central and peripheral nervous systems, action potentials are generated by nerve cells and transmitted by axons. In the normal physiological state, the presence, absence, and repetition rate of an action potential may convey useful information from a source nerve cell to a target nerve cell. In the human brain, the well-orchestrated interactions of approximately one hundred billion neurons, each neuron connected to an average of ten thousand other neurons, enables the sophisticated command, control and communication abilities associated with humans. In the peripheral nervous system, afferent nerve fibers transmit action potentials, which are responsive to the outputs of sensory nerves, while efferent nerve fibers control muscle tissue and glands.

In the pathological state, action potentials are transmitted which do not serve a useful purpose, and may cause discomfort, pain, or death. Pain, in many cases, has a positive effect, because it prevents the person in pain from further injuring damaged tissue. However, various types of pain, such as chronic low back or wrist pain, and phantom limb pain following amputation, do not necessarily help the person's overall condition, and can cause severe distress.

During various medical procedures, an anesthetic is given to a patient to block the perception of pain that would otherwise be felt. In local anesthesia, the transmission of nerve signals to the brain is inhibited, while in general anesthesia, a state of unconsciousness is induced. Both local and general anesthesia have complications, which

may include allergic reactions, liver failure, kidney damage, bleeding, blood clots, loss of limb function, paralysis, and, occasionally, death.

Defibrillation of a fibrillating heart is a life-saving treatment, in which the heart is stimulated with a high voltage that restores standard cardiac rhythm. It is a painful procedure, and sometimes unnecessarily painful when an implanted automatic defibrillator fires inappropriately.

Epilepsy is a chronic disorder characterized by paroxysmal brain dysfunction due to excessive neuronal discharge, and is usually associated with some alteration of consciousness. Drug treatments for epilepsy are widespread, but are generally viewed as not fully satisfactory. Surgical treatments often involve the removal of brain tissue, and pose significant risk to the patient.

In an article entitled, "Vagus nerve stimulator," in *Medical Sciences Bulletin,* September, 1997, which is incorporated herein by reference, a method of vagus nerve stimulation is described for treating seizures. The article notes two processes which may be initiated by the stimulation: changing of electrical thresholds and/or decreasing of the quantity of stimulatory neurotransmitters. Side effects reported with use of the stimulation technique include the induction of seizures in 20% of the treated patients.

An article by Shoogo Ueno, entitled "Biomagnetic approaches to studying the brain," in *IEEE Engineering in Medicine and Biology*, May/June, 1999, p. 108, which is incorporated herein by reference, describes a technique of transcranial magnetic stimulation (TMS). Using a pair of opposing pulsed magnetic fields, produced by a figure-eight coil, local eddy currents are induced in the brain near a target location. The technique has been shown to achieve stimulation of neurons at the target location by a vectorial electrical current to a resolution of 5 mm.

In an article entitled, "A technique for anodally blocking large nerve fibres through chronically implanted electrodes," by Brindley and Craggs, in *Journal of Neurology, Neurosurgery, and Psychiatry,* 1980, **43,** pp. 1083 - 1090, which is incorporated herein by reference, a method for applying electrical signals between a cathode and an anode on a spinal root of a primate is described. According to the authors, "...electrical pulses sent through these electrodes can stimulate nerve fibres close to the cathode and block the

resulting impulses close to the anode. We show (1) how anodal break excitation and excitation of fibres ... can be avoided; ... (3) that in a root containing somatic motor fibres and parasympathetic fibres, all somatic motor fibres can be blocked and most or all parasympathetic fibres excited but not blocked; ... (5) how block can be achieved in one direction only along a root; [and] (6) that a peripheral nerve can be blocked by the same techniques."

An article entitled, "Prevention of action potentials during extracellular electrical stimulation of long duration," by Zhou et al., *Journal of Cardiovascular Electrophysiology,* July, 1997, **8,** pp. 779-789, which is incorporated herein by reference, describes the application of hyperpolarizing and depolarizing shocks to papillary muscle of guinea pigs in order to prevent action potentials.

In an article by Burke and Ginsborg, entitled "The electrical properties of the slow muscle fibre membrane," *Journal of Physiology (London),* 1956, **132,** pp. 586-598, which is incorporated herein by reference, a method is described for avoiding anode break excitation (induction of action potentials after anodal block), by making anodal block pulses cease gradually instead of suddenly. They describe removing the anodal block by exponentially decaying the original anodal block current, and setting a time constant of the exponential decay to about 30 ms.

An article by Accornero et al., entitled "Selective activation of peripheral nerve fibre groups of different diameter by triangular shaped stimulus pulses," *Journal of Physiological (London),* 1977, **273,** pp. 539-560, which is incorporated herein by reference, describes a method for avoiding anode break excitation by applying anodal block pulses which are exponentially decayed upon removal with a range of time constants. Accornero refers to the rapid onset and the exponential decay of the anodal block pulses as having a "triangular" shape.

An article entitled, "Surface anodal stimulation of human peripheral nerves," by Winkler and Stalberg, *Experimental Brain Research,* 1988, **73,** pp. 481-488, which is incorporated herein by reference, describes the use of bipolar stimulation of nerves with short square pulses so as to elicit action potentials.

In an article by Petrofsky entitled, "Microprocessor controlled stimulation in paralyzed muscle," *IEEE NAECON Record,* December, 1979, pp. 198-210, which is incorporated herein by reference, a method is described for applying anodal block to a muscle and for sensing muscle fatigue.

US Patent 5,755,750 to Petruska et al., which is incorporated herein by reference, describes a method for selectively inhibiting activity in a nerve by applying direct current between an anode and a cathode attached to the nerve.

US Patent 5,792,186 to Rise, which is incorporated herein by reference, describes a technique for stimulating the brain to reduce the effects of neurodegenerative disorders.

US Patent 5,978,702 to Ward et al., which is incorporated herein by reference, describes techniques using one or more drugs and electrical stimulation, in order to treating a neurological disorder such as epilepsy.

US Patent 5,312,321, to Holcomb, which is incorporated herein by reference, describes a method for suppressing nerve cell action potentials using an octapolar magnetic device which generates a magnetic field near a mammalian sensory neuron.

US Patents 4,784,142 to Liss et al., 5,018,525 to Konobevtsev et al., and 5,324,317 to Reiss, which are incorporated herein by reference, describe methods for electrically stimulating a first set of nerves in order to mask the action of a second set of nerves, so as to reduce a sensation of pain.

US Patent 5,203,326 to Collins, which is incorporated herein by reference, describes an antiarrhythmic pacemaker, which stimulates the heart and also stimulates nerves or ganglia in the autonomic nervous system in order to treat the arrhythmia.

PCT Patent Publication WO 97/25098, and its corresponding national phase application US 09/101,723, entitled, "Electrical muscle controller," which are assigned to the assignee of the present patent application and are incorporated herein by reference, describe methods for modifying the force of contraction of at least a portion of a heart chamber by applying a non-excitatory electrical signal to the heart at a delay after electrical activation of the portion. The signal may be applied in combination with a pacemaker or defibrillator, which also applies an excitatory signal (i.e., pacing or defibrillation pulses) to the heart muscle. This signal can reduce or eliminate action potentials in cardiac tissue.

PCT Patent Publication WO 98/10832, and its corresponding national phase application US 09/254,900, entitled, "Cardiac output enhanced pacemaker," which are assigned to the assignee of the present patent application and are incorporated herein by reference, describe a pacemaker that modifies cardiac output. This pacemaker applies both excitatory (pacing) and non-excitatory electrical signals to the heart. By applying non-excitatory signals of suitable strength, appropriately timed with respect to the heart's electrical activation, the contraction of selected segments of the heart muscle can be increased or decreased.

SUMMARY OF THE INVENTION

It is an object of some aspects of the present invention to provide apparatus and methods for controlling the electrical behavior of nervous tissue.

It is a further object of some aspects of the present invention to provide apparatus and methods for inhibiting the propagation of action potentials in nervous tissue.

It is still a further object of some aspects of the present invention to provide apparatus and methods for modulating the output frequency of a nerve cell.

It is yet a further object of some aspects of the present invention to provide improved apparatus and methods for treatment of epilepsy and other neurological disorders.

In preferred embodiments of the present invention, the electrical behavior of nervous tissue in a human subject is modified by the application of electrical energy to the tissue. An electrical transducer is placed in a vicinity of the nervous tissue. A control unit drives the transducer to apply the energy to the tissue in order to inhibit propagation therein of an action potential. The control unit preferably configures the shape of the waveform so as to reduce (a) the likelihood of the generation of an action potential when the electrical energy is removed, and/or (b) the amount of energy applied to the tissue during a designated time period.

Preferably, the transducer comprises one or more inhibiting electrodes, but the principles of the present invention may be applied using transducers of other types, such as remote electromagnetic transducers, as in the TMS technique described in the Background of the Invention.

Typically, the nervous tissue includes a target set of nerve cells and/or axons in which it is desired to inhibit the development and propagation of action potentials, in order to prevent or palliate the effects of a neurological disorder or to control pain, for example. Preferably, an operator of the control unit positions the inhibiting electrodes so that the electrical energy is applied to directly affect the behavior of the target set of nerve cells and/or axons, not necessarily having any effect on other nerve cells and/or axons not in the target set. By virtue of focusing the energy directly on the tissue of interest, this approach is different from, and, it is believed, superior to, methods known in the art such as those described in some of the above-cited patents, in which a first set of nerves is stimulated in order to mask the signals of a second set of nerves. Typically, although not necessarily, application of the electrical energy as provided by embodiments of the present invention has an inhibiting effect on the target set of nerve cells and/or axons and does not cause the generation of action potentials in nervous tissue in a vicinity thereof. In the context of the present patent application and in the claims, the term "nervous tissue" will be understood generally to apply to substantially any type of excitable tissue, as appropriate, including neurons and axons, unless there is an indication to the contrary.

Preferably, the inhibiting electrodes are applied to the tissue, and the applied electrical energy is configured so as to produce a state of "anodic block," as is well known in the art. Apparatus and techniques described in the above-cited articles and patents which relate to the induction of anodic block (in particular, the article by Brindley and Craggs), may be adapted for use on human nervous tissue as described herein, *mutatis mutandis*. However, these embodiments of the present invention preferably configure the shape of the applied electrical energy so as to achieve a greater reduction of the likelihood of generation of action potentials than is obtained using the methods described in these articles and patents. Alternatively or additionally, the applied waveform is configured so as to reduce the amount of applied energy, while yielding the same or a greater level of action potential inhibition. Typically, but not necessarily, the enhanced performance achieved using these embodiments of the present invention is obtained by providing (a) an inhibition period, in which a cathode and an anode are driven to inject current into the tissue at a generally-constant rate, and (b) a signal-removal period, following the inhibition period, during which the rate of current injection is reduced, first slowly, and then more

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rapidly, until a smaller amount of current of substantially no more current is injected into the nerve. Prior art signal-removal periods, by contrast, use either a constant rate for reducing the applied current, or a rate which begins quickly and is then reduced as the current approaches zero (i.e., an exponential decrease).

As appropriate, the electrical energy applied by the inhibiting electrodes may include, alternatively or additionally, a series of pulses, each pulse preferably having a direct current (DC) component. Further alternatively or additionally, the electrical energy applied through the inhibiting electrodes includes a varying component. Typically, during an initial calibration period, different parameters of the electrical energy are varied according to an optimization procedure, to produce a desired inhibition of electrical activity in the target nervous tissue.

Preferably, an electrical sensor comprising a set of one or more sensing electrodes is also placed in a vicinity of the nervous tissue, to detect electrical activity of the tissue, and to transmit a signal responsive thereto to the control unit. The control unit typically modifies a timing parameter or other parameter of the energy application responsive to the signal. For some applications, e.g., pain reduction, the control unit evaluates the signal from the electrical sensor in order to determine when action potentials corresponding to pain signals are being transmitted in the nervous tissue, and, responsive to such a determination, drives the inhibiting electrodes to apply energy to the tissue which substantially or completely inhibits these action potentials. It is noted that applying the energy responsive to sensing, as described herein, is advantageous both because it reduces the energy expended during use of the apparatus (which is typically, but not necessarily, powered by batteries), and because it is believed to be beneficial to the stimulated nervous tissue to generally reduce the amount of energy applied thereto, where possible.

Optionally, the control unit controls the level of action potential inhibition so as to allow the human subject to sense a "useful" level of discomfort, instead of the pain which would be experienced without any action potential inhibition. Depending on the particular clinical indication, the energy may be applied to reduce or eliminate acute pain, such as during a defibrillation or a surgical procedure, or to reduce or eliminate chronic pain, such as low back pain, wrist pain, or phantom limb pain. In a preferred embodiment, use of

pain-reducing aspects of the present invention during a medical procedure permits a desired reduction in the quantity of anesthesia delivered to the subject.

Alternatively or additionally, a pacing electrode is placed in a vicinity of the nervous tissue and conveys a pacing signal generated by the control unit to the nervous tissue. The term "pacing" as used in the context of the present patent application and in the claims refers to signal pulses that repeat over time at a generally constant repetition rate. and does not specifically refer to pacing of the heart.

For some applications, a series of action potentials which repeat at a first rate are detected by the electrical sensor and are inhibited by energy from the inhibiting electrodes, and pacing pulses at a second rate are applied to the nervous tissue. When the second rate is slower than the first rate, this technique can be advantageously applied to subjects with disorders such as cerebral palsy or Parkinson's disease, so as to control muscle tremors.

In some of these preferred embodiments, the desired inhibition of the electrical activity produces a reduction in the contraction force or rate of a skeletal or smooth muscle. In one such embodiment, the inhibition is used to modulate muscle tone so as to treat degenerative diseases, such as cerebral palsy and Parkinson's disease, which are characterized by abnormal muscle contraction.

Alternatively or additionally, the excessive neuronal discharge associated with epilepsy is controlled by applying the electrical energy at or near a focus of the pathological electrical activity in the brain.

In some preferred embodiments of the present invention, a modulating electrode driven by the control unit applies an electrical modulation signal to one or more nerve cells. so as to modulate an output frequency thereof. The modulation signal is typically applied separately from the electrical energy that inhibits action potentials as described hereinabove. Preferred applications of these embodiments include reducing the subject's breathing rate or heart rate. Typically, the modulation signal comprises a pacing signal, which changes the output frequency of the paced nerve cells. Alternatively or additionally, the modulation signal comprises a blocking component, which inhibits stimulation of the nerve cell by an action potential or other electrophysiological signal. In one such preferred

embodiment, the modulation signal is used to modulate muscle tone, for treating disorders such as cerebral palsy.

There is therefore provided, in accordance with a preferred embodiment of the present invention, apparatus for modifying the electrical behavior of nervous tissue in a human subject, including:

an electrical energy sensing transducer, adapted to be placed in a first vicinity of the nervous tissue and to generate a signal responsive to electrical activity of the tissue;

an electrical energy application transducer, adapted to be placed in a second vicinity of the nervous tissue; and

a control unit, adapted to receive the signal and, responsive thereto, to drive the application transducer to apply electrical energy to the nervous tissue to inhibit propagation therein of action potentials.

Preferably, the control unit is adapted to configure a characteristic of the application of the energy so as to substantially not cause generation of an action potential in at least a portion of the nervous tissue.

In a preferred embodiment, the control unit is adapted to drive the application transducer to apply direct current and/or alternating current.

For some applications, the control unit is adapted to drive the application transducer to apply the electrical energy, so as to inhibit contraction of a skeletal and/or smooth muscle of the subject.

Preferably, the electrical energy application transducer includes one or more electrodes, which are adapted to be applied to the body of the subject. Further preferably, the electrical energy sensing transducer includes one or more electrodes, which are adapted to be applied to the body of the subject.

For some applications, the electrical energy application transducer includes a cathode and an anode, adapted to be placed at respective locations on the nervous tissue, and wherein the control unit is adapted to drive an electrical current between the cathode and the anode so as to induce anodal block in the tissue. Preferably, the control unit is adapted to reduce a level of the current at a first rate during a first current-reduction period, and, during a second current-reduction period, to reduce the level of the current at

a second rate, which is faster than the first rate. Further preferably, the control unit is adapted to reduce the level of the current at a series of three or more rates, substantially each of the rates having an equal or greater magnitude than a previous one of the rates.

In a preferred embodiment, the control unit is adapted to drive the application transducer to apply the electrical energy to the nervous tissue responsive to a level of the electrical activity. For example, the control unit may be adapted to drive the application transducer to apply the electrical energy to the nervous tissue responsive to a rate of action potential propagation in the tissue.

For some applications, the nervous tissue includes sympathetic nervous tissue, and the control unit is adapted to drive the application transducer to apply the electrical energy to the sympathetic nervous tissue so as to engender a parasympathetic response. Alternatively, the nervous tissue includes parasympathetic nervous tissue, and the control unit is adapted to drive the application transducer to apply the electrical energy to the parasympathetic nervous tissue so as to engender a sympathetic response.

In a preferred embodiment, the control unit is adapted to modify a parameter of the application of the energy responsive to the signal generated by the sensing transducer. For example, the control unit may be adapted to modify a timing parameter of the application of the energy responsive to the signal generated by the sensing transducer.

