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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/702,003	02/02/2007	Joseph M. Lepley	66374-281

CONFIRMATION NO. 1990

POA ACCEPTANCE LETTER



OC000000068672647

24628
HUSCH BLACKWELL LLP
HUSCH BLACKWELL SANDERS LLP WELSH & KATZ
120 S RIVERSIDE PLAZA
22ND FLOOR
CHICAGO, IL 60606

Date Mailed: 02/23/2024

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 02/19/2024.

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.

/dmbaines/



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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/702,003	02/02/2007	Joseph M. Lepley	66374-281

25269
DYKEMA GOSSETT PLLC
1301 K STREET, NW
Suite 1100 West
WASHINGTON, DC 20005

CONFIRMATION NO. 1990
POWER OF ATTORNEY NOTICE



OC000000068672573

Date Mailed: 02/23/2024

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 02/19/2024.

- The Power of Attorney to you in this application has been revoked by the assignee who has intervened as provided by 37 CFR 3.71.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.

/dmbaines/



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PATENT AND TRADEMARK OFFICE

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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #
11/702,003

RECEIPT DATE / TIME
02/19/2024 02:28:55 PM Z ET

ATTORNEY DOCKET #
66374-281

Title of Invention

HIGH TENSION CAPACITIVE DISCHARGE IGNITION WITH REINFORCING TRIGGERING PULSES

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # 7401603

CONFIRMATION # 1990

FILED BY JOANNE WICKENHAUSER

PATENT CENTER # 64366184

FILING DATE 02/02/2007

CUSTOMER # 25269

FIRST NAMED
INVENTOR Joseph M. Lepley

CORRESPONDENCE
ADDRESS -

AUTHORIZED BY Herman Rusche

Documents

TOTAL DOCUMENTS: 2

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
Power of Attorney - 564232-17.pdf	2	Power of Attorney	662 KB
3.73 Altronic - 564232-17.pdf	3	Assignee showing of ownership per 37 CFR 3.73	1600 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
Power of Attorney - 564232-17.pdf	0A2AED041445AFED0A8744ED9C69A67EEA2C83209153D17F ACCD93271FAD8FE2C026786875879D5DA6CD42391D1E684A 7C6E0D66229E62A42952213F3F5F7AEB
3.73 Altronic - 564232-17.pdf	B3C5B54C60E97C712302E5E229380AD05C3A1F3458419E9B9

6C8A0D8EE3F90D86DD9391DD61110AB34D3B7184222E726D
60EC237B2D35E9D1F1B2D590D71327E

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 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.

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(c)Applicant/Patent Owner: **ALTRONIC, LLC**Application No./Patent No.: **11702003**Filed/Issue Date: **2007-02-02**Titled: **HIGH TENSION CAPACITIVE DISCHARGE IGNITION WITH REINFORCING TRIGGERING PULSES****ALTRONIC, LLC**, a **limited liability company**

(Name of Assignee)

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

states that, for the patent application/patent identified above, it is (choose one of options 1, 2, 3 or 4 below):

1. ☒ The assignee of the entire right, title, and interest.
2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):
- ☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.
- ☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (e.g., bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose one of options A or B below):

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

1. From: **LEPLEY, JOSEPH M.** To: **ALTRONIC, INC.**The document was recorded in the United States Patent and Trademark Office at
Reel **019210**, Frame **0342**, or for which a copy thereof is attached.2. From: **ALTRONIC, INC.** To: **ALTRONIC, LLC**The document was recorded in the United States Patent and Trademark Office at
Reel **023915**, Frame **0744**, or for which a copy thereof is attached.

[Page 1 of 2]

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.

Exhibit 1002

MOTORTECH v. Altronic - IPR2025-00398

Page 5 of 97

STATEMENT UNDER 37 CFR 3.73(c)

3. From: To:

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

4. From: To:

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

5. From: To:

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

6. From: To:

The document was recorded in the United States Patent and Trademark Office at
 Reel, Frame 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(c)(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.

/H. Frederick Rusche/

2024-02-19

Signature

Date

H. Frederick Rusche

45,061

Printed or Typed Name

Title or Registration Number

[Page 2 of 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.

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA/82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number 11702003

Filing Date 2007-02-02

First Named Inventor LEPLEY, Joseph M.

Title HIGH TENSION CAPACITIVE DISCHARGE IGNITION WITH REINFORCING TRIGGERING PULSES

Art Unit 3747

Examiner Name

Attorney Docket Number 564232-17

SIGNATURE of Applicant or Patent Practitioner

Signature /H. Frederick Rusche/ Date (Optional) 2024-02-19

Name H. Frederick Rusche Registration Number 45,061

Title (if Applicant is a
jurisic entity)

Applicant Name (if Applicant is a jurisic entity)

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.



*Total of _____ forms are submitted.

A Federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with an information collection subject to the requirements of the Paperwork Reduction Act of 1995, unless this information collection has a currently valid OMB Control Number. The OMB Control Number for this information collection is 0651-0035. Public burden for this form is estimated to average 3 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the information collection. Send comments regarding this burden estimate or any other aspect of this information collection, including suggestions for reducing this burden to the Chief Administrative Officer, United States Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450 or email InformationCollection@uspto.gov. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. If filing this completed form by mail, 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.

POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

☒ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above:

24628

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

☒ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number:

OR

☐ Firm or Individual Name

Address

City

State

Zip

Country

Telephone

Email

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

Altronic LLC

- ☐ Inventor or Joint Inventor (title not required below)
- ☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)
- ☒ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)
- ☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature

Date (Optional)

February 14 2024

Name

David T. Lepley

Title

President of Altronic LLC

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ Total of forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.122, 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 the 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.



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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/702,003	02/02/2007	Joseph M. Lepley	66374-281

25269
DYKEMA GOSSETT PLLC
FRANKLIN SQUARE, THIRD FLOOR WEST
1300 I STREET, NW
WASHINGTON, DC 20005

CONFIRMATION NO. 1990
POA ACCEPTANCE LETTER



Date Mailed: 05/10/2012

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 04/26/2012.

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.

/hgray/

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



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United States Patent and Trademark Office
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/702,003	02/02/2007	Joseph M. Lepley	0069-062971

28289
THE WEBB LAW FIRM, P.C.
ONE GATEWAY CENTER
420 FT. DUQUESNE BLVD, SUITE 1200
PITTSBURGH, PA 15222

CONFIRMATION NO. 1990 POWER OF ATTORNEY NOTICE



OC000000054119251

Date Mailed: 05/10/2012

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 04/26/2012.

- 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).

/hgray/

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

11/702 003

PTO/SB/80 (11-08)

Approved for use through 11/30/2011. OMB 0851-0035

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:

25269

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:

25269

OR

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

Assignee Name and Address:

Altronic, LLC
712 Trumbull Avenue
Girard, Ohio 44420

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.

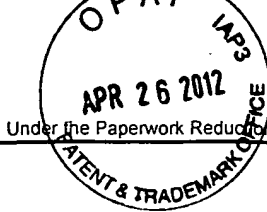
SIGNATURE of Assignee of Record

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

Signature	<i>[Signature]</i>	Date	MARCH 30, 2012
Name	WERNER GOTTLIEB	Telephone	330-288-0911
Title	PRESIDENT AND MANAGING DIRECTOR		

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.



STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: Altronic LLC

Application No./Patent No.: 7,401,603

Filed/Issue Date: 7/22/2008

Titled: **HIGH TENSION CAPACITIVE DISCHARGE IGNITION WITH REINFORCING TRIGGERING PULSES**

Altronic LLC, a Corporation

(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 023915, Frame 0744, 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: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

2. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, 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.

Werner Gottlieb
Signature

MARCH 30, 2012
Date

PRESIDENT AND
MANAGING DIRECTOR
Title

WERNER GOTTLIEB
Printed or Typed Name



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/702,003	02/02/2007	Joseph M. Lepley	0069-062971

CONFIRMATION NO. 1990

PUBLICATION NOTICE



OC000000031431975

28289
THE WEBB LAW FIRM, P.C.
700 KOPPERS BUILDING
436 SEVENTH AVENUE
PITTSBURGH, PA 15219

Title:HIGH TENSION CAPACITIVE DISCHARGE IGNITION WITH REINFORCING TRIGGERING PULSES

Publication No.US-2008-0184977-A1

Publication Date:08/07/2008

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/>.

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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.

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



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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/702,003	07/22/2008	7401603	0069-062971	1990

28289 7590 07/02/2008
THE WEBB LAW FIRM, P.C.
700 KOPPERS BUILDING
436 SEVENTH AVENUE
PITTSBURGH, PA 15219

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 30 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):

Joseph M. Lepley, Girard, OH;

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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
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28289 7590 05/06/2008

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Lori A. Fratangelo

(Depositor's name)

Lori A. Fratangelo

(Signature)

June 9, 2008

(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

11/702,003

02/02/2007

Joseph M. Lepley

0069-062971

1990

TITLE OF INVENTION: HIGH TENSION CAPACITIVE DISCHARGE IGNITION WITH REINFORCING TRIGGERING PULSES

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
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nonprovisional

YES

\$720

\$300

\$0

\$1020

08/06/2008

EXAMINER	ART UNIT	CLASS-SUBCLASS
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ARGENBRIGHT, TONY MICHAEL

3747

123-596000

06/17/2008 MBELETE2 00000038 11702003

01 FC:2501

720.00 OP

02 FC:1504

300.00 OP

03 FC:1801

30.00 OP

04 FC:9999

10.00 OP

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, 18001 (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.