In a preferred embodiment, the nervous tissue includes a nerve, and the sensing transducer includes a proximal and a distal sensing transducer, adapted to be placed at respective proximal and distal sites with respect to a location in the nerve from which a sensory nervous signal is intermittently propagated. Preferably, the control unit is adapted to receive respective proximal signals and distal signals from the proximal and distal sensing transducers, and to drive the application transducer to apply the electrical energy responsive to the proximal and distal signals. Further preferably, the proximal and distal sensing transducers are adapted to be placed at respective proximal and distal sites with respect to a location in the nerve from which an undesired pain signal is intermittently propagated, and the control unit is adapted to receive respective proximal pain-indication signals and distal pain-indication signals from the proximal and distal sensing transducers. Still further preferably, the control unit is adapted to drive the application transducer to

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apply the electrical energy responsive to the proximal and distal pain-indication signals. Typically, but not necessarily, the control unit is adapted to substantially withhold driving the application transducer to apply the electrical energy when the distal sensing transducer generates the distal pain-indication signals.

In a preferred embodiment, the sensing transducer includes a plurality of sensing electrodes, which are adapted to sense the action potentials in the tissue before the control unit drives the application transducer to apply the electrical energy to inhibit the action potentials. Preferably, the apparatus includes at least one pacing electrode, and the control unit is adapted to drive the pacing electrode to pace the tissue after one of the action potentials is sensed.

For some applications, the control unit is adapted to drive the application transducer to apply the electrical energy so as to reduce a sensation perceived by the subject. For example, the control unit may be adapted to drive the application transducer to apply the electrical energy so as to reduce a pain sensation perceived by the subject, such as a chronic pain sensation, an acute pain sensation a pain sensation perceived by the subject due to a defibrillation procedure, or a pain sensation perceived by the subject due to a surgical procedure. In this latter case, the control unit is typically, but not necessarily, adapted to drive the application transducer to apply the electrical energy so as to allow a reduction of a quantity of anesthesia normally associated with the surgical procedure.

In a preferred embodiment, the apparatus includes at least one pacing electrode, adapted to be placed in a third vicinity of the nervous tissue. The control unit is preferably adapted to drive the at least one pacing electrode to apply a pacing signal to the nervous tissue. For example, the control unit may be adapted (a) to determine responsive to the signal whether a first rate of electrical activity of the nervous tissue is above a threshold rate, (b) to drive the application transducer to apply the electrical energy responsive to determining that the activity is above the threshold rate, so as to inhibit the propagation therein of the action potentials, and (c) to drive the at least one pacing electrode to apply the pacing signal so as to engender a second rate of electrical activity of the nervous tissue which is below the threshold rate.

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Typically, the control unit is adapted to determine the first level of electrical activity responsive to a rate of action potential propagation in the nervous tissue. Alternatively or additionally, the control unit is adapted to drive the at least one pacing electrode to apply the pacing signal so as to increase a level of muscle tone of a muscle whose behavior is modulated by the nervous tissue. Further alternatively or additionally, the control unit is adapted to drive the at least one pacing electrode to apply the pacing signal so as to improve functioning of a muscle.

There is further provided, in accordance with a preferred embodiment of the present invention, apparatus for controlling epilepsy in a human subject, including:

at least one electrical energy transducer, adapted to be coupled to a brain of the subject; and

a control unit, which drives the at least one transducer to apply electrical energy to a portion of the brain to inhibit propagation therein of an action potential related to the epilepsy, so as to control the epilepsy.

Preferably, the at least one electrical energy transducer includes a cathode and an anode, and the control unit is adapted to drive an electrical current between the cathode and the anode so as to induce anodal block in the portion of the brain.

Further preferably, the control unit is adapted to configure the application of the electrical energy so as to substantially not cause generation of an action potential in at least a sub-portion of the portion of the brain.

In a preferred embodiment, the apparatus includes at least one electrical sensor, adapted to be placed in a vicinity of the portion of the brain to sense electrical activity of the portion of the brain, and adapted to convey a signal to the control unit responsive to the sensing. Preferably, the control unit is adapted to set a parameter of the application of the energy applied by the electrical energy transducer responsive to the signal.

Alternatively or additionally, the apparatus includes at least one pacing transducer, adapted to be placed in a vicinity of the portion of the brain, and the control unit is adapted to drive the at least one pacing transducer to apply a pacing signal to the portion of the brain.

There is still further provided, in accordance with a preferred embodiment of the present invention, apparatus for modulating an output of a nerve cell in a human subject, including:

a modulating transducer, adapted to be electrically coupled to the nerve cell; and

a control unit, adapted to drive the modulating transducer to apply electrical energy to the nerve cell so as to modulate an output frequency thereof.

In a preferred embodiment, the control unit is adapted to drive the transducer to apply a pacing signal to the nerve cell.

Alternatively or additionally, the control unit is adapted to configure the electrical energy to include a blocking component, which inhibits an action potential from stimulating the nerve cell.

For some applications, the control unit is adapted to drive the transducer to apply the electrical energy so as to modify a breathing rate and/or a heart rate of the subject.

Typically, but not necessarily, the control unit is adapted to configure the electrical energy so as to substantially not cause generation of an action potential in a vicinity of the nerve cell.

Preferably, the modulating transducer includes an electrode, which is adapted to be applied to the body of the subject. In addition, the apparatus preferably includes at least one electrical sensor, coupled to the control unit, which is adapted to be placed in a vicinity of the nerve cell and to sense electrical activity of the nerve cell. The control unit is preferably adapted to set a parameter of the application of the energy responsive to the sensed electrical activity.

There is yet further provided, in accordance with a preferred embodiment of the present invention, apparatus for modulating a characteristic of muscle tissue of a human subject, including:

a pacing transducer, adapted to be applied in a first vicinity of nervous tissue that modulates behavior of the muscle tissue;

an inhibiting transducer, adapted to be applied in a second vicinity of the nervous tissue; and

a control unit, adapted to drive the inhibiting transducer to apply an inhibiting signal to the nervous tissue so as to inhibit propagation of an action potential in the tissue, and adapted to drive the pacing transducer to apply a pacing signal, so as to induce propagation of an action potential in the tissue, so as to modulate the characteristic of the muscle tissue.

Preferably, the inhibiting transducer includes a cathode and an anode, and the control unit is adapted to drive an electrical current between the cathode and the anode so as to induce anodal block in the nervous tissue. In a preferred embodiment, the control unit is adapted to drive the transducers to apply the signals so as to modify tone of the muscle tissue. Alternatively or additionally, the control unit is adapted to drive the transducers to apply the signals so as to modify contraction strength of the muscle tissue. Still further alternatively or additionally, the control unit is adapted to drive the transducers to apply the signals so as to treat a dysfunction of the muscle tissue.

In a preferred embodiment, the apparatus includes a sensing transducer, adapted to sense a first plurality of action potentials having a first rate, and the control unit is adapted to drive the inhibiting transducer to apply the inhibiting signal so as to inhibit the first plurality of action potentials. In addition, the control unit is preferably adapted to drive the pacing transducer to apply the pacing signal so as to induce propagation of a second plurality of action potentials having a second rate. As appropriate, the control unit may be adapted to set the second rate to be lower than the first rate or higher than the first rate.

There is also provided, in accordance with a preferred embodiment of the present invention, a method for modifying the electrical behavior of nervous tissue in a human subject, including:

sensing electrical activity of the nervous tissue; and

applying electrical energy to the nervous tissue, responsive to the sensing, so as to inhibit propagation in the tissue of an action potential.

Typically, but not necessarily, applying the electrical energy includes injecting current into the tissue so as to induce anodal block in the tissue.

In a preferred embodiment, applying the electrical energy includes applying the energy so as to modify a sensation perceived by the subject.

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Preferably, the method includes sensing an action potential in the tissue and pacing the tissue responsive to the sensing. Further preferably, applying electrical energy to the nervous tissue includes applying energy to inhibit propagation of an action potential after the tissue is paced.

In a preferred embodiment, the method includes sensing further electrical activity of the tissue after applying the energy to inhibit the propagation, in order to verify that inhibition has taken place.

There is additionally provided, in accordance with a preferred embodiment of the present invention, a method for modulating a characteristic of muscle tissue of a human subject, including:

applying inhibitory electrical energy to nervous tissue of the subject, so as to inhibit propagation of an action potential in the nervous tissue; and

applying a pacing signal to the nervous tissue, so as to modulate the characteristic of the muscle tissue.

There is still additionally provided, in accordance with a preferred embodiment of the present invention, a method for controlling epilepsy in a human subject, including applying electrical energy to a portion of a brain of the subject to inhibit propagation therein of an action potential related to the epilepsy, so as to control the epilepsy.

There is yet additionally provided, in accordance with a preferred embodiment of the present invention, a method for modulating an output of a nerve cell in a human subject, including applying electrical energy to the nerve cell so as to modulate an output frequency thereof. Optionally, applying the electrical energy includes applying electrical energy including a blocking component, so as to inhibit an action potential from stimulating the nerve cell.

The present invention will be more fully understood from the following detailed description of the preferred embodiments thereof, taken together with the drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a simplified pictorial illustration showing apparatus for control of electrophysiological activity, in accordance with a preferred embodiment of the present invention;

Fig. 2 is a schematic block diagram showing components of the apparatus of Fig. 1, in accordance with a preferred embodiment of the present invention;

Fig. 3 is a simplified pictorial illustration showing the apparatus of Fig. 1 configured for use in a typical application, in accordance with a preferred embodiment of the present invention; and

Fig. 4 is a graph showing a signal application protocol for application by the apparatus shown in Fig. 1, in accordance with a preferred embodiment of the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Fig. 1 is a simplified pictorial illustration showing apparatus 20 for control of electrophysiological activity of nervous tissue 30 of a human subject, in accordance with a preferred embodiment of the present invention. Apparatus 20 comprises a control unit 40, coupled to control one or more inhibiting electrodes 22 placed in a vicinity of the nervous tissue. The inhibiting electrodes apply electrical energy to the tissue in order to inhibit development and/or propagation therein of an action potential. In some embodiments, the applied electrical energy has characteristics, including amplitude, frequency, and shape, similar to corresponding characteristics of non-excitatory signals described in the above-cited PCT patent publications and their corresponding US patent applications. Alternatively or additionally, some embodiments of the present invention utilize methods and apparatus described in US Patent Application 09/368,124, entitled, "Inhibition of action potentials," which is assigned to the assignee of the present patent application and is incorporated herein by reference.

Preferably, one or more local sense electrodes 24 are placed on or near the nervous tissue. Electrodes 24 typically comprise paired differential electrodes 24A and 24B, as shown in the figure. The local sense electrodes are preferably coupled to detect electrical activity of the tissue and convey a signal responsive thereto to control unit 40, which may subsequently modify the energy conveyed through inhibiting electrodes 22. For some

applications, one or more pacing electrodes 26 are placed in a vicinity of the nervous tissue to convey a pacing signal to the nervous tissue, as described hereinbelow.

In the preferred embodiment shown in Fig. 1, local sense electrodes 24 are placed both "upstream" and "downstream" of inhibiting electrodes 22 (with respect to the direction of propagation of action potentials in tissue 30). In this manner, the upstream sense electrodes can provide an indication of action potentials propagating in the tissue, responsive to which apparatus 20 applies energy to electrodes 22 and/or 26. Preferably, the downstream sense electrodes provide feedback as to the effectiveness of the applied energy in inhibiting the action potentials.

In a preferred application, a series of action potentials which repeat at a first rate are detected by sensing electrodes 24A, and are inhibited by energy applied by inhibiting electrodes 22. Optionally, control unit 40 drives pacing electrodes 26 to apply pacing pulses at a second rate which is lower than the first rate. This technique is advantageously applied, for example, in tissue which innervates a muscle that frequently demonstrates tremors, such as in subjects with cerebral palsy or Parkinson's disease.

Although preferred embodiments are described herein with reference to electrodes 22, 24 and 26, it will be understood that transducers of other types, as are known in the art, may also be used to apply electrical energy to tissue 30 and/or to sense electrical activity in the tissue. For example, electromagnetic transducers such as those described in the above-cited article entitled "Biomagnetic approaches to studying the brain" may also be used for this purpose. It is further to be understood that for clarity, various types of electrodes shown in the figures are described as performing distinct functions. However, for some applications, some or all of the electrodes perform a plurality of functions, e.g., inhibiting, sensing, and pacing.

Fig. 2 is a schematic block diagram of control unit 40, in accordance with a preferred embodiment of the present invention. A parameter determination block 42 of the control unit, typically comprising a CPU and an electronic memory (not shown), preferably sets parameters of the electrical energy delivered through one or more signal application electrodes 50 placed in a vicinity of nervous tissue 30. Further preferably, block 42 sets parameters of the pacing signal applied to the tissue through pacing

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electrodes 26. Although signal application electrodes 50 typically comprise inhibiting electrodes 22 (described with reference to Fig. 1), in some embodiments, electrodes 50 alternatively or additionally comprise modulating electrodes, described hereinbelow, which modulate an output frequency of one or more nerve cells.

The parameters set by block 42 typically include magnitude, frequency, DC offset, pulse decay features, and a base wave shape, such as DC, sinusoidal, square, or shaped pulses. Additionally, block 42 preferably selects either a current-delivery mode or a voltage-application mode of energy transfer into nervous tissue 30. A particular preferred signal application protocol is described hereinbelow with reference to Fig. 4.

In regular use, parameter determination block 42 typically receives signals from local sense electrodes 24, responsive to electrical activity of nervous tissue 30. Responsive to the signals, block 42 modifies a timing or other parameter of the electrical energy delivered through electrodes 50, and/or of the pacing signal delivered through electrodes 26. Preferably, an appropriate parameter modification strategy is generated during an initial calibration period of the control unit, described hereinbelow. Alternatively or additionally, a human operator of control unit 40 may utilize operator controls 32 (e.g., a keyboard) to participate in, or override, the determination of parameters by block 42. Further alternatively or additionally, subject controls 34, typically comprising a keypad, wheel, on/off switch, timer, or slide-bar (not shown), permit the subject to give feedback to the control unit, in order to optimize the parameter determination. The subject controls are used to particular advantage in pain-reduction applications of the present invention, as described hereinbelow.

Preferably, the parameters determined by block 42 are conveyed to a signal generation block 44 of control unit 40, which generates, responsive to the parameters, electrical signals that are applied by signal application electrodes 50 and pacing electrodes 26 to nervous tissue 30. Block 44 preferably comprises amplifiers, isolation units, and other standard circuitry known in the art of electrical signal generation for application of signals to the body.

In a preferred embodiment, the desired inhibition of the electrical activity of nervous tissue 30 produces a reduction in the contraction force of a skeletal or smooth

muscle innervated by tissue 30. This may be used, for example, to transiently induce local paralysis during surgery, to control a chronically-recurring spasm or tremor, or to treat muscle-tension headache.

In another preferred embodiment, the excessive neuronal discharge associated with epilepsy is controlled by applying the electrical energy at or near a focus of the pathological electrical activity. Typically, during an initial therapeutic session, a physician determines appropriate locations for placement of electrodes 50, 26, and 24, which are subsequently permanently implanted. Preferably, control unit 40 is portable or implantable, and periodically transmits stored data to an evaluation unit (not shown), to allow the physician to evaluate the success of a particular epilepsy control strategy, and to reprogram parameter determination block 42 if necessary. Optionally, some methods and apparatus described in the above-cited US Patent 5,792,186 to Rise are utilized in practicing this embodiment of the present invention.

For some applications, control unit 40 drives signal application electrodes 50 to apply an inhibition signal so as to reduce a sensation (for example, pain), by eliminating the action potentials or by reducing the rate and/or duration of a series of action potentials which convey the pain sensation. Preferably, the control unit initiates the inhibition signal responsive to signals from local sense electrodes 24 indicative of the onset of a pain sensation (for example, using techniques known in the art and/or as described hereinbelow with reference to Fig. 3). Alternatively or additionally, the inhibition signal is applied responsive to an input through subject controls 34 indicating that the subject is experiencing pain. Depending on the particular application, the energy may be applied to reduce or eliminate acute pain, such as during a defibrillation or a surgical procedure, or to reduce or eliminate chronic pain, such as low back pain, wrist pain, or phantom limb pain. In a preferred embodiment, use of pain-reducing aspects of the present invention during a medical procedure permits a desired reduction in the quantity of anesthesia delivered to the subject.

Typically, during the initial calibration period, different parameters of the applied electrical energy and/or pacing signal are varied according to an optimization procedure, to produce a desired inhibition of electrical activity in nervous tissue 30. Preferably, parameter determination block 42 modifies a characteristic (e.g., timing, magnitude, or

shape) of signals applied through electrodes 50 or 26, and then determines whether a measured response generally improves following the modification. The response may be, for example, an aspect of a force generated in a muscle, a signal from local sense electrodes 24, a characteristic of an electroencephalogram, or an indication of pain perceived by the subject, which is input through subject controls 34. In a series of similar calibration steps, block 42 preferably iteratively modifies characteristics of the signals applied through the electrodes, such that those modifications that improve the response are generally maintained, and modifications that cause it to worsen are typically eliminated or avoided.