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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

Altronic, Inc.

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Girard, Ohio

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 10

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☐ 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

David C. hanson

Date

June 9, 2008

Typed or printed name

David C. hanson

Registration No.

23,024

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.

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Exhibit 1002

approved TMA 5/21/08

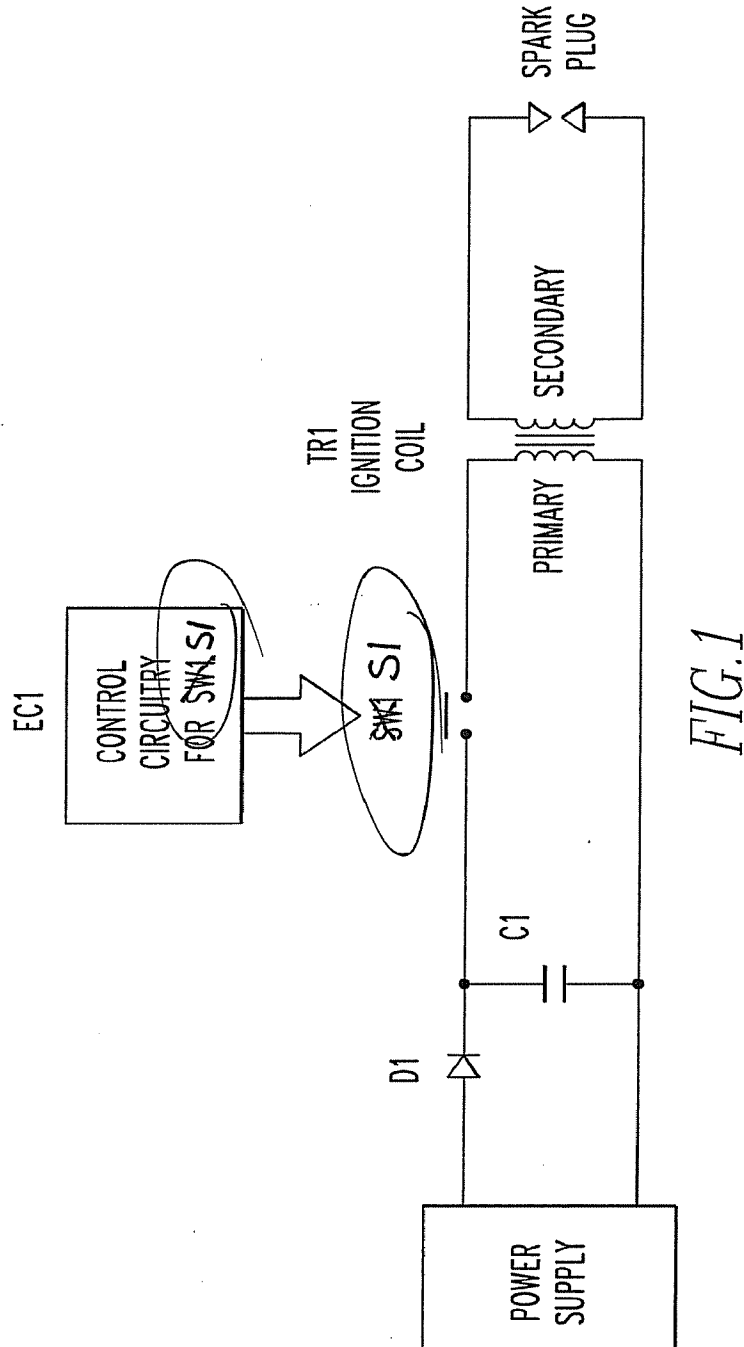


FIG. 1



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www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/702,003	02/02/2007	Joseph M. Lepley	0069-062971	1990

28289 7590 05/22/2008
THE WEBB LAW FIRM, P.C.
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436 SEVENTH AVENUE
PITTSBURGH, PA 15219

EXAMINER

ARGENBRIGHT, TONY MICHAEL

ART UNIT	PAPER NUMBER
----------	--------------

3747

MAIL DATE	DELIVERY MODE
-----------	---------------

05/22/2008

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.

Response to Rule 312 Communication	Application No.	Applicant(s)
	11/702,003	LEPLEY, JOSEPH M.
	Examiner	Art Unit
	T. M. Argenbright	3747

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

1. ☒ The amendment filed on 19 May 2008 under 37 CFR 1.312 has been considered, and has been:

a) ☒ entered.

b) ☐ entered as directed to matters of form not affecting the scope of the invention.

c) ☐ disapproved because the amendment was filed after the payment of the issue fee.

Any amendment filed after the date the issue fee is paid must be accompanied by a petition under 37 CFR 1.313(c)(1) and the required fee to withdraw the application from issue.

d) ☐ disapproved. See explanation below.

e) ☐ entered in part. See explanation below.

/T. M. Argenbright/
Primary Examiner, Art Unit 3747

Application No. 11/702,003
Paper Dated: May 19, 2008
In Reply to Notice of Allowance of May 6, 2008
Attorney Docket No. 0069-062971

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No. : 11/702,003 Confirmation No. 1990
Applicant : JOSEPH M. LEPLEY
Filed : February 2, 2007
Title : HIGH TENSION CAPACITIVE DISCHARGE
IGNITION WITH REINFORCING TRIGGERING
PULSES
Group Art Unit : 3747
Examiner :
Customer No. : 28289

Mail Stop ISSUE FEE
Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

AMENDMENT UNDER RULE 312

Sir:

In response to the Notice of Allowance dated May 6, 2008, Applicant submits the following amendments and remarks.

Amendments to the Drawings begin on page 2 of this paper and include both an attached replacement sheet and an annotated sheet showing changes.

Remarks begin on page 3 of this paper.

I hereby certify that this correspondence is being electronically submitted to the United States Patent and Trademark Office on May 19, 2008.

05/19/2008
Date


Signature

Lori A. Fratangelo

Typed Name of Person Signing Certificate

Application No. 11/702,003
Paper Dated: May 19, 2008
In Reply to Notice of Allowance of May 6, 2008
Attorney Docket No. 0069-062971

AMENDMENTS TO THE DRAWINGS

The attached sheet of drawing includes changes to Fig. 1. In Fig. 1, "SW1" has been amended to read "S1" (both occurrences). This sheet, which includes Fig. 1, replaces the original sheet including Fig. 1.

Attachment: Replacement Sheet
Annotated Sheet Showing Changes

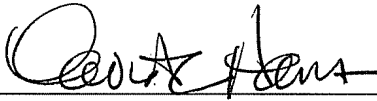
Application No. 11/702,003
Paper Dated: May 19, 2008
In Reply to Notice of Allowance of May 6, 2008
Attorney Docket No. 0069-062971