For some applications, signal application electrodes 50 comprise one or more modulating electrodes, which apply an electrical modulation signal to nervous tissue 30, so as to modulate an output frequency of one or more nerve cells therein. The modulation signal is typically, but not necessarily, applied at a separate time from, or to the exclusion of, the electrical energy which inhibits action potentials described hereinabove. Preferred applications of this embodiment include, for example, increasing or decreasing the subject's breathing rate or heart rate. Typically, the modulation signal comprises a pacing signal, as described hereinabove, which changes the output frequency of the paced nerve cell(s). Alternatively or additionally, the modulation signal comprises a blocking component, which inhibits stimulation of nerve cells in tissue 30 by some or all nerve cells connected thereto. It is noted that vagus nerve stimulation techniques known in the art *stimulate* the vagus nerve in order to increase its firing rate and to thereby decrease the heart rate, unlike embodiments of the present invention wherein electrical energy is applied to nervous tissue to control action potential generation and/or propagation by means of inhibition and, optionally, pacing. In particular, embodiments of the present invention described in this application enable the application of inhibiting energy to sympathetic nerves, in order to obtain a parasympathetic response (e.g., to reduce respiration rate or heart rate), or, by contrast, the application of inhibiting energy to parasympathetic nerves so as to obtain a sympathetic response (e.g., to increase respiration rate or heart rate).

Fig. 3 is a simplified pictorial illustration showing apparatus 20 in one preferred configuration thereof, in accordance with a preferred embodiment of the present invention.

As shown in the figure, a plurality of electrodes 100, including some or all of the electrodes shown in Fig. 1, are implanted within the body of the subject in a vicinity of, or preferably in contact with, a nerve 70, such as an intercostal nerve. Preferably, but not necessarily, at least some of electrodes 100 are positioned near the spinal column. Control unit 40 is preferably implanted in the subject's body, either in proximity to nerve 70, or at another location within the subject's body, as appropriate. Control unit 40 and electrodes 100 are typically implanted using techniques known in the art for chronic implantation of bioelectrical apparatus. Suitable methods are described, for example, in the above-referenced article by Brindley and Craggs. It will be appreciated that techniques which are useful in the construction and implantation of pacemakers are similarly useful in applying some of the principles of the present invention, *mutatis mutandis*. It is also to be understood that, although Fig. 3 shows control unit 40 and all of electrodes 100 as being implanted in the subject, for some other applications of the invention, the control unit and/or some or all of electrodes 100 may be completely external to the subject. Moreover, for some applications, some or all of the electrodes are passed through the skin of the subject, so as to be positioned in a vicinity of nerve 70.

Electrodes 100 and control unit 40 are typically not implanted when apparatus 20 is designated for usage during a relatively-limited period, such as for pain-relief applications during the first day or several days following a traumatic injury to the chest which, for example, breaks one or more ribs. Implanting the control unit and electrodes, by contrast, is often appropriate during intensive thoracic surgery in which a rib retractor is used, that, without treatment, may cause prolonged intense pain in some patients. Preferably, the implanted apparatus is implanted using techniques which allow for relatively easy removal thereof. For implanted electrodes as well as for non-implanted electrodes, it is advantageous to use these embodiments of the present invention both so as to relieve the subject's pain, and because it is known in the art that patients who experience distress when breathing may adversely modify their respiration pattern, leading to pulmonary collapse. Although thoracic pain relief is a preferred embodiment of the present invention, it is nevertheless to be understood that the principles of the present invention could be applied for non-thoracic pain relief applications, as well as for inhibiting action potentials unrelated to pain signals.

Preferably, electrodes 100 comprise a plurality of local sense electrodes 24, which are positioned at various locations along the length of nerve 70. Control unit 40 is preferably programmed to determine that pain signals are being transmitted through the nerve if the plurality of local sense electrodes detect a wave of action potential propagation moving towards the brain, having a conduction velocity or other aspect which is characteristic of a pain signal. Typically, such a conduction velocity is determined during an initial calibration period of apparatus 20. Alternatively or additionally, the subject is instructed to press a button on subject controls 34 every time pain is present, and algorithms running in control unit 40 (e.g., artificial neural network algorithms) determine characteristics of the signals detected by local sense electrodes 24 that frequently correspond in time to the subject's indications of sensed pain. Responsive to determining that the subject is experiencing pain, control unit 40 drives one or more of electrodes 100 to apply an inhibition signal, so as to transiently reduce or eliminate the propagation of action potentials associated with the pain signal.

For some applications, it is desirable to place electrodes 100 on nerve 70, close to the subject's spinal column (as shown in Fig. 3), so as to suppress pain sensations initiated anywhere in the zone innervated by the nerve. Alternatively, proximal and distal electrodes drawn from electrodes 100 are positioned on nerve 70 near an entry location on the nerve, where pain sensations from a surgical site enter the nerve to be conveyed to the spinal cord and to the brain. In this case, the proximal electrodes are preferably placed on nerve 70 nearer to the spinal column than the entry site, and the distal electrodes are placed on the nerve at a site distal to the entry location. Pain signals which are detected by the proximal electrodes but not by the distal electrodes are preferably suppressed using the techniques described herein, if the subject's physician believes that these pain signals are a result of the surgery and are thus likely to be causing pain without serving a useful purpose. However, pain signals which are detected by both the proximal and the distal electrodes are preferably not suppressed, because they are likely not to be a result of the surgery, and are therefore probably conveying a useful pain signal (e.g., the subject is touching something hot).

Fig. 4 is a graph (not to scale) showing an inhibition signal application protocol for use by apparatus 20, in accordance with a preferred embodiment of the present invention.

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Typically, but not necessarily, local sense electrodes 24 sense the initiation of a pain signal or other bioelectrical signal at a time t_{sense}. At a time t_{on} following t_{sense}, control unit 40 drives one or more of electrodes 22 to inject a direct current of magnitude I_{on} into nervous tissue 30. At a time t_{reduce} subsequent to t_{on}, the control unit causes electrodes 22 to reduce the magnitude of the applied direct current from I_{on} to zero. As shown in the figure, this reduction is initially implemented at a slow rate, and gradually increases to a faster rate until a time t_{off}, when the magnitude of the applied current reaches zero. By contrast, it is noted that prior art anodal block techniques, such as those described in the Background section of the present patent application, typically cause an exponential or linear decay of the applied current.

Preferably, electrodes 22 are positioned using techniques known in the art, such that the application of the current during the time period between t_{on} and t_{reduce} causes anodal block in nervous tissue 30, thereby inhibiting propagation of action potentials in a vicinity of one of electrodes 22 which is acting as an anode. By contrast, one of electrodes 22 which acts as a cathode typically does induce at least one action potential. This action potential propagates towards the anode, but advantageously, generally does not pass the anode because of the applied block. Thus, for applications such as pain relief or muscle control, the cathode-generated action potentials have substantially no negative effect on the subject, because the generated action potentials do not reach the subject's brain or muscles, respectively.

It is known that the initiation of anodal block hyperpolarizes nervous tissue to which the block is applied. As shown in the figure, the membrane voltage V_m moves from a first membrane voltage V_{m1} to a second membrane voltage V_{m2} during the application of the current I_{on}. In addition, it is also known that the threshold voltage V_t at which the nervous tissue would generate an action potential also increases in magnitude (i.e., becomes more negative) with the application of the current. It is to be understood that the response of the nervous tissue shown in the upper graph in Fig. 4 is to be interpreted as a schematic illustration, and not as a representation of measured data.

If the applied current is suddenly removed, then the hyperpolarized membrane typically returns to the original voltage V_{m1} faster than the threshold voltage V_t returns to its original voltage V_{t1}. Under some conditions, this may cause the magnitude of V_m to

be smaller than the magnitude of V_t, thereby initiating an undesired action potential. Prior art techniques, such as those described in the articles and patents listed in the Background section of the present patent application, avoid this phenomenon of "anodal block break excitation" by prolonging the removal of the applied current, such that the magnitude of the threshold voltage V_t is able to decrease in step with the decrease in magnitude of the membrane voltage V_m, thereby generally preventing the generation of an action potential. Typically, these prior art techniques apply an exponential decay to the applied current over a relatively long period.

By contrast, the protocol shown in Fig. 4 utilizes a "concave down" current removal strategy, which is typically of shorter duration than the current-removal periods which are possible using the prior art techniques. The relatively-steep initial decrease in current associated with prior art exponential decay protocols would cause break excitation if the time constant of the decay is too short, because a too-short time constant is essentially equivalent to suddenly removing the applied current. Therefore, the time constant in these prior art techniques is generally relatively long. During this period, more current is injected than is necessary, and therefore more energy is expended than is necessary.

Because the protocol in Fig. 4 utilizes a differently-shaped waveform which bears essentially no resemblance to a sudden removal of current, the inventors believe that it is possible to reduce the duration of the current removal period below that which is possible using the prior art techniques. Advantageously, reducing the time period also generally reduces the total amount of current which is applied during the current removal period, and, therefore, typically achieves one or more of the following:

- an extension of battery life (for those applications in which a battery is used),
- an increase of a repetition rate associated with multiple applications of anodal block, substantially without needing to continually apply current (only one application is shown in Fig. 4),
- a reduction of the adverse effects of polarization, and
- a minimization or essential elimination of any adverse effects in the tissue which might be caused by prior art techniques.

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It will be appreciated by persons skilled in the art that the present invention is not limited to what has been particularly shown and described hereinabove. Rather, the scope of the present invention includes both combinations and subcombinations of the various features described hereinabove and in the above-cited articles, patents, and patent applications, as well as variations and modifications thereof that are not in the prior art, which would occur to persons skilled in the art upon reading the foregoing description.

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CLAIMS

1. Apparatus for modifying the electrical behavior of nervous tissue in a human subject, comprising:

an electrical energy sensing transducer, adapted to be placed in a first vicinity of the nervous tissue and to generate a signal responsive to electrical activity of the tissue;

an electrical energy application transducer, adapted to be placed in a second vicinity of the nervous tissue; and

a control unit, adapted to receive the signal and, responsive thereto, to drive the application transducer to apply electrical energy to the nervous tissue to inhibit propagation therein of action potentials.

2. Apparatus according to claim 1, wherein the control unit is adapted to configure a characteristic of the application of the energy so as to substantially not cause generation of an action potential in at least a portion of the nervous tissue.

3. Apparatus according to claim 1, wherein the control unit is adapted to drive the application transducer to apply direct current.

4. Apparatus according to claim 1, wherein the control unit is adapted to drive the application transducer to apply alternating current.

5. Apparatus according to claim 1, wherein the control unit is adapted to drive the application transducer to apply the electrical energy, so as to inhibit contraction of a skeletal muscle of the subject.

6. Apparatus according to claim 1, wherein the control unit is adapted to drive the application transducer to apply the electrical energy, so as to inhibit contraction of a smooth muscle of the subject.

7. Apparatus according to claim 1, wherein the electrical energy application transducer comprises one or more electrodes, which are adapted to be applied to the body of the subject.

8. Apparatus according to claim 1, wherein the electrical energy sensing transducer comprises one or more electrodes, which are adapted to be applied to the body of the subject.

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9. Apparatus according to claim 1, wherein the control unit is adapted to drive the application transducer to apply the electrical energy to the nervous tissue, the nervous tissue including sympathetic nervous tissue, so as to engender a parasympathetic response.

10. Apparatus according to claim 1, wherein the control unit is adapted to drive the application transducer to apply the electrical energy to the nervous tissue, the nervous tissue including parasympathetic nervous tissue, so as to engender a sympathetic response.

11. Apparatus according to any one of claims 1-10, wherein the electrical energy application transducer comprises a cathode and an anode, adapted to be placed at respective locations on the nervous tissue, and wherein the control unit is adapted to drive an electrical current between the cathode and the anode so as to induce anodal block in the tissue.

12. Apparatus according to claim 11, wherein the control unit is adapted to reduce a level of the current at a first rate during a first current-reduction period, and, during a second current-reduction period, to reduce the level of the current at a second rate, which is faster than the first rate.

13. Apparatus according to claim 12, wherein the control unit is adapted to reduce the level of the current at a series of three or more rates, substantially each of the rates having an equal or greater magnitude than a previous one of the rates.

14. Apparatus according to any one of claims 1-10, wherein the control unit is adapted to drive the application transducer to apply the electrical energy to the nervous tissue responsive to a level of the electrical activity.

15. Apparatus according to claim 14, wherein the control unit is adapted to drive the application transducer to apply the electrical energy to the nervous tissue responsive to a rate of action potential propagation in the tissue.

16. Apparatus according to any one of claims 1-10, wherein the control unit is adapted to modify a parameter of the application of the energy responsive to the signal generated by the sensing transducer.

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17. Apparatus according to claim 16, wherein the control unit is adapted to modify a timing parameter of the application of the energy responsive to the signal generated by the sensing transducer.

18. Apparatus according to any one of claims 1-10, wherein the nervous tissue includes a nerve, wherein the sensing transducer comprises a proximal and a distal sensing transducer, adapted to be placed at respective proximal and distal sites with respect to a location in the nerve from which a sensory nervous signal is intermittently propagated, wherein the control unit is adapted to receive respective proximal signals and distal signals from the proximal and distal sensing transducers, and wherein the control unit is adapted to drive the application transducer to apply the electrical energy responsive to the proximal and distal signals.

19. Apparatus according to any one of claims 1-10, wherein the nervous tissue includes a nerve, wherein the sensing transducer comprises a proximal and a distal sensing transducer, adapted to be placed at respective proximal and distal sites with respect to a location in the nerve from which an undesired pain signal is intermittently propagated, wherein the control unit is adapted to receive respective proximal pain-indication signals and distal pain-indication signals from the proximal and distal sensing transducers, and wherein the control unit is adapted to drive the application transducer to apply the electrical energy responsive to the proximal and distal pain-indication signals.

20. Apparatus according to claim 19, wherein the control unit is adapted to substantially withhold driving the application transducer to apply the electrical energy when the distal sensing transducer generates the distal pain-indication signals.

21. Apparatus according to any one of claims 1-10, wherein the sensing transducer comprises a plurality of sensing electrodes, which are adapted to sense the action potentials in the tissue before the control unit drives the application transducer to apply the electrical energy to inhibit the action potentials.

22. Apparatus according to claim 21, and comprising at least one pacing electrode, wherein the control unit is adapted to drive the pacing electrode to pace the tissue after one of the action potentials is sensed.

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23. Apparatus according to any one of claims 1-10, wherein the control unit is adapted to drive the application transducer to apply the electrical energy so as to reduce a sensation perceived by the subject.

24. Apparatus according to claim 23, wherein the control unit is adapted to drive the application transducer to apply the electrical energy so as to reduce a pain sensation perceived by the subject.

25. Apparatus according to claim 24, wherein the control unit is adapted to drive the application transducer to apply the electrical energy so as to reduce a chronic pain sensation perceived by the subject.

26. Apparatus according to claim 24, wherein the control unit is adapted to drive the application transducer to apply the electrical energy so as to reduce an acute pain sensation perceived by the subject.

27. Apparatus according to claim 24, wherein the control unit is adapted to drive the application transducer to apply the electrical energy so as to reduce a pain sensation perceived by the subject due to a defibrillation procedure.

28. Apparatus according to claim 24, wherein the control unit is adapted to drive the application transducer to apply the electrical energy so as to reduce a pain sensation perceived by the subject due to a surgical procedure.

29. Apparatus according to claim 28, wherein the control unit is adapted to drive the application transducer to apply the electrical energy so as to allow a reduction of a quantity of anesthesia normally associated with the surgical procedure.

30. Apparatus according to any one of claims 1-10, and comprising at least one pacing electrode, adapted to be placed in a third vicinity of the nervous tissue, wherein the control unit is adapted to drive the at least one pacing electrode to apply a pacing signal to the nervous tissue.

31. Apparatus according to claim 30, wherein the control unit is adapted (a) to determine responsive to the signal whether a first rate of electrical activity of the nervous tissue is above a threshold rate, (b) to drive the application transducer to apply the electrical energy responsive to determining that the activity is above the threshold rate, so

as to inhibit the propagation therein of the action potentials, and (c) to drive the at least one pacing electrode to apply the pacing signal so as to engender a second rate of electrical activity of the nervous tissue which is below the threshold rate.

32. Apparatus according to claim 31, wherein the control unit is adapted to determine the first rate of electrical activity responsive to a rate of action potential propagation in the nervous tissue.

33. Apparatus according to claim 31, wherein the control unit is adapted to drive the at least one pacing electrode to apply the pacing signal so as to increase a level of muscle tone of a muscle whose behavior is modulated by the nervous tissue.

34. Apparatus according to claim 31, wherein the control unit is adapted to drive the at least one pacing electrode to apply the pacing signal so as to improve functioning of a muscle.

35. Apparatus for controlling epilepsy in a human subject, comprising:

at least one electrical energy transducer, adapted to be coupled to a brain of the subject; and

a control unit, which drives the at least one transducer to apply electrical energy to a portion of the brain to inhibit propagation therein of an action potential related to the epilepsy, so as to control the epilepsy.

36. Apparatus according to claim 35, wherein the at least one electrical energy transducer comprises a cathode and an anode, and wherein the control unit is adapted to drive an electrical current between the cathode and the anode so as to induce anodal block in the portion of the brain.

37. Apparatus according to claim 35, wherein the control unit is adapted to configure the application of the electrical energy so as to substantially not cause generation of an action potential in at least a sub-portion of the portion of the brain.