REMARKS

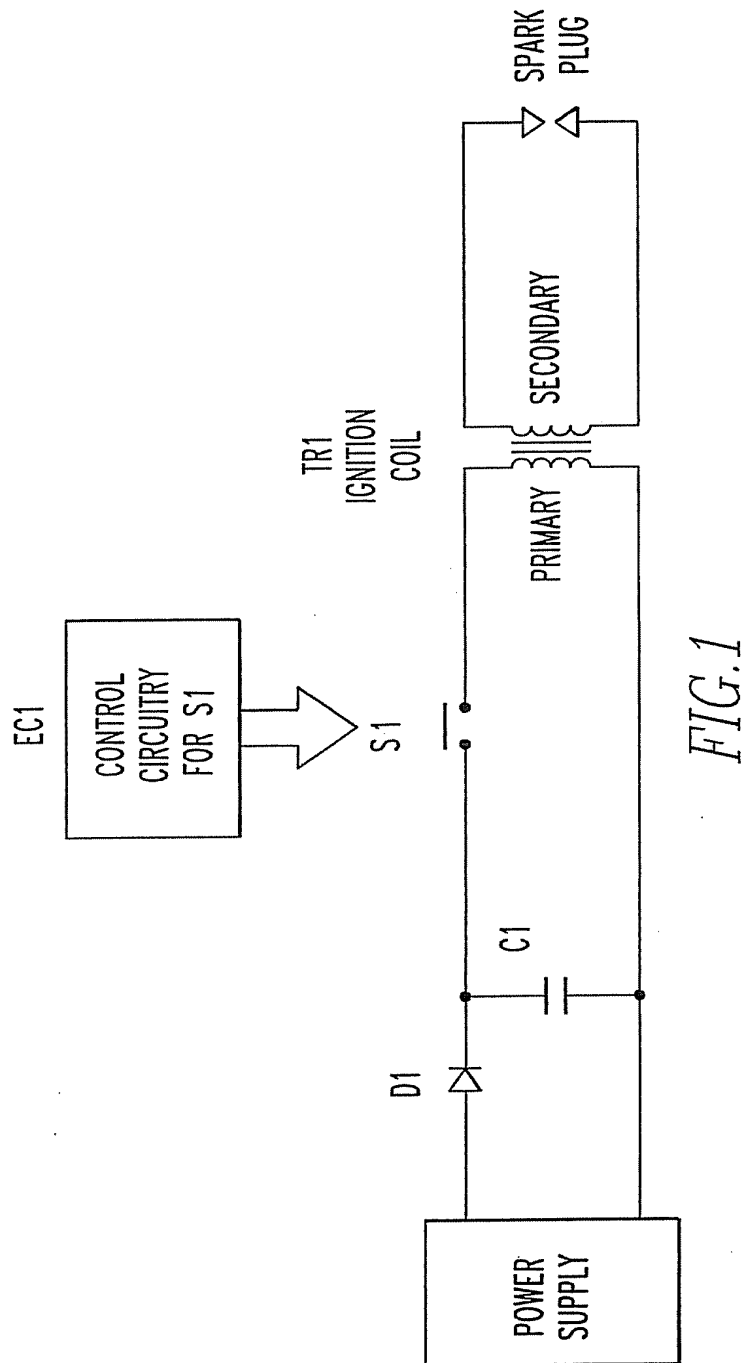
In response to the Notice of Allowability dated May 6, 2008, Applicant submits amended Fig. 1. As noted in the Notice of Allowability, "SW1" appears twice in Fig. 1 but not in the specification. Therefore, Applicant has amended Fig. 1 to read "S1." A replacement sheet containing Fig. 1 is submitted herewith.

Respectfully submitted,

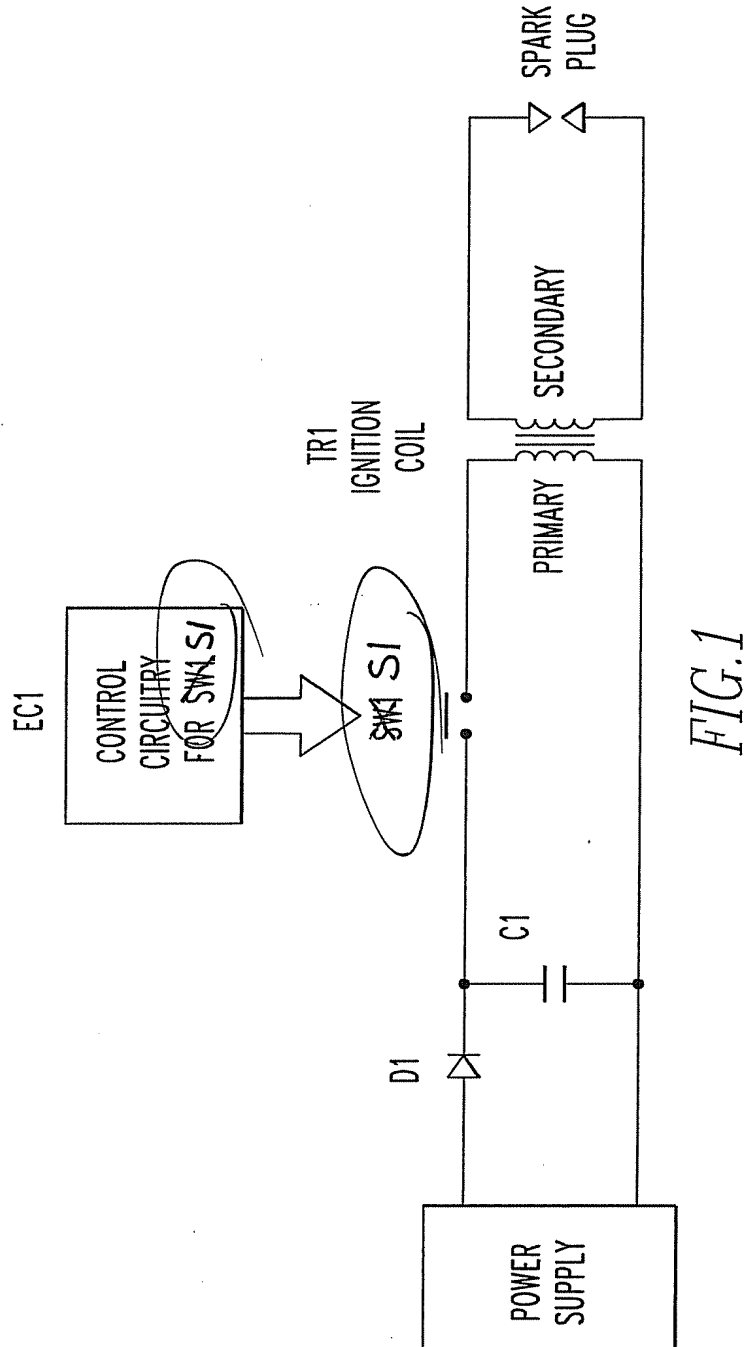
THE WEBB LAW FIRM

By 

David C. Hanson, Reg. No. 23,024
Attorney for Applicant
436 Seventh Avenue
700 Koppers Building
Pittsburgh, PA 15219
Telephone: (412) 471-8815
Facsimile: (412) 471-4094
E-mail: webblaw@webblaw.com



1/11



Electronic Acknowledgement Receipt

EFS ID:	3323435
Application Number:	11702003
International Application Number:	
Confirmation Number:	1990
Title of Invention:	HIGH TENSION CAPACITIVE DISCHARGE IGNITION WITH REINFORCING TRIGGERING PULSES
First Named Inventor/Applicant Name:	Joseph M. Lepley
Customer Number:	28289
Filer:	David C. Hanson/Lori Fratangelo
Filer Authorized By:	David C. Hanson
Attorney Docket Number:	0069-062971
Receipt Date:	19-MAY-2008
Filing Date:	02-FEB-2007
Time Stamp:	15:44:37
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
1	Miscellaneous Incoming Letter	transmittalform_0001-1.pdf	131869 b7329b2f3c7e31d96253f658140e0b3a a04dccc4	no	1

Warnings:

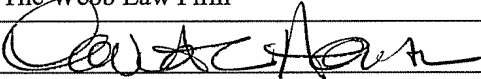
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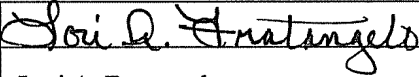
2	Amendment after Notice of Allowance (Rule 312)	312amendment.pdf	248454 f0e628492c3fdb7e54214630774db6f56 66b820a	no	5
Warnings:					
Information:					
Total Files Size (in bytes):				380323	
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TRANSMITTAL FORM <i>(to be used for all correspondence after initial filing)</i>	Application Number	11/702,003	
	Filing Date	2/2/2007	
	First Named Inventor	Joseph M. Lepley	
	Art Unit	3747	
	Examiner Name	Tony Michael Argenbright	
Total Number of Pages in This Submission	6	Attorney Docket Number	0069 - 062971

ENCLOSURES (check all that apply)		
☐ Fee Transmittal Form ☐ Fee Attached ☐ Amendment / Reply ☐ After Final ☐ Affidavits/declaration(s) ☐ Extension of Time Request ☐ Express Abandonment Request ☐ Information Disclosure Statement ☐ Certified Copy of Priority Document(s) ☐ Reply to Missing Parts/ Incomplete Application ☐ Reply to Missing Parts Under 37 CFR 1.52 or 1.53	☒ Drawing(s) ☐ Licensing-related Papers ☐ Petition ☐ Petition to convert to a Provisional Application ☐ Power of Attorney, Revocation Change of Correspondence Address ☐ Terminal Disclaimer ☐ Request for Refund ☐ CD, Number of CD(s) _____ ☐ Landscape Table on CD	☒ After Allowance communication to TC ☐ Appeal Communication to Board of Appeals and Interferences ☐ Appeal Communication to TC (Appeal Notice, Brief, Reply Brief) ☐ Proprietary Information ☐ Status Letter ☐ Other Enclosure(s) (please identify below):
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Firm Name	The Webb Law Firm		
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Date	May 19, 2008	Reg. No.	23024

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28289 7590 05/06/2008

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EXAMINER

ARGENBRIGHT, TONY MICHAEL

ART UNIT

PAPER NUMBER

3747

DATE MAILED: 05/06/2008

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

11/702,003

02/02/2007

Joseph M. Lepley

0069-062971

1990

TITLE OF INVENTION: HIGH TENSION CAPACITIVE DISCHARGE IGNITION WITH REINFORCING TRIGGERING PULSES

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	\$720	\$300	\$0	\$1020	08/06/2008

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.

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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.

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28289 7590 05/06/2008

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/702,003	02/02/2007	Joseph M. Lepley	0069-062971	1990

TITLE OF INVENTION: HIGH TENSION CAPACITIVE DISCHARGE IGNITION WITH REINFORCING TRIGGERING PULSES

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	\$720	\$300	\$0	\$1020	08/06/2008

EXAMINER	ART UNIT	CLASS-SUBCLASS
ARGENBRIGHT, TONY MICHAEL	3747	123-596000

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.
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- (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. 2 _____
- 3 _____

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(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:

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- ☐ Publication Fee (No small entity discount permitted)
- ☐ Advance Order - # of Copies _____

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- ☐ 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).

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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.

Exhibit 1002



UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/702,003	02/02/2007	Joseph M. Lepley	0069-062971	1990

28289 7590 05/06/2008

THE WEBB LAW FIRM, P.C.
700 KOPPERS BUILDING
436 SEVENTH AVENUE
PITTSBURGH, PA 15219

EXAMINER

ARGENBRIGHT, TONY MICHAEL

ART UNIT

PAPER NUMBER

3747

DATE MAILED: 05/06/2008

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 34 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 34 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.

Notice of Allowability

Application No.

11/702,003

Examiner

T. M. Argenbright

Applicant(s)

LEPLEY, JOSEPH M.

Art Unit

3747

-- 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 4/27/07 preliminary amdt.
2. ☒ The allowed claim(s) is/are 1-16.
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 Draftsperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date 4/27/07
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 ____.

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

The application has been amended as follows:

Drawings

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: Figure 1 contains "SW1" (two occurrences). The specification and remainder of the Figures use "S1" for the controllable switch. Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d).

The following is an examiner's statement of reasons for allowance: The prior art does not teach or suggest driving a controllable switch with a pulse train to cause primary winding pulses timed to reinforce ringing of transformer secondary voltage resulting from prior primary pulses.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the

Art Unit: 3747

issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to T. M. Argenbright whose telephone number is 571-272-4837. The examiner can normally be reached M-Th 6:30am-3:00pm and alt. Fridays 6:30am-2:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen K. Cronin can be reached on 571-272-4536. 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.

/T. M. Argenbright/
Primary Examiner, Art Unit 3747

Notice of References Cited	Application/Control No. 11/702,003		Applicant(s)/Patent Under Reexamination LEPLEY, JOSEPH M.	
	Examiner T. M. Argenbright		Art Unit 3747	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-6,662,792 B2	12-2003	Dutt et al.	123/598
*	B	US-3,906,919	09-1975	Asik et al.	123/598
*	C	US-4,327,701	05-1982	Gerry, Martin E.	123/598
*	D	US-4,479,467	10-1984	Burrows et al.	123/606
	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. 1990

SERIAL NUMBER 11/702,003	FILING or 371(c) DATE 02/02/2007 RULE	CLASS 123	GROUP ART UNIT 3747	ATTORNEY DOCKET NO. 0069-062971	
APPLICANTS Joseph M. Lepley, Girard, OH; ** CONTINUING DATA ***** ** FOREIGN APPLICATIONS ***** ** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** * SMALL ENTITY ** 03/07/2007					
Foreign Priority claimed ☐ Yes ☒ No 35 USC 119(a-d) conditions met ☐ Yes ☒ No Verified and /TONY MICHAEL ARGENBRIGHT/ Acknowledged Examiner's Signature	☐ Met after Allowance Initials	STATE OR COUNTRY OH	SHEETS DRAWINGS 11	TOTAL CLAIMS 16	INDEPENDENT CLAIMS 2
ADDRESS THE WEBB LAW FIRM, P.C. 700 KOPPERS BUILDING 436 SEVENTH AVENUE PITTSBURGH, PA 15219 UNITED STATES					
TITLE High tension capacitive discharge ignition with reinforcing triggering pulses					
FILING FEE RECEIVED 1095	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		

Search Notes 	Application/Control No. 11702003	Applicant(s)/Patent Under Reexamination LEPLEY, JOSEPH M.
	Examiner T. M Argenbright	Art Unit 3747

SEARCHED			
Class	Subclass	Date	Examiner
123	598,605,606,620,637	4/15/08	TMA
315	209T,209CD	4/15/08	TMA

SEARCH NOTES		
Search Notes	Date	Examiner
Interference Search History Printout	4/16/08	TMA

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner
PGPUB TEXT SEARCH (see printout)		4/16/08	TMA

<i>Index of Claims</i> 	Application/Control No. 11702003	Applicant(s)/Patent Under Reexamination LEPLEY, JOSEPH M.
	Examiner T. M Argenbright	Art Unit 3747

✓	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	04/15/2008								
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	4	=								
	5	=								
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	12	=								
	13	=								
	14	=								
	15	=								
	16	=								

EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L4	42	((ring\$ or oscillat\$) and ignition and capacitor).clm.	US-PGPUB	OR	ON	2008/04/16 13:19

4/ 16/ 08 1:23:06 PM

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Substitute for form 1449A/PTO		Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>		Application Number	11/702,003
		Filing Date	February 2, 2007
		First Named Inventor	Joseph M. Lepley
		Art Unit	3747
		Examiner Name	Not Yet Assigned
		Attorney Docket Number	0069-062971
Sheet	1		

U.S. PATENT DOCUMENTS					
Examiner Initials*	Cite No. ¹	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number - Kind Code ² (if known)			
/TA/		US- 4,004,561 B1	01/25/1977	Thieme	
/TA/		US- 5,429,103 B1	07/04/1995	Rich	
/TA/		US- 5,754,011 B1	05/19/1998	Frus et al.	
		US-			
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FOREIGN PATENT DOCUMENTS						
Examiner Initials*	Cite No. ¹	Foreign Patent Document	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
		Country Code ³ Number ⁴ Kind Code ⁵ (if known)				

Examiner Signature	/Tony Argenbright/	Date Considered	04/15/2008
--------------------	--------------------	-----------------	------------

*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. 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.

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 2 hours 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.



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www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
11/702,003	02/02/2007	3747	1095	0069-062971	16	2

CONFIRMATION NO. 1990

UPDATED FILING RECEIPT

28289
THE WEBB LAW FIRM, P.C.
700 KOPPERS BUILDING
436 SEVENTH AVENUE
PITTSBURGH, PA15219

Date Mailed: 05/15/2007

Receipt is acknowledged of this regular Patent Application. It will be considered in its order and you will be notified as to the results of the examination. Be sure to provide the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION when inquiring about this application. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please mail to the Commissioner for Patents P.O. Box 1450 Alexandria Va 22313-1450. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections (if appropriate).**

Applicant(s)

Joseph M. Lepley, Girard, OH;

Assignment For Published Patent Application

ALTRONIC, INC., Girard, OH

Power of Attorney: The patent practitioners associated with Customer Number 28289

Domestic Priority data as claimed by applicant

Foreign Applications

If Required, Foreign Filing License Granted: 03/07/2007

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is
US11/702,003

Projected Publication Date: 08/07/2008

Non-Publication Request: No

Early Publication Request: No

**** SMALL ENTITY ****

Title

High tension capacitive discharge ignition with reinforcing triggering pulses

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4158).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the

subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).



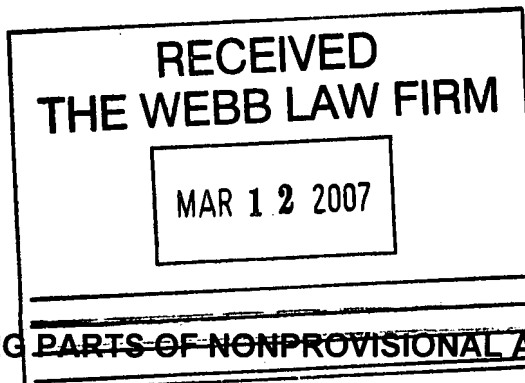
UNITED STATES PATENT AND TRADEMARK OFFICE

APR 27 2007

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 United States Patent and Trademark Office
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 P.O. Box 1450
 Alexandria, Virginia 22313-1450
 www.uspto.gov

APPLICATION NUMBER	FILING OR 371 (c) DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NUMBER
11/702,003	02/02/2007	Joseph M. Lepley	0069-062971

28289
 THE WEBB LAW FIRM, P.C.
 700 KOPPERS BUILDING
 436 SEVENTH AVENUE
 PITTSBURGH, PA 15219



CONFIRMATION NO. 1990
 FORMALITIES
 LETTER

Date Mailed: 03/08/2007

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

Filing Date Granted

Items Required To Avoid Abandonment:

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items and pay any fees required below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The statutory basic filing fee is missing.
Applicant must submit \$ 150 to complete the basic filing fee for a small entity.
- The oath or declaration is missing. *A properly signed oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date, is required.*
Note: If a petition under 37 CFR 1.47 is being filed, an oath or declaration in compliance with 37 CFR 1.63 signed by all available joint inventors, or if no inventor is available by a party with sufficient proprietary interest, is required.