38. Apparatus according to claim 35, and comprising at least one electrical sensor, adapted to be placed in a vicinity of the portion of the brain to sense electrical activity of the portion of the brain, and adapted to convey a signal to the control unit responsive to the sensing, wherein the control unit is adapted to set a parameter of the application of the energy applied by the electrical energy transducer responsive to the signal.

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39. Apparatus according to any one of claims 35-38, and comprising at least one pacing transducer, adapted to be placed in a vicinity of the portion of the brain, wherein the control unit is adapted to drive the at least one pacing transducer to apply a pacing signal to the portion of the brain.

40. Apparatus for modulating an output of a nerve cell in a human subject, comprising:

a modulating transducer, adapted to be electrically coupled to the nerve cell; and

a control unit, adapted to drive the modulating transducer to apply electrical energy to the nerve cell so as to modulate an output frequency thereof.

41. Apparatus according to claim 40, wherein the control unit is adapted to drive the transducer to apply a pacing signal to the nerve cell.

42. Apparatus according to claim 40, wherein the control unit is adapted to configure the electrical energy to include a blocking component, which inhibits an action potential from stimulating the nerve cell.

43. Apparatus according to claim 40, wherein the control unit is adapted to drive the transducer to apply the electrical energy so as to modify a breathing rate of the subject.

44. Apparatus according to claim 40, wherein the control unit is adapted to drive the transducer to apply the electrical energy so as to modify a heart rate of the subject.

45. Apparatus according to claim 40, wherein the control unit is adapted to configure the electrical energy so as to substantially not cause generation of an action potential in a vicinity of the nerve cell.

46. Apparatus according to claim 40, wherein the modulating transducer comprises an electrode, which is adapted to be applied to the body of the subject.

47. Apparatus according to any one of claims 40-46, and comprising at least one electrical sensor, coupled to the control unit, which is adapted to be placed in a vicinity of the nerve cell and to sense electrical activity of the nerve cell, wherein the control unit is adapted to set a parameter of the application of the energy responsive to the sensed electrical activity.

48. Apparatus for modulating a characteristic of muscle tissue of a human subject, comprising:

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a pacing transducer, adapted to be applied in a first vicinity of nervous tissue that modulates behavior of the muscle tissue;

an inhibiting transducer, adapted to be applied in a second vicinity of the nervous tissue; and

a control unit, adapted to drive the inhibiting transducer to apply an inhibiting signal to the nervous tissue so as to inhibit propagation of an action potential in the tissue, and adapted to drive the pacing transducer to apply a pacing signal, so as to induce propagation of an action potential in the tissue, so as to modulate the characteristic of the muscle tissue.

49. Apparatus according to claim 48, wherein the inhibiting transducer comprises a cathode and an anode, and wherein the control unit is adapted to drive an electrical current between the cathode and the anode so as to induce anodal block in the nervous tissue.

50. Apparatus according to claim 48, wherein the control unit is adapted to drive the transducers to apply the signals so as to modify tone of the muscle tissue.

51. Apparatus according to claim 48, wherein the control unit is adapted to drive the transducers to apply the signals so as to modify contraction strength of the muscle tissue.

52. Apparatus according to claim 48, wherein the control unit is adapted to drive the transducers to apply the signals so as to treat a dysfunction of the muscle tissue.

53. Apparatus according to any one of claims 48-52, and comprising a sensing transducer, adapted to sense a first plurality of action potentials having a first rate, wherein the control unit is adapted to drive the inhibiting transducer to apply the inhibiting signal so as to inhibit the first plurality of action potentials, and wherein the control unit is adapted to drive the pacing transducer to apply the pacing signal so as to induce propagation of a second plurality of action potentials having a second rate.

54. Apparatus according to claim 53, wherein the control unit is adapted to set the second rate to be lower than the first rate.

55. Apparatus according to claim 53, wherein the control unit is adapted to set the second rate to be higher than the first rate.

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56. A method for modifying the electrical behavior of nervous tissue in a human subject, comprising:

sensing electrical activity of the nervous tissue; and

applying electrical energy to the nervous tissue, responsive to the sensing, so as to inhibit propagation in the tissue of an action potential.

57. A method according to claim 56, wherein applying the electrical energy comprises configuring the energy so as to substantially not cause generation of an action potential in at least a portion of the nervous tissue.

58. A method according to claim 56, wherein applying the electrical energy comprises applying direct current to the tissue.

59. A method according to claim 56, wherein applying the electrical energy comprises applying alternating current to the tissue.

60. A method according to claim 56, wherein applying the electrical energy comprises applying the electrical energy so as to inhibit contraction of a skeletal muscle of the subject.

61. A method according to claim 56, wherein applying the electrical energy comprises applying the electrical energy so as to inhibit contraction of a smooth muscle of the subject.

62. A method according to claim 56, wherein the nervous tissue includes a nerve, wherein sensing the electrical activity comprises sensing electrical activity at respective proximal and distal sites with respect to a location in the nerve from which an undesired pain signal is intermittently propagated, and wherein applying the electrical energy comprises substantially withholding the application of the energy responsive to sensing electrical activity indicative of pain at the distal site.

63. A method according to claim 56, wherein applying the electrical energy to the nervous tissue comprises applying the electrical energy to the nervous tissue, the nervous tissue including sympathetic nervous tissue, so as to engender a parasympathetic response.

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64. A method according to claim 56, wherein applying the electrical energy to the nervous tissue comprises applying the electrical energy to the nervous tissue, the nervous tissue including parasympathetic nervous tissue, so as to engender a sympathetic response.

65. A method according to any one of claims 56-64, wherein applying the electrical energy comprises setting a parameter of the application of the energy responsive to the sensed electrical activity.

66. A method according to claim 65, wherein setting the parameter comprises setting a timing parameter.

67. A method according to claim 56, wherein applying the electrical energy comprises injecting current into the tissue so as to induce anodal block in the tissue.

68. A method according to claim 67, and comprising:

reducing a level of the current at a first rate during a first current-reduction period; and

during a second current-reduction period, reducing the level of the current at a second rate, which is faster than the first rate.

69. A method according to claim 67, and comprising reducing a level of the current at a series of rates, substantially each of the rates having an equal or greater magnitude than a previous one of the rates.

70. A method according to any one of claims 56-64, wherein applying the electrical energy comprises applying the energy so as to modify a sensation perceived by the subject.

71. A method according to claim 70, wherein applying the electrical energy comprises applying the energy so as to reduce a sensation of pain perceived by the subject.

72. A method according to claim 71, wherein applying the electrical energy comprises applying the energy so as to reduce a sensation of acute pain perceived by the subject.

73. A method according to claim 71, wherein applying the electrical energy comprises applying the energy so as to reduce a sensation of chronic pain perceived by the subject.

74. A method according to claim 71, wherein applying the electrical energy comprises applying the energy so as to reduce pain associated with a defibrillation procedure.

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75. A method according to claim 71, wherein applying the electrical energy comprises applying the energy so as to reduce pain associated with a surgical procedure.

76. A method according to claim 75, wherein applying the electrical energy comprises applying the energy so as to allow a reduction of a quantity of anesthesia normally associated with the surgical procedure.

77. A method according to any one of claims 56-64, and comprising applying a pacing signal to the nervous tissue, responsive to the sensing.

78. A method according to claim 77, wherein applying the pacing signal comprises sensing the action potential in the tissue and pacing the tissue responsive to the sensing, and wherein applying electrical energy to the nervous tissue to inhibit the propagation comprises applying energy to inhibit propagation of an action potential after the tissue is paced.

79. A method according to claim 78, and comprising sensing further electrical activity of the tissue after applying the energy to inhibit the propagation, in order to verify that inhibition has taken place.

80. A method for modulating a characteristic of muscle tissue of a human subject, comprising:

applying inhibitory electrical energy to nervous tissue of the subject, so as to inhibit propagation of an action potential in the nervous tissue; and

applying a pacing signal to the nervous tissue, so as to modulate the characteristic of the muscle tissue.

81. A method according to claim 80, wherein applying the electrical energy and applying the pacing signal modulate dysfunctional contraction of the muscle tissue.

82. A method according to claim 80 or claim 81, and comprising sensing a first plurality of action potentials having a first rate, wherein applying the inhibitory electrical energy comprises applying the inhibitory electrical energy so as to inhibit the first plurality of action potentials, and wherein applying the pacing signal comprises applying the pacing signal so as to induce propagation of a second plurality of action potentials having a second rate.

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83. A method according to claim 82, wherein applying the pacing signal comprises applying the pacing signal such that the second rate is higher than the first rate.

84. A method according to claim 82, wherein applying the pacing signal comprises applying the pacing signal such that the second rate is lower than the first rate.

85. A method for controlling epilepsy in a human subject, comprising applying electrical energy to a portion of a brain of the subject to inhibit propagation therein of an action potential related to the epilepsy, so as to control the epilepsy.

86. A method according to claim 85, wherein applying the electrical energy comprises injecting current so as to induce anodal block.

87. A method according to claim 85, wherein applying the electrical energy comprises configuring the electrical energy so as to substantially not cause generation of an action potential in at least a sub-portion of the portion of the brain.

88. A method according to claim 85, and comprising sensing electrical activity of the portion of the brain and setting a parameter of the application of the energy responsive to the sensed electrical activity.

89. A method according to any one of claims 85-88, and comprising applying a pacing signal to the portion of the brain.

90. A method for modulating an output of a nerve cell in a human subject, comprising applying electrical energy to the nerve cell so as to modulate an output frequency thereof.

91. A method according to claim 90, wherein applying the electrical energy comprises applying electrical energy including a blocking component, so as to inhibit an action potential from stimulating the nerve cell.

92. A method according to claim 90, wherein applying the electrical energy comprises applying the electrical energy so as to modify a breathing rate of the subject.

93. A method according to claim 90, wherein applying the electrical energy comprises applying the electrical energy so as to modify a heart rate of the subject.

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94. A method according to claim 90, wherein applying the electrical energy comprises configuring the electrical energy so as to substantially not cause generation of an action potential in a vicinity of the nerve cell.

95. A method according to claim 90, and comprising sensing electrical activity of the nerve cell and setting a parameter of the application of the energy responsive to the sensed electrical activity.

96. A method according to any one of claims 90-95, and comprising applying a pacing signal to the nerve cell.

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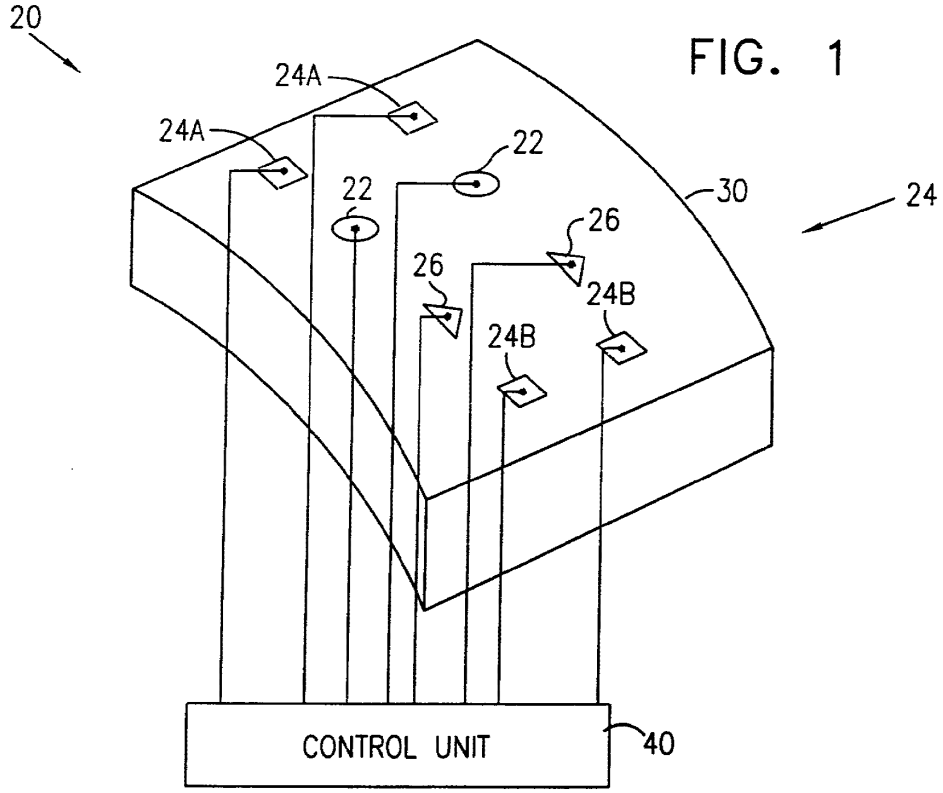
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CONTROL UNIT
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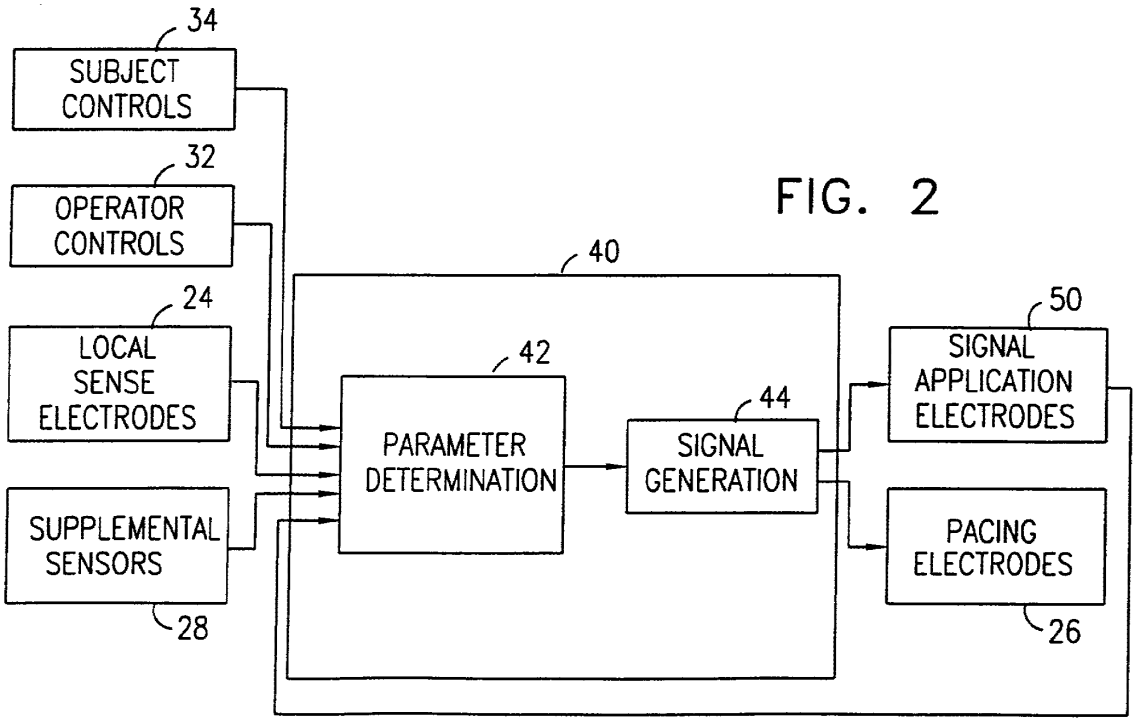
FIG. 1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OPERATOR CONTROLS
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SUPPLEMENTAL SENSORS
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SIGNAL GENERATION
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SIGNAL APPLICATION ELECTRODES
PACING ELECTRODES
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FIG. 2