The applicant needs to satisfy supplemental fees problems indicated below.

The required item(s) identified below must be timely submitted to avoid abandonment:

- Additional claim fees of \$180 as a small entity, including any required multiple dependent claim fee, are required. Applicant must submit the additional claim fees or cancel the additional claims for which fees are due.
- To avoid abandonment, a surcharge (for late submission of filing fee, search fee, examination fee or oath or declaration) as set forth in 37 CFR 1.16(f) of \$65 for a small entity in compliance with 37 CFR 1.27, must be submitted with the missing items identified in this letter.

04/30/2007 CNGUYEN2 00000039 11702003

SUMMARY OF FEES DUE:

Total additional fee(s) required for this application is \$745 for a small entity

01 FC:2011	150.00 OP
02 FC:2111	250.00 OP
03 FC:2311	100.00 OP
04 FC:2051	65.00 OP
05 FC:2202	350.00 OP
06 FC:2203	180.00 OP

- \$150 Statutory basic filing fee.

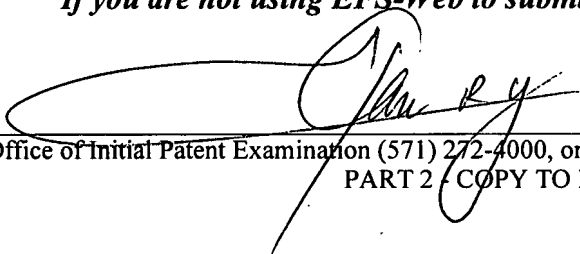
- \$65 Surcharge.
- The application search fee has not been paid. Applicant must submit **\$250** to complete the search fee.
- The application examination fee has not been paid. Applicant must submit **\$100** to complete the examination fee for a small entity in compliance with 37 CFR 1.27.
- Total additional claim fee(s) for this application is **\$180**
 - **\$180** for multiple dependent claim surcharge.

Replies should be mailed to: Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web.
<https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html>

For more information about EFS-Web please call the USPTO Electronic Business Center at **1-866-217-9197** or visit our website at <http://www.uspto.gov/ebc>.

If you are not using EFS-Web to submit your reply, you must include a copy of this notice.



Office of Initial Patent Examination (571) 272-4000, or 1-800-PTO-9199

PART 2 / COPY TO BE RETURNED WITH RESPONSE

Application No. 11/702,003
Paper Dated April 25, 2007
Reply to USPTO Corres. of March 8, 2007
Attorney Docket No. 0069-062971

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No. 11/702,003 Confirmation No. 1990
Applicants Joseph M. Lepley
Filed APR 27 2007 February 2, 2007
Title HIGH TENSION CAPACITIVE DISCHARGE IGNITION
WITH REINFORCING TRIGGERING PULSES
Art Unit : 3747
Examiner : Not Yet Assigned
Customer No. : 28289

LETTER

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

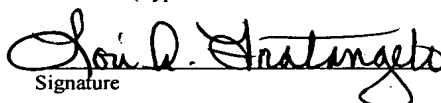
In response to Document PTO-1533 regarding "Notice To File Missing Parts of Nonprovisional Application Filed Under 37 CFR 1.53(b)" mailed March 8, 2007, attached hereto are the following documents for filing in the above-identified United States Patent Application:

1. Fee Transmittal Letter in triplicate for purposes of calculating the filing fees;
2. the required Declaration and Power of Attorney;
3. the required copy of the above-mentioned "Notice" to be returned with the response;

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on April 25, 2007.

Lori A. Fratangelo

(Type or Print Name of Person Making Deposit)


Signature

04/25/2007
Date

4. our check in the amount of \$1,095.00 to cover the filing fees and surcharge;

5. Preliminary Amendment; and

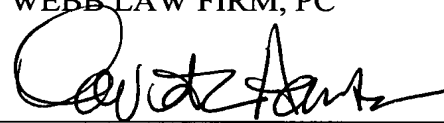
6. Information Disclosure Statement.

The Commissioner is hereby authorized to charge any additional fees as set forth in 37 CFR 1.16 and 1.17 which may be required to Deposit Account No. 23-0650. Please refund any overpayment to Deposit Account No. 23-0650. The original and two copies of this Letter are attached.

Respectfully submitted,

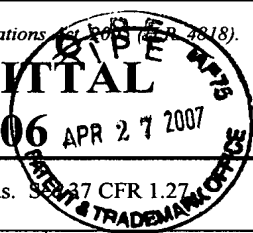
THE WEBB LAW FIRM, PC

By



David C. Hanson, Reg. No. 23,024
Attorney for Applicant
700 Koppers Building
436 Seventh Avenue
Pittsburgh, PA 15219
Telephone: 412-471-8815
Facsimile: 412-471-4094
E-Mail: webblaw@webblaw.com

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.

<i>Fees pursuant to the Consolidated Appropriations Act, 2006 (P.L. 109-178).</i> FEE TRANSMITTAL For FY 2006 		Complete if Known <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:30%;">Application Number</td> <td>11/702,003</td> </tr> <tr> <td>Filing Date</td> <td>February 2, 2007</td> </tr> <tr> <td>First Named Inventor</td> <td>Joseph M. Lepley</td> </tr> <tr> <td>Examiner Name</td> <td>Not Yet Assigned</td> </tr> <tr> <td>Art Unit</td> <td>3747</td> </tr> <tr> <td>Attorney Docket No.</td> <td>0069-062971</td> </tr> </table>		Application Number	11/702,003	Filing Date	February 2, 2007	First Named Inventor	Joseph M. Lepley	Examiner Name	Not Yet Assigned	Art Unit	3747	Attorney Docket No.	0069-062971
Application Number	11/702,003														
Filing Date	February 2, 2007														
First Named Inventor	Joseph M. Lepley														
Examiner Name	Not Yet Assigned														
Art Unit	3747														
Attorney Docket No.	0069-062971														
☒ Applicant claims small entity status. See 37 CFR 1.27															
TOTAL AMOUNT OF PAYMENT (\$) 1,095.00															

METHOD OF PAYMENT (check all that apply)

☒ Check
 ☐ Credit Card
 ☐ Money Order
 ☐ None
 ☐ Other (please identify): _____

☒ Deposit Account
 Deposit Account Number: 23-0650
 Deposit Account Name: _____

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

☐ Charge fee(s) indicated below
 ☐ Charge fee(s) indicated below, **except for the filing fee**

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

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

FEE CALCULATION (All the fees below are due upon filing or may be subject to a surcharge.)

1. BASIC FILING, SEARCH, AND EXAMINATION FEES

Application Type	FILING FEES		SEARCH FEES		EXAMINATION FEES		Fees Paid (\$)
	Small Entity Fee (\$)	Small Entity Fee (\$)	Small Entity Fee (\$)	Small Entity Fee (\$)	Small Entity Fee (\$)	Small Entity Fee (\$)	
Utility	300	150	500	250	200	100	500
Design	200	100	100	50	130	65	
Plant	200	100	300	150	160	80	
Reissue	300	150	500	250	600	300	
Provisional	200	100	0	0	0	0	

2. EXCESS CLAIM FEES

Fee Description	Small Entity Fee (\$)	Small Entity Fee (\$)
Each claim over 20 (including Reissues)	50	25
Each independent claim over 3 (including Reissues)	200	100
Multiple dependent claims	360	180

Multiple Dependent Claims

Total Claims	Extra Claims	Fee (\$)	Fee Paid (\$)
34 - 20 or HP =	14	25	350

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

Indep. Claims	Extra Claims	Fee (\$)	Fee Paid (\$)
2 - 3 or HP =	0		

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

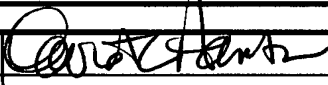
3. APPLICATION SIZE FEE

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 \$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).

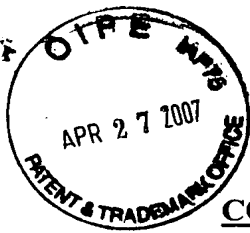
Total Sheets	Extra Sheets	Number of each additional 50 or fraction thereof	Fee (\$)	Fee Paid (\$)
- 100 =	/ 50 =	(round up to a whole number) x		

4. OTHER FEE(S)

	Fees Paid (\$)
Non-English Specification, \$130 fee (no small entity discount)	
Other (e.g., late filing surcharge): <u>late filing surcharge</u>	65

SUBMITTED BY			
Signature		Registration No. (Attorney/Agent)	23,024
Name (Print/Type)	David C. Hanson	Telephone	412-471-8815
		Date	April 25, 2007

This collection of information is required by 37 CFR 1.136. 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 30 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.



Utility (NOT Claiming Benefit to Provisional Application)
or Design Application

Application No. 11/702,003
Attorney Docket No. 0069-062971

COMBINED DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that:

My residence, mailing address and citizenship are as stated below next to my name.