FIG. 3

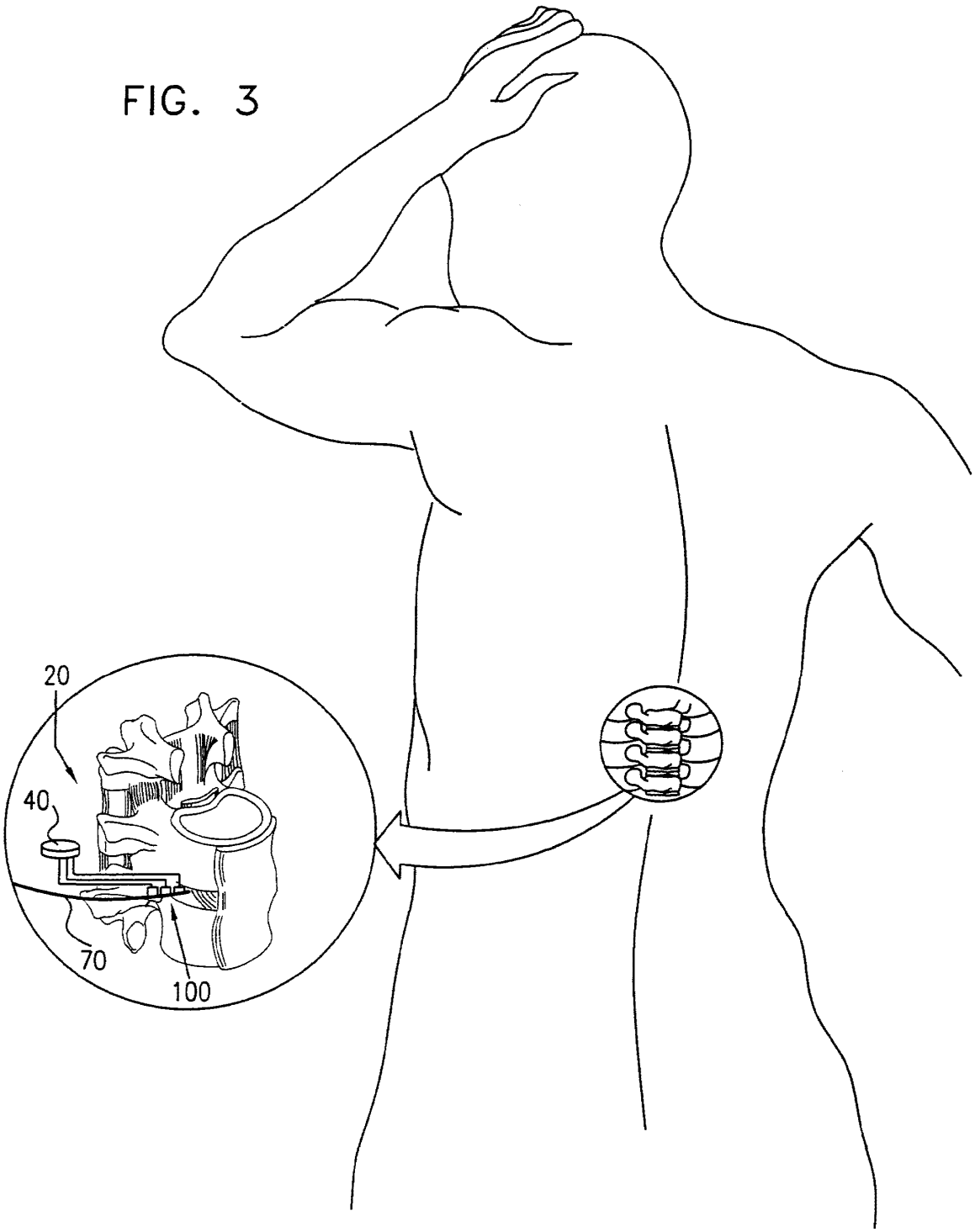
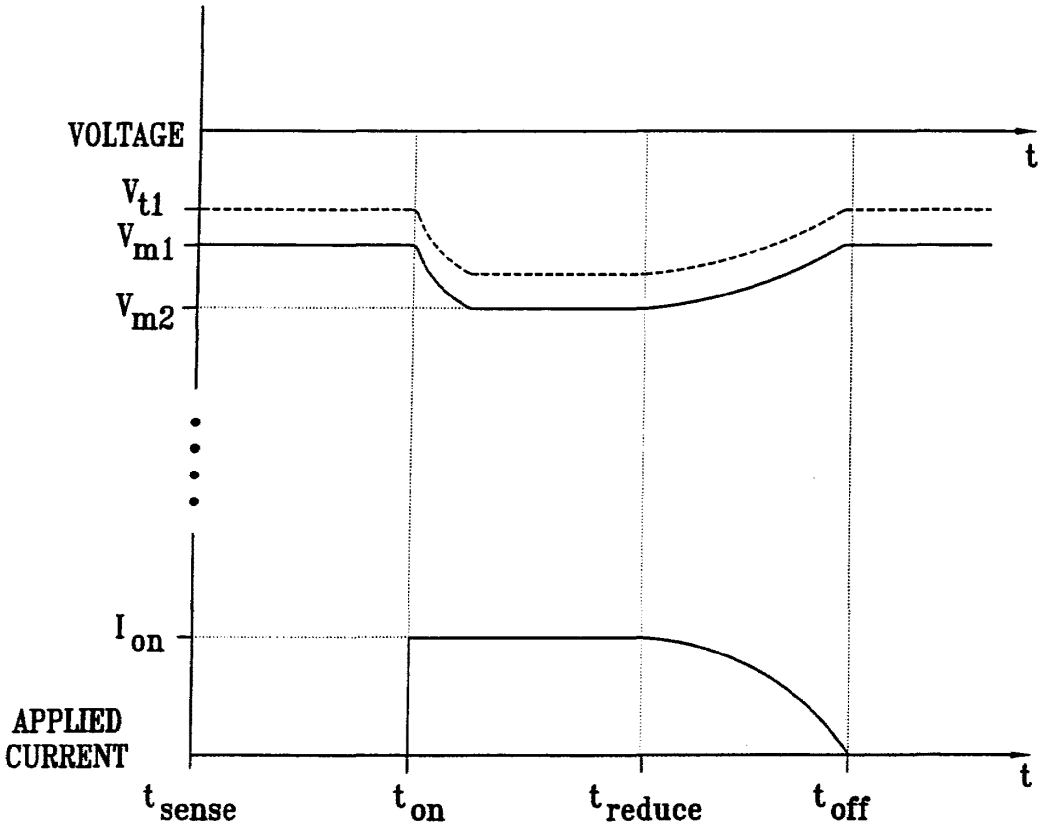


FIG. 4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t_{on}
t_{reduce}
t_{off}

Electronic Acknowledgement Receipt

EFS ID:	1317526
Application Number:	11279045
International Application Number:	
Confirmation Number:	7423
Title of Invention:	TWO-WAY LINK AGGREGATION
First Named Inventor/Applicant Name:	David Zelig
Customer Number:	7278
Filer:	Jay Philip Lessler
Filer Authorized By:	
Attorney Docket Number:	06727/0204293-US0
Receipt Date:	16-NOV-2006
Filing Date:	07-APR-2006
Time Stamp:	12:35:34
Application Type:	Utility

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Filed	00917035.pdf	78726	no	6
Warnings:					

Information:					
This is not an USPTO supplied IDS fillable form					
2	Foreign Reference	00915158.pdf	1933816	no	41
Warnings:					
Information:					
3	NPL Documents	00916905.pdf	96756	no	15
Warnings:					
Information:					
4	NPL Documents	00916913.pdf	390545	no	54
Warnings:					
Information:					
5	NPL Documents	00916919.pdf	292984	no	46
Warnings:					
Information:					
6	NPL Documents	00916930.pdf	305073	no	35
Warnings:					
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7	NPL Documents	00916935.pdf	29357	no	4
Warnings:					
Information:					
8	NPL Documents	00916941.pdf	190510	no	31
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9	NPL Documents	00916946.pdf	166731	no	25
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10	NPL Documents	00916964.pdf	103928	no	15

Warnings:					
Information:					
11	NPL Documents	00916969.pdf	63070	no	8
Warnings:					
Information:					
12	NPL Documents	00916974.pdf	133856	no	10
Warnings:					
Information:					
		Total Files Size (in bytes):	3785352		

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

Docket No.: 06727/0204293-US0
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
David Zelig et al.

Application No.: 11/279,045 Confirmation No.: 7423

Filed: April 7, 2006 Art Unit: N/A

For: TWO-WAY LINK AGGREGATION Examiner: Not Yet Assigned

INFORMATION DISCLOSURE STATEMENT (IDS)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This Information Disclosure Statement is submitted in accordance with 37 C.F.R. 1.97, 1.98, and it is requested that the information set forth in this statement and in the listed documents be considered during the pendency of the above-identified application, and any other application relying on the filing date of the above-identified application or cross-referencing it as a related application.

1. This IDS should be considered, in accordance with 37 C.F.R. 1.97, as it is filed: (Check one of the boxes A-D)

- [ ] A. within three months of the filing date of the above-identified national application or within three months of the entry into the national stage of the above identified national application
- [x] B. before the mailing date of a first office action on the merits, or a first office action after filing a request for continued examination.
- [ ] C. after (A) and (B) above, but before final rejection or allowance, and Applicants have made the necessary statement in box "i" below or paid the necessary fee in box "ii" below.

(check one of the boxes "i" and "ii" below:)

☐ i. Counsel states that, upon information and belief, each item of information listed herein was (check one of boxes (a) or (b))

☐ (a) first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this IDS; or

☐ (b) not cited in a communication from a foreign patent office in a counterpart foreign application and, to the knowledge of undersigned after making reasonable inquiry, was not known to any individual designated in 1.56(c) more than three months prior to the filing of this IDS.

☐ ii. A check for the fee set forth in 1. 17(p), presently believed to be $180, is enclosed.

☐ D. after (A), (B) and (C) above, but before payment of the issue fee: Applicant petitions under 37 C.F.R. 1.97(d) for the consideration of this IDS. Under 37 CFR 1.17(i) a check in the amount of $180.00 is enclosed. Counsel certifies that, upon information and belief, each item of information listed herein was

(check one of the boxes "a" and "b" below:)

☐ (a) first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this IDS; or

☐ (b) was not cited in a communication from a foreign patent office in a counterpart foreign application and, to the knowledge of undersigned after making reasonable inquiry, was not known to any individual designated in 1.56(c) more than three months prior to the filing of this IDS.

2. In accordance with 37 C.F.R. 1.98, this IDS includes a list (e.g., form PTO/SB/08) of all patents, publications, or other information submitted for consideration by the office, either incorporated into this IDS or as an attachment hereto. A copy of each document listed is attached, except as explained below.

(check boxes A, B and/or C and fill in blanks, if appropriate.)

[x] A. Pursuant to the Notice issued by the United States Patent and Trademark Office dated July 11, 2003 waiving the requirements of 37 C.F.R. § 1.98(a)(2)(i), a copy/copies of the United States Patent on PTO/SB08 is/are not being submitted.

[ ] B. Document(s) _____is (are) deemed substantially cumulative to document(s) _____ , and, in accordance with 1.98(c), only a copy of each of the latter documents is enclosed.

[ ] C. Certain documents were previously cited by or submitted to the Office in the following prior applications, which are relied upon under 35 U.S.C. 120:

<<INSERT SERIAL NO. & FILING DATE>>

Applicant identifies these documents by attaching hereto copies of the forms PTO-892, PTO-1449 and/or PTO/SB/08 from the files of the prior application(s) or a fresh PTO/SB/08 listing these documents, and request that they be considered and made of record in accordance with 1.98(d). Per 37 CFR 1.98(d), copies of these documents need not be filed in this application.

[ ] 3. Cite No(s). _____ are not in the English language. In accordance with 1.98(c), Applicant states:

[ ] An English translation of each document (or of the pertinent portions thereof), or a copy of each corresponding English-language patent or application , or English-language abstract (or claim) is enclosed.

[ ] The requirement for a concise explanation of the relevance of any foreign language document is satisfied by the attached search report; citation of the documents cited in the search report shall not be construed as an admission that they are or are considered to be, material to patentability of the subject matter claimed herein (See MPEP §609).

[ ] A concise explanation of the relevance of document(s) _____ is set forth as follows: [Insert concise explanation of relevance]

[ ] A concise explanation of the relevance of document(s) _____ can be found on page(s) _____ of the specification.

[ ] A concise explanation of document(s) _____ can be found on the attached sheet.

[x] 4. No explanation of relevance is necessary for documents in the English language (see reply to Comments 67 in the preamble to the final rules; 1135 OG 13 at 20).

[ ] 5. Other information being provided for the examiner's consideration follows:

[A/An _____ Search Report, dated_____, which issued during the prosecution of _____Application No._____ which corresponds to the present application.]

6. In accordance with 37 C.F.R. 1.97(g) and (h), the filing of this IDS should not be construed as a representation that a search has been made or that information cited is, or is considered to be, material to patentability as defined in §1.56 (b), or that any cited document listed or attached is (or constitutes) prior art. Unless other-wise indicated, the date of publication indicated for an item is taken from the face of the item and Applicant reserves the right to prove that the date of publication is in fact different.

Early and favorable consideration is earnestly solicited.

The Commissioner is authorized to charge any deficiency of up to $300.00 or credit any excess in this fee to Deposit Account No. 04-0100.

Dated: November 14, 2006

Respectfully submitted,

By_____

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P.O. Box 5257
New York, New York 10150-5257
(212) 527-7700
(212) 527-7701 (Fax)
Attorneys/Agents For Applicant

PTO/SB/08A/B (09-06)
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Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 1 of 2

Complete if Known	
Application Number	11/279,045-Conf. #7423
Filing Date	April 7, 2006
First Named Inventor	David Zelig
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	06727/0204293-US0

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	AA*	US-5,540,730-B1	07-30-1996	Terry, Jr.	
	AB*	US-5,188,104-B1	02-23-1993	Wernicke	
	AC*	US-5,263,480-B1	11-23-1993	Wernicke	
	AD*	US-5,571,150-B1	11-05-1996	Wernicke	
	AE*	US-4,702,254-B1	10-27-1987	Zabara	
	AF*	US-4,867,164-B1	09-19-1989	Zabara	
	AG*	US-5,025,807-B1	06-25-1991	Zabara	
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	AK*	US-5,335,657-B1	08-09-1994	Terry, Jr.	
	AL*	US-5,707,400-B1	01-13-1998	Terry, Jr.	
	AM*	US-5,282,468-B1	02-01-1994	Klepinski	
	AN*	US-4,628,942-B1	12/1986	Sweeney et al.	
	AO*	US-4,535,785-B1	08-20-1985	van den Honert	
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	AQ*	US-5,199,430-B1	04-06-1993	Fang	
	AR*	US-5,215,086-B1	06-01-1993	Terry, Jr.	
	AS*	US-5,755,750-B1	05-26-1998	Petruska	
	AT*	US-4,649,936-B1	03-17-1987	Ungar	
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	AV*	US-5,423,872-B1	06-13-1995	Cigaina	
	AW*	US-5,716,385-B1	02-10-1998	Mittal	
	AX*	US-6,097,984-B1	08-01-2000	Douglas	
	AY*	US-6,104,955-B1	08-15-2000	Bourgeois	
	AZ*	US-6,091,992	07-18-2000	Bourgeois et al.	
	AA1*	US-5,836,994-B1	11-17-1998	Bourgeois	
	AB1*	US-6,026,326-B1	02-15-2000	Bardy	
	AC1*	US-6,083,249	07-04-2000	Familoni	
	AD1*	US-5,690,691-B1	11/1997	Chen et al.	
	AE1*	US-5,292,344-B1	03-08-1994	Douglas	
	AF1*	US-3,411,507-B1	11-19-1968	Wingrove	
	AG1*	US-4,962,751-B1	10-16-1990	Krauter	
	AH1*	US-4,739,764-B1	04/1988	Lue et al.	
	AI1*	US-4,573,481-B1	03-04-1986	Bullara	
	AJ1*	US-5,540,734-B1	07-30-1996	Zabara	
	AK1*	US-20030103449-A1	06-05-2003	Barsheshet et al.	
	AL1*	US-6,339,595	01-15-2002	Rekhter et al.	
	AM1*	US-6,205,488	03-20-2001	Casey et al.	
	AN1*	US-6,765,921	07-20-2004	Stacey et al.	
	AO1*	US-6,628,624	09-30-2003	Mahajan et al.	
	AP1*	US-20040202171-A1	07-04-2006	Hama	
	AQ1*	US-6,886,043	04-26-2005	Mauger et al.	
	AR1*	US-20020176450-A1	11-28-2002	Kong et al.	
	AS1*	US-6,778,496	08-17-2004	Meempat et al.	

Examiner Signature		Date Considered	

00915253.doc

PTO/SB/08A/B (09-06)
Approved for use through 03/31/2007. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 2 of 2

Complete if Known	
Application Number	11/279,045-Conf. #7423
Filing Date	April 7, 2006
First Named Inventor	David Zelig
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	06727/0204293-US0

	AT1*	US-6,604,136	08-05-2003	Chang et al.	
	AU1*	US-6,275,493	08-14-2001	Morris et al.	
	AV1*	US-6,760,775	07-06-2004	Anerousis et al.	
	AW1*	US-6,304,575	10-16-2001	Carroll et al.	
	AX1*	US-6,466,985	10-15-2002	Goyal et al.	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document: Country Code[3]-Number[4]-Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
	BA	WO-01/10375-A2	02-15-2001	Impulse Dynamics Nv et al.		

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
	CA	MAMAKOS, et al., " A Method for Transmitting PPP Over Ethernet (PPPoE)", in IETF RFC 2516, February 1999 pg. 1-15.	
	CB	ROSEN, et al., "Multiprotocol Label Switching Architecture" in Request for Comments (RFC) 3031 of the Internet Engineering Task Force (IETF), January 2001 pg. 1-54. Also available at www.ietf.org/rfc.html.	
	CC	TSIANG, D. et al., "The Cisco SRP MAC Layer Protocol" in Request for Comments (RFC) 2892 of the Internet Engineering Task Force (IETF), August 2000 pg. 1-46.	
	CD	MALKIN, G. "RIP version 2", RFC 2453, November 1998, pg. 1-39	
	CE	FINLAYSON, R. et al, "A Reverse Address Resolution Protocol", RFC 903, June 1984, pg. 1-5.	
	CF	BRADLEY, et al., "Multiprotocol Interconnect over Frame Relay" in IETF RFC 1490, July 1993, pg. 1-31.	
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	CJ	Clause 43 of IEEE Standard 802.3a, "Carrier Sense Multiple Access Method with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications" 2002 Edition.	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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UTILITY PATENT APPLICATION TRANSMITTAL

(ONLY FOR NEW NONPROVISIONAL APPLICATIONS UNDER 37 CFR 1.53(B))

Attorney Docket No.	06727/0204293-US0
First Inventor	David Zelig
Title	TWO-WAY LINK AGGREGATION
Express Mail Label No.	