I believe the inventor(s) named below to be the original and first inventor(s) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

**HIGH TENSION CAPACITIVE DISCHARGE IGNITION
WITH REINFORCING TRIGGERING PULSES**

(Invention Title)

the specification of which:

☐ is filed concurrently herewith.

OR

☒ was filed as U.S. Application No. 11/702,003 on 02/02/2007 (mm/dd/yyyy) and was amended on _____ (mm/dd/yyyy).
(if applicable)

OR

☐ was filed as PCT International Application No. _____ on _____ (mm/dd/yyyy) and was amended under PCT Article 19 on _____ (mm/dd/yyyy) and/or PCT Article 34 on _____ (mm/dd/yyyy).
(if applicable) (if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claim(s), as amended by any amendment referred to above.

I do not know and do not believe that the invention was ever known or used in the United States before my invention thereof; or patented or described in any printed publication in any country any time by others before my invention or by anyone more than one year prior to this application; or in public use or on sale in the United States by anyone more than one year prior to this application.

I do not know and do not believe that the invention has been patented or caused to be patented, or was the subject of an inventor's certificate, by me or my legal representatives or assigns in any country foreign to the United States on a patent application or inventor's certificate filed more than twelve months, or six months for a design application, prior to the filing date in the United States of this application.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, §1.56.

Utility (NOT Claiming Benefit to Provisional Application)
or Design Application

Application No. 11/702,003
Attorney Docket No. 0069-062971

I hereby claim foreign priority benefits under Title 35, United States Code, §119(a)-(d) or (f), or §365(b) of any foreign application(s) for patent, inventor's or plant breeder's rights certificate(s), or §365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent, inventor's or plant breeder's rights certificate(s), or any PCT international application having a filing date before that of the application on which priority is claimed.

PRIOR FOREIGN APPLICATION NO.	COUNTRY	FOREIGN FILING DATE (mm/dd/yyyy)	PRIORITY NOT CLAIMED	CERTIFIED COPY ATTACHED?	
			☐	YES ☐	NO ☐

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

APPLICATION NO.	FILING DATE

I hereby appoint the practitioners associated with

Customer Number 28289

to prosecute this application and to transact all business in the United States Patent and Trademark Office connected therewith.

Please send all correspondence to Customer Number 28289.

Please direct all telephone calls to David C. Hanson, at telephone number (412) 471-8815.

The law firm of **THE WEBB LAW FIRM** whose address is 700 Koppers Building, 436 Seventh Avenue, Pittsburgh, Pennsylvania 15219, Telephone No. 412-471-8815 has been assigned Customer Number 28289 by the United States Patent and Trademark Office.

Utility (NOT Claiming Benefit to Provisional Application)
or Design Application

Application No. 11/702,003
Attorney Docket No. 0069-062971

I hereby 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 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

1.

FULL NAME OF INVENTOR	
Joseph M. Lepley	
INVENTOR'S SIGNATURE	DATE
<i>Joseph M. Lepley</i>	4/12/07
RESIDENCE	
Girard, Ohio	
COUNTRY OF CITIZENSHIP	
US	
MAILING ADDRESS	
5602 Greenbriar Drive, Girard, Ohio 44420	

2.

FULL NAME OF INVENTOR	
INVENTOR'S SIGNATURE	DATE
RESIDENCE	
COUNTRY OF CITIZENSHIP	
MAILING ADDRESS	

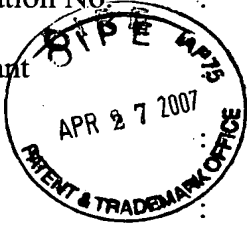
* Before signing this declaration each person signing must:

1. Review the declaration and verify the correctness of all information therein; and
2. Review the specification and the claims, including any amendments made to the claims.

☐ Checked Box indicates _____ additional page(s) for inventor signatures.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No. : 11/702,003 Confirmation No. 1990
Applicant : Joseph M. Lepley
Filed : February 2, 2007
Title : HIGH TENSION CAPACITIVE DISCHARGE IGNITION
WITH REINFORCING TRIGGERING PULSES
Art Unit : 3747
Examiner : Not Yet Assigned
Customer No. : 28289
Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450



PRELIMINARY AMENDMENT

Sir:

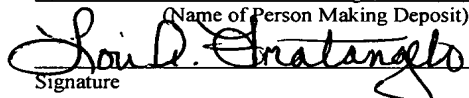
Preliminary to examination, please amend the above-identified application as follows.

Amendments to the Specification begin on page 2 of this paper.

Amendments to the claims are reflected in the listing of claims which begins on page 3 of this paper.

Remarks begin on page 7 of this paper.

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on April 25, 2007.

Lori A. Fratangelo
(Name of Person Making Deposit)

Signature Date 04/25/2007

AMENDMENTS TO THE SPECIFICATION

Please replace paragraph [0041] with the following amended paragraph:

[0041] Referring to Fig. 9, the secondary current which results from a traditional control signal to switch S1 has a waveform shape which is roughly equivalent to a triangle. The power (Watts) supplied by the coil to the load is equal to the secondary current multiplied by the secondary voltage during the time that the current is flowing in the spark gap. The energy (Joules) delivered to the spark gap is the integral with respect to time of the power waveform. A formula which can be used to estimate the spark energy in Joules is:

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims

Claim 1 (Currently Amended): In a capacitive discharge ignition system for an internal combustion engine comprising: a storage capacitor ~~and diode in series therewith~~; a power supply connected in series with the storage capacitor ~~and diode~~; an ignition transformer having primary and secondary windings; and a controllable switch; the primary winding of the ignition transformer and the storage capacitor being connected in series through the controllable switch; a spark plug connected in series with the secondary winding of the ignition transformer; the improvement comprising an electronic control circuit for driving the controllable switch which is operating in synchronism with the engine such that the switch is initially closed for a period of time to transfer energy to the ignition coil primary, that after this time, the switch is then opened for a second period of time and then the switch is again closed creating a pulse train, such that the switch is controlled by a successive string of control pulses to the switch, each of the individual pulse times having a duration and spacing as determined by the control circuit, these pulses being arranged in time to occur when it is possible to reinforce the ringing action of the ignition transformer secondary voltage resulting from the previous primary pulses, such that the open circuit breakdown voltage capability of the ignition transformer is increased.

Claim 2 (Original): A device according to claim 1, wherein the control circuit for the controllable switch causes the switch to be opened and closed a variable number of times during each firing event until a spark breakdown is sensed.

Claim 3 (Original): A device according to claim 1, wherein the control circuit for the controllable switch causes the switch to be opened and closed a variable number of times up to a maximum number during each firing event to limit the highest available breakdown voltage of the coil.

Claim 4 (Original): A device according to claim 1, wherein the control circuit for the controllable switch causes the switch to be opened and closed a variable number of times during each firing event until a spark breakdown is sensed and the secondary

breakdown voltage required by the engine is estimated by counting the number of reinforcing primary pulses sent before the breakdown event is sensed.

Claim 5 (Original): A device according to claim 1, wherein the control circuit for the controllable switch drives the switch at an adjustable rate during the reinforcing time periods available so as to improve the resolution of the voltage sensing function.

Claim 6 (Currently Amended): A device according to claims 1, 2, 3, 4 ~~and~~ or 5, wherein the control circuit for the controllable switch operates in a closed loop manner by measuring the behavior of the circuit parameters to determine the exact wave shape of the pulse train sent to the controllable switch.

Claim 7 (Currently Amended): A device according to claims 1, 2, 3, 4 ~~and~~ or 5, wherein the control circuit for the controllable switch (S1) operates in an open loop manner by using a stored memory map to determine the exact wave shape of the pulse train sent to the controllable switch.

Claim 8 (Currently Amended): In a capacitive discharge ignition system for an internal combustion engine comprising: a storage capacitor ~~and diode in series therewith~~; a power supply connected in series with the storage capacitor ~~and diode~~; an ignition transformer having primary and secondary windings; and a controllable switch; the primary winding of the ignition transformer and the storage capacitor being connected in series through the controllable switch; a spark plug connected in series with the secondary winding of the ignition transformer; the improvement comprising an electronic control circuit for driving the controllable switch which is operating in synchronism with the engine such that the switch is initially closed for a period of time to transfer energy to the ignition coil primary, that after this time, the switch is then opened for a second period of time and then the switch is again closed creating a pulse train, such that the switch is controlled by a successive string of control pulses to the switch, each of the individual pulse times having a duration and spacing as determined by the control circuit, these pulses being arranged in time to occur when it is possible to reinforce the ringing action of the ignition transformer secondary voltage resulting from the previous primary pulses, such that the secondary circuit current capability of the ignition transformer is increased.

Claim 9 (Original): A device according to claim 8, wherein the control circuit drives the switch to establish the time period for which the switch remains closed such that the amplitude of the extended arc current of the spark is controlled.

Claim 10 (Original): A device according to claim 8, wherein the control circuit for the controllable switch causes the pulse train to continue to send additional pulses to drive the secondary current higher until a desired secondary current level is reached.