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. [ ] **Fee Transmittal Form** (e.g., PTO/SB/17) *(Submit an original and a duplicate for fee processing)*
2. [X] **Applicant claims small entity status.** See 37 CFR 1.27.
3. [X] **Specification** [*Total Pages* 30]
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   (For information on the preferred arrangement, see MPEP 608.01(a))
4. [X] **Drawing(s)** *(35 U.S.C. 113)* [*Total Sheets* 3]
5. **Oath or Declaration** [*Total Sheets* 3]
   a. [X] Newly executed (original or copy)
   b. [ ] A copy from a prior application (37 CFR 1.63(d)) *(for continuation/divisional with Box 18 completed)*
      i. [ ] DELETION OF INVENTOR(S)
      Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).
6. [X] **Application Data Sheet.** See 37 CFR 1.76
7. [ ] **CD-ROM or CD-R** in duplicate, large table or Computer Program *(Appendix)*
   [ ] Landscape Table on CD
8. **Nucleotide and/or Amino Acid Sequence Submission** *(if applicable, items a. – c. are required)*
   a. Computer Readable Form (CRF)
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ACCOMPANYING APPLICATION PARTS

9. [ ] **Assignment Papers** (cover sheet & document(s))
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10. [ ] **37 CFR 3.73(b) Statement** *(when there is an assignee)* [ ] **Power of Attorney**
11. [ ] **English Translation Document** *(if applicable)*
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    [ ] Copies of foreign patent documents, publications, & other information
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18. If a CONTINUING APPLICATION, *check appropriate box, and supply the requisite information below and in the first sentence of the specification following the title, or in an Application Data Sheet under 37 CFR 1.76:*
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    Prior application information: Examiner *Art Unit:*

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TWO-WAY LINK AGGREGATION

FIELD OF THE INVENTION

The present invention relates generally to communication networks, and particularly to methods and systems for link aggregation in network elements.

BACKGROUND OF THE INVENTION

Link aggregation (LAG) is a technique by which a group of parallel physical links between two endpoints in a data network can be joined together into a single logical link (referred to as the "LAG group"). Traffic transmitted between the endpoints is distributed among the physical links in a manner that is transparent to the clients that send and receive the traffic. For Ethernet™ networks, link aggregation is defined by Clause 43 of IEEE Standard 802.3ad, Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications (2002 Edition), which is incorporated herein by reference. Clause 43 defines a link aggregation protocol sub-layer, which interfaces between the standard Media Access Control (MAC) layer functions of the physical links in a link aggregation group and the MAC clients that transmit and receive traffic over the aggregated links. The link aggregation sub-layer comprises a distributor function, which distributes data frames submitted by MAC clients among the physical links in the group, and a collector function, which receives frames over the aggregated links and passes them to the appropriate MAC clients.

SUMMARY OF THE INVENTION

In various communication applications, users connect to a communication network through a network element, such as an access concentrator or aggregator for obtaining different data services.

Embodiments of the present invention that are described hereinbelow provide improved methods and systems for connecting users to a communication network with increased capacity and quality of service. The network element comprises one or more user interface modules (UIMs), each serving one or more user ports. In some embodiments, each UIM is connected to the communication network using two or more physical links arranged in parallel, in order to provide sufficient bandwidth at a given quality-of-service (QoS) level.

Upstream data frames sent from the user ports to the communication network and downstream data frames sent from the communication network to the user ports are distributed among the parallel physical links, so as to balance the traffic load among the links. The load balancing enables each UIM, and the network element as a whole, to deliver a higher bandwidth at a given QoS or to improve the QoS at a given bandwidth.

In some embodiments, the UIMs are coupled to a backplane of the network element, and the parallel physical links comprise backplane traces. In some embodiments, the physical links are configured as an Ethernet link aggregation (LAG) group. Distribution of frames to individual physical links typically comprises applying a suitable mapping function, such as a hashing function. The mapping function typically uses frame attributes, such as various header fields of the frame,

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to determine a physical link over which to send each frame.

Unlike some known network element configurations, in which each user port is fixedly assigned to a specific backplane trace, the load balancing operation in embodiments of the present invention enables statistical multiplexing of the frames, in which there is no direct relationship or connection between user ports and backplane traces.

In some embodiments, two or more physical user ports are aggregated into a LAG group external to the network element, so as to form an aggregated user port having a higher bandwidth. The frames to and from the aggregated user port are distributed among the physical user ports of the external LAG group to balance the load and enable higher bandwidth and higher QoS. In the downstream direction, a combined mapping operation for frames addressed to the aggregated user port determines an individual backplane trace and a physical user port over which to send each frame in a single mapping computation.

Several system configurations that implement the disclosed methods are described hereinbelow. Bandwidth allocation considerations for allocating sufficient bandwidth in the various resources of the network element are also described and demonstrated.

Although some of the embodiments described herein relate specifically to access concentrators, aspects of the present invention are also applicable to link aggregation performed by network elements of other sorts.

There is therefore provided, in accordance with an embodiment of the present invention, a method for communication, including:

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coupling a network node to one or more interface modules using a first group of first physical links arranged in parallel;

coupling each of the one or more interface modules to a communication network using a second group of second physical links arranged in parallel;

receiving a data frame having frame attributes sent between the communication network and the network node;

selecting, in a single computation based on at least one of the frame attributes, a first physical link out of the first group and a second physical link out of the second group; and

sending the data frame over the selected first and second physical links.

In an embodiment, the network node includes a user node, and sending the data frame includes establishing a communication service between the user node and the communication network.

In another embodiment, the second physical links include backplane traces formed on a backplane to which the one or more interface modules are coupled.

In yet another embodiment, at least one of the first and second groups of physical links includes an Ethernet link aggregation (LAG) group.

In still another embodiment, coupling the network node to the one or more interface modules includes aggregating two or more of the first physical links into an external Ethernet LAG group so as to increase a data bandwidth provided to the network node.

In an embodiment, coupling each of the one or more interface modules to the communication network includes at least one of multiplexing upstream data frames sent from the network node to the communication network, and

demultiplexing downstream data frames sent from the communication network to the network node.

In another embodiment, selecting the first and second physical links includes balancing a frame data rate among at least some of the first and second physical links.

In an embodiment, selecting the first and second physical links includes applying a mapping function to the at least one of the frame attributes. In another embodiment, applying the mapping function includes applying a hashing function. In still another embodiment, applying the hashing function includes determining a hashing size responsively to a number of at least some of the first and second physical links, applying the hashing function to the at least one of the frame attributes to produce a hashing key, calculating a modulo of a division operation of the hashing key by the hashing size, and selecting the first and second physical links responsively to the modulo. In an embodiment, selecting the first and second physical links responsively to the modulo includes selecting the first and second physical links responsively to respective first and second subsets of bits in a binary representation of the modulo.

In an embodiment, the at least one of the frame attributes includes at least one of a layer 2 header field, a layer 3 header field, a layer 4 header field, a source Internet Protocol (IP) address, a destination IP address, a source medium access control (MAC) address, a destination MAC address, a source Transmission Control Protocol (TCP) port and a destination TCP port.

In another embodiment, coupling the network node to the one or more interface modules and coupling each of the one or more interface modules to the communication

network include specifying bandwidth requirements including at least one of a committed information rate (CIR), a peak information rate (PIR) and an excess information rate (EIR) of a communication service provided by the communication network to the network node, and allocating a bandwidth for the communication service over the first and second physical links responsively to the bandwidth requirements.

There is additionally provided, in accordance with an embodiment of the present invention, a method for connecting user ports to a communication network, including:

coupling the user ports to one or more user interface modules;

coupling each user interface module to the communication network via a backplane using two or more backplane traces arranged in parallel;

receiving data frames sent between the user ports and the communication network, the data frames having respective frame attributes;

for each data frame, selecting responsively to at least one of the respective frame attributes a backplane trace from the two or more backplane traces; and

sending the data frame over the selected backplane trace.

Apparatus for connecting a network node with a communication network and for connecting user ports to a communication network are also provided.

The present invention will be more fully understood from the following detailed description of the embodiments thereof, taken together with the drawings in which:

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BRIEF DESCRIPTION OF THE DRAWINGS

Figs. 1 and 2 are block diagrams that schematically illustrate communication systems, in accordance with embodiments of the present invention;

Fig. 3 is a block diagram that schematically illustrates elements of a communication system, in accordance with an embodiment of the present invention;

Fig. 4 is a flow chart that schematically illustrates a method for single-stage hashing, in accordance with an embodiment of the present invention; and

Fig. 5 is a block diagram that schematically illustrates bandwidth allocation aspects of a communication system, in accordance with an embodiment of the present invention.

DETAILED DESCRIPTION OF EMBODIMENTS

SYSTEM DESCRIPTION

Fig. 1 is a block diagram that schematically illustrates a communication system 20, in accordance with an embodiment of the present invention. System 20 interconnects a plurality of user ports 24 to a communication network 28. Network 28 may comprise a wide-area network (WAN), such as the Internet, a network internal to a particular organization (Intranet), or any other suitable communication network.

A network element 32, such as an access concentrator, connects user ports 24 to a node 36 in network 28, typically via a network processor (NP) 38. Node 36 may comprise any suitable network element, such as a switch. The network element enables bi-directional communication in both upstream (i.e., user ports to

network 28) and downstream (network 28 to user ports) directions.

In some embodiments, system 20 provides data services to users via network element 32. Typically, the system uses a Layer 2 communication protocol, such as an Ethernet™ communication protocol, in which data is transferred among the different system components using Ethernet frames. In some cases, services use higher level protocols, such as Multi-protocol label switching (MPLS). Alternatively, the Internet Protocol (IP) or other layer 2 or layer 3 protocols may also be used.

Network element 32 comprises one or more user interface modules (UIMs), such as line cards 40. Each line card is assigned to process data frames of one or more user ports. In some embodiments, the line cards are plugged into, mounted on, or otherwise coupled to a backplane 52, which distributes digital signals carrying the frames to and from line cards 40. Backplane 52 comprises physical links, such as backplane traces 56, typically in the form of printed circuit board (PCB) conductors. Each backplane trace 56 has a finite bandwidth and can support a certain maximum frame throughput.

A multiplexer (MUX) 44 is coupled to backplane traces 56. In the upstream direction, MUX 44 multiplexes upstream frames coming out of line cards 40 to produce an upstream output. The upstream output is provided to network processor 38. The upstream output is then sent by network processor 38 via a network connection 48 to network 28. In the downstream direction, network processor 38 of network element 32 accepts a downstream input comprising downstream frames addressed to user ports 24 from node 36 through connection 48. MUX 44 sends

each frame to the appropriate user port via the appropriate line-card, using methods which will be explained below.

In many cases, a particular line card is connected to MUX 44 using two or more parallel backplane traces, in order to support the total bandwidth of the user ports assigned to this line card. In general, the statistical distribution of frames sent over different backplane traces may differ significantly from trace to trace, even for traces that belong to the same line card. In order to improve the capacity of the line cards, and consequently of network element 32 as a whole, it is desirable to balance the load of frames sent over the different traces, so as to avoid situations in which a certain backplane trace is overloaded, while excess capacity is available on a neighboring trace.

In many cases, the bandwidth offered by network element 32 to its users is specified in terms of quality of service (QoS) figures of merit, such as a guaranteed bandwidth (sometimes denoted CIR - Committed Information Rate) and a peak bandwidth (sometimes denoted PIR - Peak Information Rate). An alternative definition sometimes specifies the excess information rate (EIR), wherein CIR+EIR=PIR. Balancing the frame load between backplane traces 56 reduces the probability of lost frames due to overloading of backplane traces. The load balancing thus improves the QoS figures of merit, increases the quality of service offered by the concentrator and/or enables a higher bandwidth for a given QoS.

One way of balancing the load is to distribute the data rate of the Ethernet frames as uniformly as possible among the backplane traces. Alternatively, any other load balancing criterion can be used. In order to achieve load

balancing, each group of backplane traces belonging to a particular line card is configured as an Ethernet link aggregation (LAG) group 58. Each LAG group 58 is considered by the relevant line card and by multiplexer 44 to be a single logical link having an aggregated bandwidth (i.e., capacity) equal to the sum of the bandwidths of the individual backplane traces in the group. As a result, there is no pre-assigned relationship or connection between any given user port 24 and a specific backplane trace 56, as in some conventional network elements. Ethernet frames are statistically multiplexed so as to balance the load among the backplane traces.

In some embodiments, Ethernet frames are mapped to individual backplane traces in the LAG group in accordance with a suitable mapping function, such as a hashing function. The mapping function distributes the frames among the different backplane traces so as to balance the load between the traces. In some embodiments, the mapping function hashes one or more frame attributes, such as header fields of the Ethernet frame, to produce a hashing key. The hashing key corresponds to an index of the backplane trace over which the frame is to be sent. Header fields may comprise any suitable layer 2, 3 or 4 headers of the Ethernet frame, such as source Internet Protocol (IP) address, destination IP address, source medium access control (MAC) address, destination MAC address, source Transmission Control Protocol (TCP) port and destination TCP port, MPLS label, virtual circuit (VC) label, virtual local area network identification (VLAN-ID) tag, as well as any other suitable header field.

In some embodiments, in the upstream direction, each line card 40 performs an upstream mapping of upstream frames to the individual backplane traces in its LAG group using a suitable mapping function. The mapping function typically uses attributes of the upstream frames, as described above.

In some embodiments, in the downstream direction, a control module 60 in network element 32 determines a downstream mapping of each downstream frame received through connection 48 to the appropriate backplane trace, using a suitable mapping function. The mapping performed by module 60 should naturally consider the user port to which the frame is addressed, in order to send the frame to the line card serving this user port. Module 60 controls multiplexer 44 in order to send each frame over the appropriate backplane trace. In addition to determining the appropriate line card for each frame (i.e., determining over which LAG group 58 to send the frame), the downstream mapping also balances the load of frames within each LAG group, responsively to attributes of the downstream frames.

For example, the downstream mapping can be implemented in two sequential stages. First, for each Ethernet frame, module 60 determines the appropriate line card to which the frame should be sent, depending on the destination user port. Then, within the backplane traces belonging to the LAG group of the appropriate line card, module 60 selects a particular trace and controls MUX 44 to send the frame over the selected trace. Alternatively, any other suitable mapping method can be used by module 60.

Control module 60 may be implemented in hardware, as software code running on a suitable processor, or as a

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combination of hardware and software elements. Module 60 may comprise an independent module, or be integrated with other components of network element 32. Different embodiments of network element 32 may comprise any number of line cards 40. Each line card may serve any number of user ports 24 and any number of backplane traces 56. In general, there need not be a direct relation between the number of user ports and the number of backplane traces. Each user port and each backplane trace may have any suitable bandwidth. User ports can have equal or different bandwidths. Similarly, the backplane traces within each LAG group 58 can have equal or different bandwidths.

Fig. 2 is a block diagram that schematically illustrates communication system 20, in accordance with another embodiment of the present invention. In some cases, a particular user requires a bandwidth higher than the bandwidth of a single user port 24. For this purpose, in the exemplary embodiment of Fig. 2, a number of user ports 24 are configured to form an aggregated user port 64. User ports 24 forming port 64 are configured as an Ethernet LAG group, referred to as an external LAG group 68. Thus, the bandwidth of port 64 is generally equal to the sum of bandwidths of the individual user ports 24 in external LAG group 68, in both upstream and downstream directions.

External LAG group 68 may comprise any number of user ports 24, belonging to any number of line cards 40. In general, a particular line card 40 may have some of its user ports 24 assigned to an external LAG group and other user ports 24 used individually or assigned to another external LAG group.

An external multiplexer (MUX) 72 performs the multiplexing and de-multiplexing (mapping) functions of the external LAG group. MUX 72 is external to network element 32 and is often located in user equipment 76, separate and distinct from network element 32. Aggregated port 64 is typically connected on the downstream side to a user node, such as a layer 2 or layer 3 switch (not shown).

In the downstream direction, MUX 72 multiplexes the downstream frames arriving over the user ports of external LAG group 68 to port 64. In the upstream direction, MUX 72 applies a suitable mapping function, such as a hashing function, to balance the load of upstream frames sent from port 64 over the different user ports of group 68. The mapping function uses attributes of the upstream frames, as explained above. Such load balancing helps to increase the upstream bandwidth of port 64 and/or its quality of service.

SINGLE-STAGE DOWNSTREAM MAPPING METHOD

In the system configuration of Fig. 2, consider the downstream frames arriving from network 28, via network processor 38, to multiplexer 44 and addressed to aggregated user port 64. In general, the processing of these frames in network element 32 comprises two consecutive mapping operations. First, each frame is mapped to one of user ports 24 in external LAG group 68. Determining the user port implicitly determines through which line card 40 the frame will pass. Then, the same frame is mapped to one of backplane traces 56 in the appropriate LAG group 58 that serves the selected line card. In some embodiments, in order to reduce the hardware complexity and/or computational complexity of network element 32, control module 60 performs a single

combined mapping operation that combines the two mapping operations described above.

Thus, the combined mapping comprises a single hashing operation that determines, for each such downstream frame, both the backplane trace 56 over which the frame is to be sent to one of line cards 40, and the user port 24 to be used within external LAG group 68.