Claim 11 (Original): A device according to claim 8, wherein the control circuit for the controllable switch causes the pulse train for the control of the switch to continue to send additional pulses to drive the secondary current higher until a desired maximum secondary current level is reached and then suspend sending pulses until the current falls to a value below a desired minimum secondary current level when pulses are then sent again.

Claim 12 (Original): A device according to claim 8, wherein the control circuit for the controllable switch causes the pulse train for the control of the switch to continue to send additional pulses to drive the secondary current higher until a desired maximum secondary current level is reached and then suspend sending pulses until the current falls to a value below a desired minimum secondary current level when pulses are then sent again, for a desired total time of the spark duration.

Claim 13 (Currently Amended): A device according to claims 8, 9, 10, 11 and or 12, wherein the control circuit for the controllable switch operates in a closed loop manner by measuring the behavior of the circuit parameters to determine the exact wave shape of the pulse train sent to the controllable switch.

Claim 14 (Currently Amended): A device according to claims 8, 9, 10 and or 11, wherein the control circuit (EC1) for the controllable switch operates in an open loop manner by using a stored memory map to determine the exact wave shape of the pulse train sent to controllable switch.

Claim 15 (Original): A device according to claims 8, 9, 10 or 11, wherein the control circuit for the controllable switches enables the duration and amplitude of the extended arc current of the spark to be controlled independently of the initial breakdown voltage required to initiate the spark.

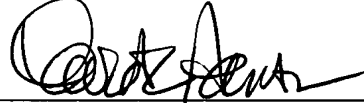
Claim 16 (Original): A device according to claim 12, wherein the control circuit for the controllable switch enables the secondary power versus time wave shape to be controlled to produce a spark having a desired energy envelope.

REMARKS

Examination and allowance of pending claims 1-16 are respectfully requested.

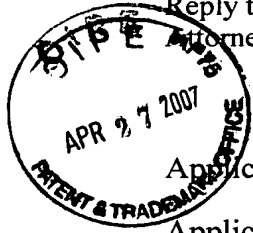
Respectfully submitted,

THE WEBB LAW FIRM

By 

David C. Hanson, Reg. No. 23,024
Attorney for Applicant
700 Koppers Building
436 Seventh Avenue
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Telephone: 412-471-8815
Facsimile: 412-471-4094
E-Mail: webblaw@webblaw.com

Application No. 11/702,003
Paper Dated April 25, 2007
Reply to USPTO Corres. of March 8, 2007
Attorney Docket No. 0069-062971



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No. : 11/702,003 Confirmation No. 1990
Applicants : Joseph M. Lepley
Filed : February 2, 2007
Title : HIGH TENSION CAPACITIVE DISCHARGE IGNITION
WITH REINFORCING TRIGGERING PULSES
Art Unit : 3747
Examiner : Not Yet Assigned
Customer No. : 28289

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

INFORMATION DISCLOSURE STATEMENT

Sir:

Pursuant to the requirements of 37 CFR §§ 1.56, 1.97, and 1.98, filed herewith is Form PTO/SB/08A identifying three patents that are referred to in the specification of the above-identified application.

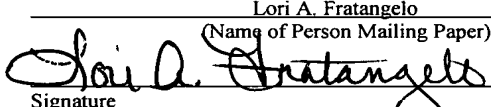
Respectfully submitted,

THE WEBB LAW FIRM

By 

David C. Hanson, Reg. No. 23,024
Attorney for Applicant
700 Koppers Building
436 Seventh Avenue
Pittsburgh, PA 15219
Telephone: 412-471-8815
Facsimile: 412-471-4094
E-Mail: webblaw@webblaw.com

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on April 25, 2007.


Signature
Lori A. Fratangelo
(Name of Person Mailing Paper)
04/25/2007
Date

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Substitute for form 1449A/PTO		Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT <i>(Use as many sheets as necessary)</i>		Application Number	11/702,003
		Filing Date	February 2, 2007
		First Named Inventor	Joseph M. Lepley
		Art Unit	3747
		Examiner Name	Not Yet Assigned
		Attorney Docket Number	0069-062971
Sheet	1		

U.S. PATENT DOCUMENTS					
Examiner Initials*	Cite No. ¹	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number - Kind Code ² (if known)			
		US- 4,004,561 B1	01/25/1977	Thieme	
		US- 5,429,103 B1	07/04/1995	Rich	
		US- 5,754,011 B1	05/19/1998	Frus et al.	
		US-			
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FOREIGN PATENT DOCUMENTS						
Examiner Initials*	Cite No. ¹	Foreign Patent Document	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
		Country Code ³ Number ⁴ Kind Code ⁵ (if known)				

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 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.

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 2 hours 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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04-27-07

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PATENT APPLICATION FEE DETERMINATION RECORD					11/702,003	
Substitute for Form PTO-875						
APPLICATION AS FILED – PART I						
(Column 1)		(Column 2)		SMALL ENTITY		OTHER THAN SMALL ENTITY
FOR	NUMBER FILED	NUMBER EXTRA		RATE (\$)	FEE (\$)	RATE (\$)
BASIC FEE (37 CFR 1.16(a), (b), or (c))					150	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))					250	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))					100	
TOTAL CLAIMS (37 CFR 1.16(i))	34	minus 20 =		X\$25=	350	X\$50
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2	minus 3 =		X\$100=		X\$200=
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					
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))						
* If the difference in column 1 is less than zero, enter "0" in column 2.						
APPLICATION AS AMENDED – PART II						
(Column 1)		(Column 2)		(Column 3)		OTHER THAN SMALL ENTITY
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	*	Minus **	=	X =	X =
	Independent (37 CFR 1.16(h))	*	Minus ***	=	X =	X =
	Application Size Fee (37 CFR 1.16(s))				N/A	N/A
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))				N/A	N/A
				TOTAL ADD'T FEE		TOTAL ADD'T FEE
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE (\$)	ADDITIONAL FEE (\$)
	Total (37 CFR 1.16(i))	*	Minus **	=	X =	X =
	Independent (37 CFR 1.16(h))	*	Minus ***	=	X =	X =
	Application Size Fee (37 CFR 1.16(s))				N/A	N/A
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))				N/A	N/A
				TOTAL ADD'T FEE		TOTAL ADD'T 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.						

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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04-27-07

PTO/SB/06 (12-04)

Approved for use through 7/31/2006. 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

11/702,003**APPLICATION AS FILED – PART I**

(Column 1) (Column 2)

FOR	NUMBER FILED	NUMBER EXTRA
BASIC FEE (37 CFR 1.18(a), (b), or (c))		
SEARCH FEE (37 CFR 1.18(k), (l), or (m))		
EXAMINATION FEE (37 CFR 1.18(o), (p), or (q))		
TOTAL CLAIMS (37 CFR 1.16(i))	34 minus 20 =	14
INDEPENDENT CLAIMS (37 CFR 1.18(h))	2 minus 3 =	
APPLICATION SIZE FEE (37 CFR 1.18(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	
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))		

* If the difference in column 1 is less than zero, enter "0" in column 2.

SMALL ENTITY

RATE (\$)	FEE (\$)
	150
	250
	100
X\$25=	350
X\$100=	
N/A	180
TOTAL	1030

OTHER THAN SMALL ENTITY

RATE (\$)	FEE (\$)
X\$50	
X\$200=	
N/A	
TOTAL	

OR

APPLICATION AS AMENDED – PART II

(Column 1) (Column 2) (Column 3)

AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
4/27/07			
Total (37 CFR 1.16(i))	16 Minus	34 **	2
Independent (37 CFR 1.18(h))	2 Minus	3 ***	
Application Size Fee (37 CFR 1.16(s))			
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))			

SMALL ENTITY

RATE (\$)	ADDITIONAL FEE (\$)
X =	
X =	
N/A	
TOTAL	
ADD'T FEE	

OTHER THAN SMALL ENTITY

RATE (\$)	ADDITIONAL FEE (\$)
X =	
X =	
N/A	
TOTAL	
ADD'T FEE	

OR

(Column 1) (Column 2) (Column 3)

AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total (37 CFR 1.16(i))	Minus	**	=
Independent (37 CFR 1.18(h))	Minus	***	=
Application Size Fee (37 CFR 1.16(s))			
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))			

RATE (\$)

ADDITIONAL FEE (\$)

RATE (\$)	ADDITIONAL FEE (\$)
X =	
X =	
N/A	
TOTAL	
ADD'T FEE	

OR

RATE (\$)	ADDITIONAL FEE (\$)
X =	
X =	
N/A	
TOTAL	
ADD'T FEE	

OR

* 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".