Fig. 3 is a block diagram that schematically illustrates elements of system 20, in accordance with an embodiment of the present invention. Fig. 3 is a simplified diagram, shown for the purpose of explaining the single-stage hashing method. As such, system elements unnecessary for explaining the method are omitted from the figure. The exemplary configuration of network element 32 in Fig. 3 comprises four line cards 40. Each line card is connected to MUX 44 using four backplane traces 56. The four backplane traces of each line card are configured as a LAG group. Each line card 40 serves a single user port 24. The four user ports are configured as an external LAG group to form aggregated user port 64, as explained above.

Fig. 4 is a flow chart that schematically illustrates a method for single-stage downstream hashing, in accordance with an embodiment of the present invention. Although the following description demonstrates the method using the simplified system configuration of Fig. 3 above, the method can also be applied in any other system configuration comprising two stages of link aggregation, such as the configurations discussed in the descriptions of Figs. 1 and 2 above.

The method begins with control module 60 determining a hashing size parameter denoted N_{bpow}, at a hash size definition step 80. N_{bpow} is defined as $N_{bpow} = N_{extp} \cdot N_{bpt}$,

wherein N_{extp} denotes the number of user ports in external LAG group 68, and N_{bpt} denotes the number of backplane traces 56 in each LAG group 58. For simplicity, it is assumed that all line cards 40 having a user port in external LAG group 68 have the same number of backplane traces 56 connecting them to MUX 44. In the present example, $N_{extp}=4$, $N_{bpt}=4$, therefore $N_{bpow}=16$.

In different embodiments of network element 32, the value of hashing size N_{bpow} can be hard-wired in the concentrator design. Alternatively, the hashing size can be provided to the network element as part of its configuration, or determined by control module 60 responsively to the configuration setting of network element 32, as detected by module 60. In general, different line cards 40 may comprise different numbers of user ports belonging to external LAG group 68.

During normal operation, network element 32 receives downstream frames via network connection 36, at a frame reception step 82. For each downstream frame, control module 60 calculates a hashing key of the frame, at a hash key calculation step 84. As explained above, the hashing key is typically calculated by applying a suitable hashing function to the frame attributes of the downstream frame.

Module 60 performs an integer modulo-N_{bpow} division of the hashing key, at a mapping calculation step 86. Module 60 divides the hashing key of the downstream frame by N_{bpow} and retains the modulo, or the remainder of the division operation, as a mapping index. The mapping index can be represented as a binary number having a fixed number of bits, depending on the value of N_{bpow}. In the

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present example in which $N_{bpow}=16$, the mapping index, being a remainder after division by 16, is an integer number in the range 0…15, which can be represented using 4 bits.

Module 60 partitions the binary representation of the mapping index into two parts having N1 and N2 bits. Module 60 uses N1 bits as a user slot/port index, indicating over which user port 24 in external LAG group 68 the frame should be sent. The remaining N2 bits are used as a backplane trace index, indicating over which of the backplane traces of the relevant line card the frame should be sent. In the present example, the four bit mapping index is partitioned so that two bits encode the user port and two bits encode the backplane trace. In other words, N1=N2=2. The user port index and the backplane trace index jointly define the combined mapping operation for determining how the particular downstream frame is to be handled. Alternatively, module 60 can apply any other suitable method for determining the combined mapping responsively to the frame attributes.

Having determined the combined mapping, module 60 controls MUX 44 so as to send the downstream frame, at a frame sending step 88. MUX 44 sends the frame to the appropriate line card over the appropriate backplane trace, responsively to the user port index and the backplane trace index, respectively. In some embodiments, MUX 44 sends the user port index to the line card along with the frame. The line card then selects the user port over which to send the frame to aggregated port 64 responsively to the user port index.

After sending the frame over the appropriate backplane trace and user port, the method returns to reception step 82 to process the next downstream frame.

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BANDWIDTH ALLOCATION CONSIDERATIONS

Fig. 5 is a block diagram that schematically illustrates bandwidth allocation aspects in communication system 20, in accordance with an embodiment of the present invention. In the exemplary configuration of Fig. 5, network element 32 comprises two line cards 100 and 101, each having a similar structure and functionality to line cards 40 of Figs. 1-3 above. Network element 32 connects network 28 with a user node, in the present example comprising a layer-2 switch 102. Port 64 is served by three user ports 24 configured as an external LAG group 68. As explained above, frames sent between switch 102 and network 28 undergo two stages of link aggregation. In addition to port 64, network element 32 also supports an independent user port 104 on line card 101. Frames sent between port 104 and network 28 undergo link aggregation only once.

Each of user ports 24 and 104 is coupled to a respective queue 106, which queues the frames of this port. In some embodiments, each port may have separate queues for upstream and downstream frames. Each line card comprises a link aggregator 108, which performs the aggregation of backplane traces 56 of this line card into the respective LAG group 58 in both upstream and downstream directions.

The configuration shown in Fig. 5 is an exemplary configuration chosen for the sake of simplicity. The bandwidth allocation calculations given below can be used in conjunction with any other suitable configuration of system 20, such as configurations having different numbers and arrangements of line cards, user ports, aggregated user ports and backplane traces.

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Consider a particular communication service provided by network 28 to aggregated port 64. The bandwidth allocation of this communication service is commonly specified in terms of CIR and PIR or CIR and EIR figures-of-merit, as explained above. In order to provide these bandwidths at the specified quality-of-service, it is desirable to allocate sufficient bandwidth in the different physical resources used for transferring the frames. These resources comprise, for example, user ports 24, backplane traces 56 and different queues 106 in line cards 100 and 101. In some embodiments, a high quality of service is achieved by defining suitable bandwidth margins for the different physical resources. The following description details an exemplary calculation for allocating sufficient bandwidth to the different resources of system 20. Alternatively, any other suitable bandwidth allocation method can be used.

In the upstream direction, let $BW_{SERVICE}$ denote the total bandwidth of the communication service in question. ($BW_{SERVICE}$ may refer to the CIR, EIR or PIR of the service, as applicable. Similarly, the different bandwidth calculations given throughout the description below may be used to allocate CIR, EIR or PIR to the different system resources.) Upstream frames belonging to this service originating from switch 102 are mapped and distributed by MUX 72 among the three user ports 24 of external LAG group 68. In theory, the mapping operation should distribute the frames evenly among the user ports, so that each port receives a bandwidth of $BW_{SERVICE}/3$. In practice, however, the actual bandwidth distribution may deviate significantly from these values. In particular, deviations are likely to occur in embodiments in which

the mapping operation is a data-dependent operation, such as hashing.

Therefore, in order to account for these deviations, each of the three user ports of external LAG group 68 is allocated a higher bandwidth given by:

[1] $BW_{ELAGPORT} = (BW_{SERVICE} / 3) \cdot MARGIN_{UPELAG}$

wherein $MARGIN_{UPELAG}$ denotes an upstream bandwidth margin of each user port 24 in the external LAG group. (In other words, $MARGIN_{UPELAG}=1.5$ corresponds to a 50% bandwidth margin.) In general, the bandwidth allocated to a particular user port 24 should also be allocated to the respective queue 106 that queues the frames of this port.

After being mapped and sent over one of user ports 24, the upstream frames are processed by one of line cards 100 and 101. As part of this processing, the frames are mapped again by link aggregator 108 in the line card, so as to distribute them among the four backplane traces 56 of LAG group 56. It is thus desirable to allocate sufficient bandwidth on each of backplane traces 56. Assuming an optimal (uniform) distribution among the backplane traces, the bandwidth received by each backplane trace can be written as $BW_{ELAGPORT}*\#PORTS_{ELAG}/\#BPT$, wherein $\#PORTS_{ELAG}$ denotes the number of user ports of external LAG group 68 that are processed by the particular line card, and #BPT denotes the number of backplane traces 56 in the LAG group 58 of this line card.

Since, as explained above, the actual distribution achieved by the mapping operation (in this case, the mapping between backplane traces performed by aggregator 108) often deviates from uniform distribution, a suitable margin denoted $MARGIN_{UPBPLAG}$ is added. Thus, the bandwidth

allocation of each backplane trace can be written as $BW_{ELAGPORT}$*#$PORTS_{ELAG}$*$MARGIN_{UPBPLAG}$/#BPT, wherein #$PORTS_{ELAG}$ denotes the number of user ports in the particular line card. In some cases, however, this bandwidth allocation is greater than $BW_{SERVICE}$, the total bandwidth of the communication service. Clearly there is no need to assign to any single backplane trace a bandwidth that is greater than the total service bandwidth. Therefore, the bandwidth allocated to each backplane trace can be written as:

$$[2] \quad BW_{BPT} = \text{Min}\left\{\begin{matrix} BW_{ELAGPORT} \cdot \#\,PORTS_{ELAG} \cdot \\ MARGIN_{UPBPLAG} /\#\,BPT,\, BW_{SERVICE}\end{matrix}\right\}$$

Note that according to equation [1], $BW_{ELAGPORT}$ already contains $MARGIN_{UPELAG}$, the bandwidth margin of the external LAG. #$PORTS_{ELAG}$ refers to the specific line card in question.

The total bandwidth allocated on LAG group 56 is thus given by

$$[3] \quad BW_{BPLAG} = \text{Min}\left\{\begin{matrix} BW_{ELAGPORT} \cdot \#\,PORTS_{ELAG} \cdot \\ MARGIN_{UPBPLAG} /\#\,BPT,\, BW_{SERVICE}\end{matrix}\right\} \cdot \#\,BPT$$

In cases where external LAG is not used, such as for upstream frames originating from independent port 104, the total bandwidth allocated on LAG group 56 is given by the simpler expression:

$$[4] \quad BW_{BPLAG} = \text{Min}\left\{\begin{matrix} BW_{SERVICE} \cdot MARGIN_{UPBPLAG} /\#\,BPT \\ , BW_{SERVICE}\end{matrix}\right\} \cdot \#\,BPT$$

In the downstream direction, as explained above, downstream frames undergo only a single mapping operation. When external LAG is used, using a similar calculation, the total bandwidth allocated to LAG group

56 for downstream frames of a particular service can be written as:

$$[5] \quad BW_{BPLAG} = \text{Min} \left\{ \begin{matrix} BW_{ELAGPORT} \cdot \#\,PORTS_{ELAG} \cdot \\ /\#\,BPT,\ BW_{SERVICE} \end{matrix} \right\} \cdot \#\,BPT$$

wherein a suitable downstream bandwidth margin is assumed to be already included in $BW_{ELAGPORT}$. When external LAG is not used, such as for downstream frames addressed to independent port 104, the total bandwidth allocation can be written as:

$$[6] \quad BW_{BPLAG} = \text{Min} \left\{ \begin{matrix} BW_{SERVICE} \cdot MARGIN_{DNBPLAG} /\#\,BPT \\ ,\ BW_{SERVICE} \end{matrix} \right\} \cdot \#\,BPT$$

wherein $MARGIN_{DNBPLAG}$ denotes a downstream bandwidth margin for the backplane traces, which may be the same as or different from $MARGIN_{UPBPLAG}$.

Although the methods and systems described herein mainly address link aggregation of backplane traces and external link aggregation in Ethernet communication systems, the principles of the present invention can also be used in any system configuration in which a user interface module connects one or more user ports to a communication network via two or more parallel physical links. In particular, the principles of the present invention can also be used in other applications involving the selection of physical links in two successive link aggregation stages using a single computation.

It will thus be appreciated that the embodiments described above are cited by way of example, and that the present invention is not limited to what has been particularly shown and described hereinabove. Rather, the scope of the present invention includes both combinations

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and sub-combinations of the various features described hereinabove, as well as variations and modifications thereof which would occur to persons skilled in the art upon reading the foregoing description and which are not disclosed in the prior art.

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CLAIMS

1. A method for communication, comprising:

coupling a network node to one or more interface modules using a first group of first physical links arranged in parallel;

coupling each of the one or more interface modules to a communication network using a second group of second physical links arranged in parallel;

receiving a data frame having frame attributes sent between the communication network and the network node;

selecting, in a single computation based on at least one of the frame attributes, a first physical link out of the first group and a second physical link out of the second group; and

sending the data frame over the selected first and second physical links.

2. The method according to claim 1, wherein the network node comprises a user node, and wherein sending the data frame comprises establishing a communication service between the user node and the communication network.

3. The method according to claim 1, wherein the second physical links comprise backplane traces formed on a backplane to which the one or more interface modules are coupled.

4. The method according to claim 1, wherein at least one of the first and second groups of physical links comprises an Ethernet link aggregation (LAG) group.

5. The method according to claim 1, wherein coupling the network node to the one or more interface modules comprises aggregating two or more of the first physical links into an external Ethernet LAG group so as to increase a data bandwidth provided to the network node.

6. The method according to claim 1, wherein coupling each of the one or more interface modules to the communication network comprises at least one of multiplexing upstream data frames sent from the network node to the communication network, and demultiplexing downstream data frames sent from the communication network to the network node.

7. The method according to claim 1, wherein selecting the first and second physical links comprises balancing a frame data rate among at least some of the first and second physical links.

8. The method according to claim 1, wherein selecting the first and second physical links comprises applying a mapping function to the at least one of the frame attributes.

9. The method according to claim 8, wherein applying the mapping function comprises applying a hashing function.

10. The method according to claim 9, wherein applying the hashing function comprises determining a hashing size responsively to a number of at least some of the first and second physical links, applying the hashing function to the at least one of the frame attributes to produce a hashing key, calculating a modulo of a division operation of the hashing key by the hashing size, and selecting the first and second physical links responsively to the modulo.

11. The method according to claim 10, wherein selecting the first and second physical links responsively to the modulo comprises selecting the first and second physical links responsively to respective first and second subsets of bits in a binary representation of the modulo.

12. The method according to claim 1, wherein the at least one of the frame attributes comprises at least one of a layer 2 header field, a layer 3 header field, a layer 4 header field, a source Internet Protocol (IP) address, a destination IP address, a source medium access control (MAC) address, a destination MAC address, a source Transmission Control Protocol (TCP) port and a destination TCP port.

13. The method according to claim 1, wherein coupling the network node to the one or more interface modules and coupling each of the one or more interface modules to the communication network comprise specifying bandwidth requirements comprising at least one of a committed information rate (CIR), a peak information rate (PIR) and an excess information rate (EIR) of a communication service provided by the communication network to the network node, and allocating a bandwidth for the communication service over the first and second physical links responsively to the bandwidth requirements.

14. A method for connecting user ports to a communication network, comprising:

coupling the user ports to one or more user interface modules;

coupling each user interface module to the communication network via a backplane using two or more backplane traces arranged in parallel;

receiving data frames sent between the user ports and the communication network, the data frames having respective frame attributes;

for each data frame, selecting responsively to at least one of the respective frame attributes a backplane trace from the two or more backplane traces; and

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sending the data frame over the selected backplane trace.

15. The method according to claim 14, wherein at least some of the backplane traces are aggregated into an Ethernet link aggregation (LAG) group.

16. The method according to claim 14, wherein selecting the backplane trace comprises applying a hashing function to the at least one of the frame attributes.

17. Apparatus for connecting a network node with a communication network, comprising:

one or more interface modules, which are arranged to process data frames having frame attributes sent between the network node and the communication network;

a first group of first physical links arranged in parallel so as to couple the network node to the one or more interface modules;

a second group of second physical links arranged in parallel so as to couple the one or more interface modules to the communication network; and

a control module, which is arranged to select for each data frame sent between the communication network and the network node, in a single computation based on at least one of the frame attributes, a first physical link out of the first group and a second physical link out of the second group over which to send the data frame.

18. The apparatus according to claim 17, and comprising a backplane to which the one or more interface modules are coupled, wherein the second physical links comprise backplane traces formed on the backplane.

19. The apparatus according to claim 17, wherein at least one of the first and second groups of physical links comprises an Ethernet link aggregation (LAG) group.

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20. The apparatus according to claim 17, wherein two or more of the first physical links are aggregated into an external Ethernet LAG group so as to increase a data bandwidth provided to the network node.

21. The apparatus according to claim 17, and comprising a multiplexer, which is arranged to perform at least one of multiplexing upstream data frames sent from the network node to the communication network, and demultiplexing downstream data frames sent from the communication network to the network node.

22. The apparatus according to claim 17, wherein the control module is arranged to balance a frame data rate among at least some of the first and second physical links.

23. The apparatus according to claim 17, wherein the control module is arranged to apply a mapping function to the at least one of the frame attributes so as to select the first and second physical links.

24. The apparatus according to claim 23, wherein the mapping function comprises a hashing function.

25. The apparatus according to claim 24, wherein the control module is arranged to determine a hashing size responsively to a number of at least some of the first and second physical links, to apply the hashing function to the at least one of the frame attributes to produce a hashing key, to calculate a modulo of a division operation of the hashing key by the hashing size, and to select the first and second physical links responsively to the modulo.

26. The apparatus according to claim 25, wherein the control module is arranged to select the first and second physical links responsively to respective first and

second subsets of bits in a binary representation of the modulo.

27. The apparatus according to claim 17, wherein the at least one of the frame attributes comprises at least one of a layer 2 header field, a layer 3 header field, a layer 4 header field, a source Internet Protocol (IP) address, a destination IP address, a source medium access control (MAC) address, a destination MAC address, a source Transmission Control Protocol (TCP) port and a destination TCP port.

28. The apparatus according to claim 17, wherein the communication network is arranged to provide a communication service to the network node, the service having specified bandwidth requirements comprising at least one of a committed information rate (CIR), a peak information rate (PIR) and an excess information rate (EIR), and wherein the first and second groups of physical links are dimensioned to provide an allocated bandwidth for the communication service responsively to the bandwidth requirements.

29. Apparatus for connecting user ports to a communication network, comprising:

one or more user interface modules coupled to the user ports, which are arranged to process data frames having frame attributes sent between the user ports and the communication network;

a backplane having the one or more user interface modules coupled thereto and comprising a plurality of backplane traces arranged in parallel so as to transfer the data frames between the one or more user interface modules and the communication network;

a control module, which is arranged to select, for each data frame, responsively to at least one of the

frame attributes, a backplane trace from the plurality of backplane traces over which to send the data frame.

30. The apparatus according to claim 29, wherein at least some of the backplane traces are aggregated into an Ethernet link aggregation (LAG) group.

31. The apparatus according to claim 29, wherein the control module is arranged to apply a hashing function to the at least one of the frame attributes so as to select the backplane trace.

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TWO-WAY LINK AGGREGATION

ABSTRACT

A method for communication includes coupling a network node to one or more interface modules using a first group of first physical links arranged in parallel. Each of the one or more interface modules is coupled to a communication network using a second group of second physical links arranged in parallel. A data frame having frame attributes sent between the communication network and the network node is received. A first physical link out of the first group and a second physical link out of the second group are selected in a single computation based on at least one of the frame attributes. The data frame is sent over the selected first and second physical links. This method allows two or more link aggregation groups to be concatenated, using a single processing stage to determine port assignment for each frame in each of the link aggregation groups

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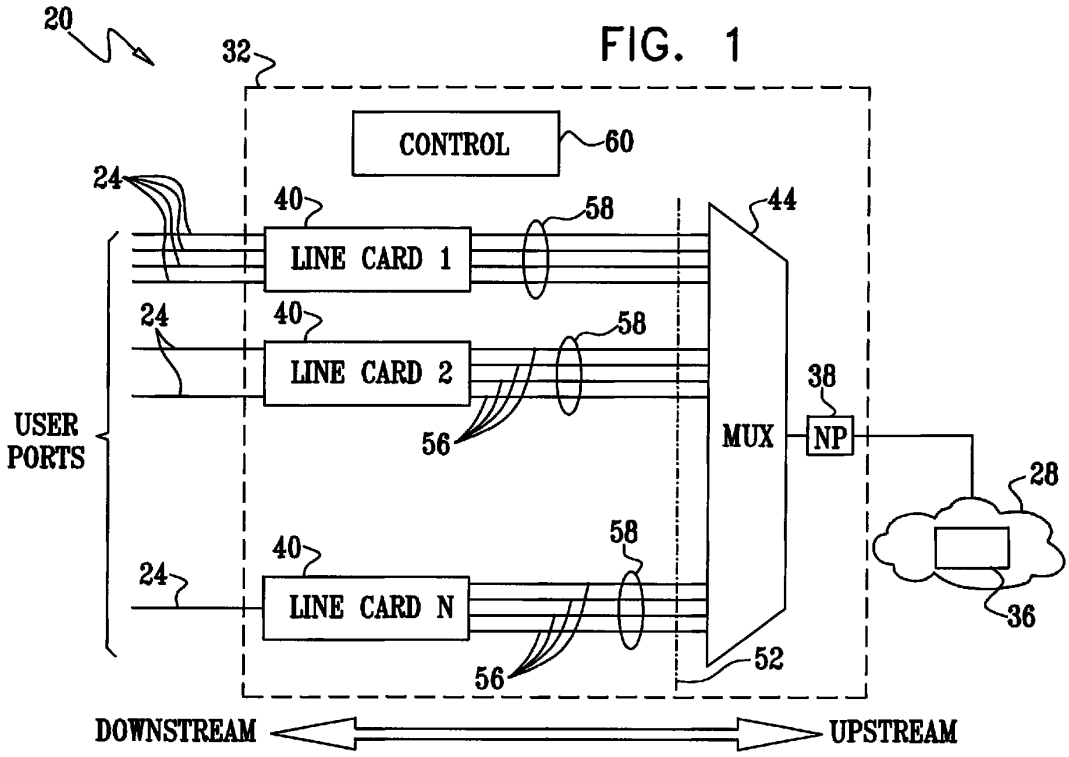
FIG. 1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60
24
40
LINE CARD 1
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LINE CARD 2
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USER PORTS
MUX
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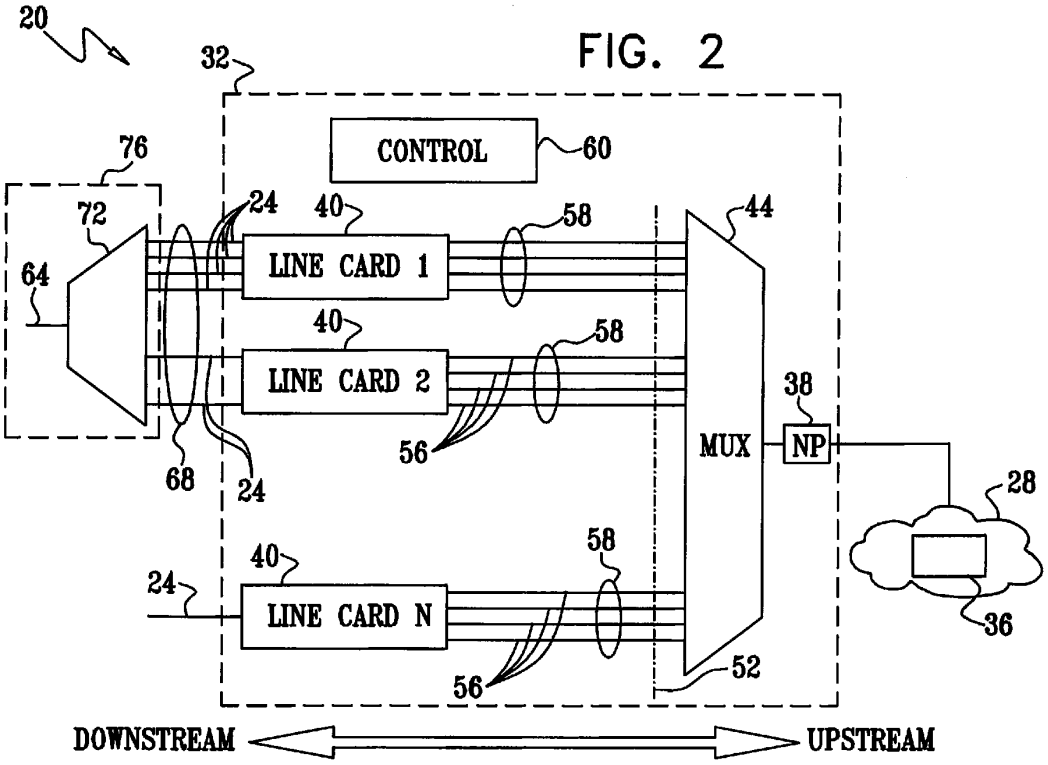
NP
28
36
LINE CARD N
52
DOWNSTREAM
UPSTREAM

FIG. 2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LINE CARD 2
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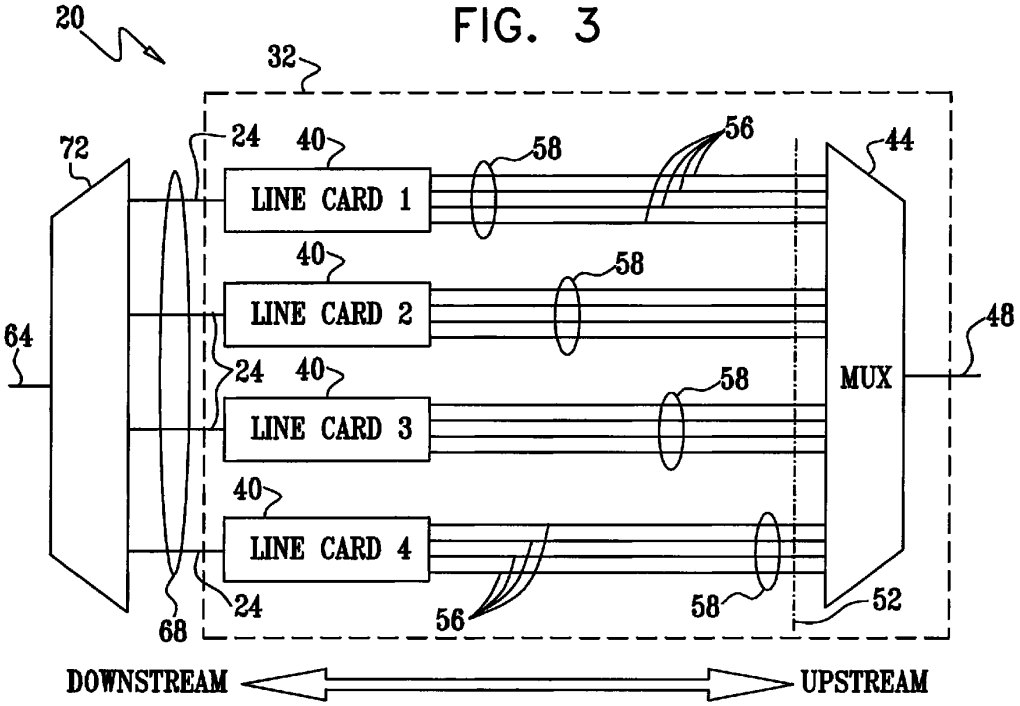
DOWNSTREAM
UPSTREAM

FIG. 3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72
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LINE CARD 2
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MUX
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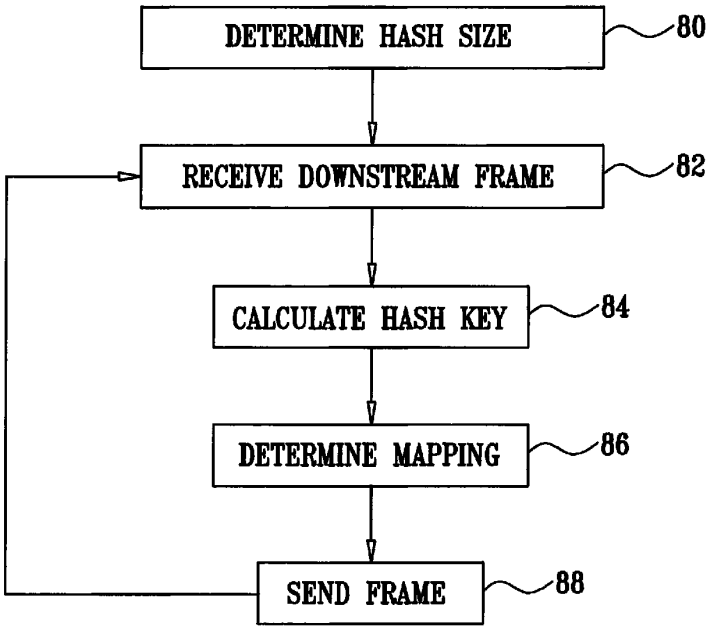
DOWNSTREAM
UPSTREAM

FIG. 4


DETERMINE HASH SIZE
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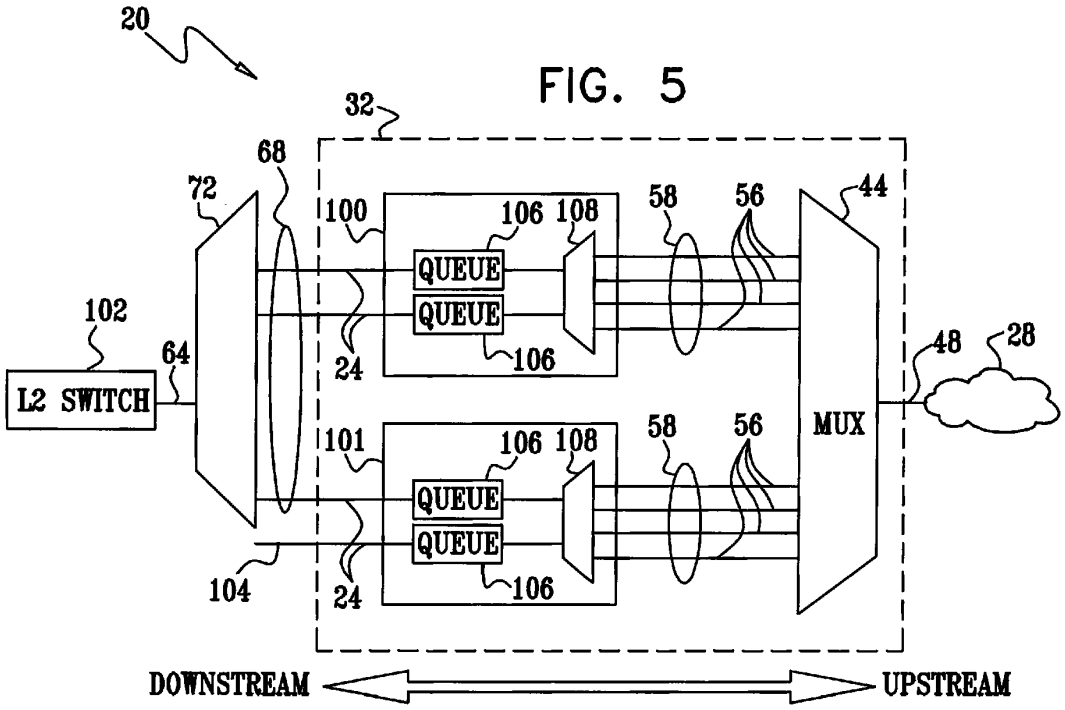
RECEIVE DOWNSTREAM FRAME
82
CALCULATE HASH KEY
84
DETERMINE MAPPING
86
SEND FRAME
88

FIG. 5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56
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QUEUE
QUEUE
102
64
L2 SWITCH
24
106
48
28
101
MUX
104
DOWNSTREAM
UPSTREAM

Docket No.: _____

DECLARATION
AND POWER OF ATTORNEY
Original Application

As a below named inventor, I declare that the information given herein is true, that I believe that I am the original, first and sole inventor if only one name is listed at 1 below, or a joint inventor if plural inventors are named below, of the invention entitled:

TWO-WAY LINK AGGREGATION

Which is described and claimed in:

[X] the attached specification or

[ ] the specification in application
Serial No.
Filed

that I do not know and do not believe that the same was ever known or used in the United States of America before my or our invention thereof or patented or described in any printed publication in any country before my or our invention thereof, or more than one year prior to this application, or in public use or on sale in the United States of America more than one year prior to this application, that the invention has not been patented or made the subject of an inventor's certificates issued before the dated of this application in any country foreign to the United States of America on an application filed by me or my legal representatives or assigns more than twelve months prior to this application, that I acknowledge my duty to disclose information of which I am aware which is material to patentability in accordance with 37 CFR § 1.56. I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I hereby claim the priority benefits under 35 U.S.C. § 119 of any application(s) for patent or inventor's certificate listed below. All foreign applications for patent or inventor's certificate on this invention filed by me or my legal representatives or assigns prior to the application(s) of which priority is claimed are also identified below.

PRIOR APPLICATION(S), IF ANY, OF WHICH PRIORITY IS CLAIMED

COUNTRY	APPLICATION NO.	DATE OF FILING

120

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Ex.1002
CISCO SYSTEMS, INC. / Page 240 of 249

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 if the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

SIGNATURE OF INVENTOR 1: X _____ DATED: X 16/3/06

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SIGNATURE OF INVENTOR 3: X _____ DATED: X 16.03.06

Application Data Sheet

Application Information

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Secrecy Order in Parent Appl.?::	No

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Initial 04/06/06

Electronic Patent Application Fee Transmittal

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Filing Date:	
Title of Invention:	TWO-WAY LINK AGGREGATION
First Named Inventor:	David Zelig
Filer:	Ema Gualano
Attorney Docket Number:	06727/0204293-US0

Filed as Small Entity

Utility Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Utility filing Fee (Electronic filing)	4011	1	75	75
Utility Search Fee	2111	1	250	250
Utility Examination Fee	2311	1	100	100
Pages:				
Claims:				
Claims in excess of 20	2202	11	25	275
Independent claims in excess of 3	2201	1	100	100
Miscellaneous-Filing:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		800

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Confirmation Number:	7423
Title of Invention:	TWO-WAY LINK AGGREGATION
First Named Inventor:	David Zelig
Customer Number:	07278
Filer:	Ema Gualano
Filer Authorized By:	
Attorney Docket Number:	06727/0204293-US0
Receipt Date:	07-APR-2006
Filing Date:	
Time Stamp:	15:58:50
Application Type:	Utility
International Application Number:	

Payment information:

Submitted with Payment	yes
Payment was successfully received in RAM	$800.0
RAM confirmation Number	82
Deposit Account	040100

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Document Number	Document Description	File Name	File Size(Bytes)	Multi Part	Pages

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Multipart Description

Doc Desc	Start	End
Specification	1	22
Claims	23	29
Abstract	30	30
Drawings	31	33
Oath or Declaration filed	34	36
Application Data Sheet	37	39

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