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APPLICATION NUMBER	FILING OR 371 (c) DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NUMBER
11/702,003	02/02/2007	Joseph M. Lepley	0069-062971

28289
 THE WEBB LAW FIRM, P.C.
 700 KOPPERS BUILDING
 436 SEVENTH AVENUE
 PITTSBURGH, PA 15219

CONFIRMATION NO. 1990
 FORMALITIES
 LETTER

Date Mailed: 03/08/2007

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

Filing Date Granted

Items Required To Avoid Abandonment:

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items and pay any fees required below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The statutory basic filing fee is missing.
Applicant must submit \$ 150 to complete the basic filing fee for a small entity.
- The oath or declaration is missing. *A properly signed oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date, is required.*
Note: If a petition under 37 CFR 1.47 is being filed, an oath or declaration in compliance with 37 CFR 1.63 signed by all available joint inventors, or if no inventor is available by a party with sufficient proprietary interest, is required.

The applicant needs to satisfy supplemental fees problems indicated below.

The required item(s) identified below must be timely submitted to avoid abandonment:

- Additional claim fees of **\$180** as a small entity, including any required multiple dependent claim fee, are required. Applicant must submit the additional claim fees or cancel the additional claims for which fees are due.
- To avoid abandonment, a surcharge (for late submission of filing fee, search fee, examination fee or oath or declaration) as set forth in 37 CFR 1.16(f) of \$65 for a small entity in compliance with 37 CFR 1.27, must be submitted with the missing items identified in this letter.

SUMMARY OF FEES DUE:

Total additional fee(s) required for this application is **\$745** for a small entity

- **\$150** Statutory basic filing fee.

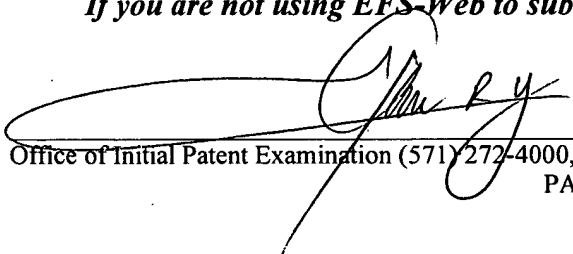
- **\$65 Surcharge.**
- The application search fee has not been paid. Applicant must submit **\$250** to complete the search fee.
- The application examination fee has not been paid. Applicant must submit **\$100** to complete the examination fee for a small entity in compliance with 37 CFR 1.27.
- Total additional claim fee(s) for this application is **\$180**
 - **\$180** for multiple dependent claim surcharge.

Replies should be mailed to: Mail Stop Missing Parts
 Commissioner for Patents
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 Alexandria VA 22313-1450

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web.
<https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html>

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
11/702,003	02/02/2007	3747	0.00	0069-062971	16	2

CONFIRMATION NO. 1990

FILING RECEIPT

28289
THE WEBB LAW FIRM, P.C.
700 KOPPERS BUILDING
436 SEVENTH AVENUE
PITTSBURGH, PA15219

Date Mailed: 03/08/2007

Receipt is acknowledged of this regular Patent Application. It will be considered in its order and you will be notified as to the results of the examination. Be sure to provide the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION when inquiring about this application. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please mail to the Commissioner for Patents P.O. Box 1450 Alexandria Va 22313-1450. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections (if appropriate).**

Applicant(s)

Joseph M. Lepley, Girard, OH;

Assignment For Published Patent Application

ALTRONIC, INC., Girard, OH

Power of Attorney: None

Domestic Priority data as claimed by applicant

Foreign Applications

If Required, Foreign Filing License Granted: 03/07/2007

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is
US11/702,003

Projected Publication Date: To Be Determined - pending completion of Missing Parts

Non-Publication Request: No

Early Publication Request: No

**** SMALL ENTITY ****

Title

High tension capacitive discharge ignition with reinforcing triggering pulses

Preliminary Class

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4158).

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Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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**UTILITY
PATENT APPLICATION
TRANSMITTAL**

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	0069-062971
First Inventor	Joseph M. Lepley
Title	"High Tension Capacitive Discharge Ignition With Reinforcing Triggering Pulses"
Express Mail Label No.	EV 919134851 US

U.S. PTO
11/702003
02/02/2007

APPLICATION ELEMENTS See MPEP chapter 600 concerning utility patent application contents.	ADDRESS TO: Commissioner for Patents P.O. Box 1450 Alexandria VA 22313-1450
1. ☐ Fee Transmittal Form (e.g., PTO/SB/17) (Submit an original and a duplicate for fee processing)	ACCOMPANYING APPLICATION PARTS
2. ☒ Applicant claims small entity status. See 37 CFR 1.27.	9. ☐ Assignment Papers (cover sheet & document(s)) Name of Assignee _____
3. ☒ Specification [Total Pages <u>13</u>] Both the claims and abstract must start on a new page (For information on the preferred arrangement, see MPEP 608.01(a))	10. ☐ 37CFR 3.73(b) Statement ☐ Power of Attorney (when there is an assignee)
4. ☒ Drawing(s) (35 U.S.C. 113) [Total Sheets <u>11</u>]	11. ☐ English Translation Document (if applicable)
5. Oath or Declaration [Total Sheets _____] a. ☐ 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) name in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).	12. ☐ Information Disclosure Statement (PTO/SB/08 or PTO-1449) ☐ Copies of foreign patent documents, Publications, & other information
6. ☒ Application Data Sheet. See 37 CFR 1.76	13. ☐ Preliminary Amendment
7. ☐ CD-ROM or CD-R in duplicate, large table or Computer Program (Appendix) ☐ Landscape Table on CD	14. ☒ Return Receipt Postcard (MPEP 503) (Should be specifically itemized)
8. Nucleotide and/or Amino Acid Sequence Submission (if applicable, items a.- c. are required) a. Computer Readable Form (CRF) i. ☐ Computer Readable Form (CRF) ii. ☐ Transfer Request (37 CFR 1.821(e)) b. Specification Sequence Listing on: i. ☐ CD-ROM or CD-R (2 copies); or ii. ☐ Paper c. ☐ Statements verifying identity of above copies	15. ☐ Certified Copy of Priority Document(s) (if foreign priority is claimed)
	16. ☐ Nonpublication Request under 35 U.S.C.122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent.
	17. ☒ Other: <u>Express Mail Transmittal</u>

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:

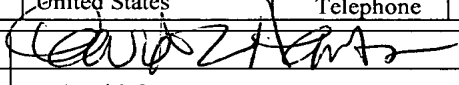
☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No: _____

Prior application information: Examiner _____ Art Unit: _____

19. CORRESPONDENCE ADDRESS

☒ The address associated with Customer Number: **28289** OR ☐ Correspondence address below

Name	The Webb Law Firm				
Address	700 Koppers Building 436 Seventh Avenue				
City	Pittsburgh	State	PA	Zip Code	15219
Country	United States	Telephone	412-471-8815	Fax	412-471-4094

Signature		Date	February 2, 2007	
Name (Print/Type)	David C. Hanson	Registration No. (Attorney/Agent)	23,024	

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MOTORTECH v. Altronic - IPR2025-00398

Page 68 of 97

Exhibit 1002

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF:

ATTORNEY'S DOCKET NUMBER

JOSEPH M. LEPLEY

0069-062971

ENTITLED

**“HIGH TENSION CAPACITIVE DISCHARGE WITH
REINFORCING TRIGGERING PULSES”**

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

EXPRESS MAIL CERTIFICATE

“Express Mail” Label Number EV 919134851 US

Date of Deposit February 2, 2007

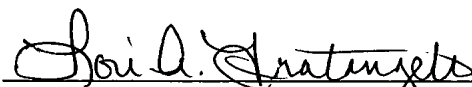
I hereby certify that the following attached paper or fee

UTILITY PATENT APPLICATION TRANSMITTAL (1 p.);
APPLICATION DATA SHEET (2 pp.);
SPECIFICATION (9 pp.) CLAIMS (16 - 3 pp.) and ABSTRACT (1 p.); and
ELEVEN (11) SHEETS OF FORMAL DRAWINGS

is being deposited with the United States Postal Service “Express Mail Post Office to Addressee” service under 37 C.F.R. §1.10 on the date indicated above and is addressed to the Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Lori A. Fratangelo

(Typed name of person mailing paper or fee)



(Signature of person mailing paper or fee)

HIGH TENSION CAPACITIVE DISCHARGE IGNITION WITH REINFORCING TRIGGERING PULSES

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] This invention relates to capacitive discharge ignition systems wherein a charge capacitor is switched to deliver energy to the primary of an ignition coil (transformer) in synchronism with the rotation of the engine crank shaft.

Description of Related Art

[0002] U.S. Patent No. 4,004,561 entitled "Ignition System" discloses a capacitive discharge ignition system in which multiple capacitors are switched by multiple switches to provide contiguous sequential pulses to the primary of a high tension coil. U.S. Patent No. 5,429,103 entitled "High Performance Ignition System" discloses charging and discharging pulses from a capacitor to the primary of a high tension coil. The pulses are spaced so the ringing action of the coil has been substantially damped prior to the next pulse. U.S. Patent No. 5,754,011 entitled "Method and Apparatus for Controllably Generating Sparks in an Ignition System or the Like" discloses discharging multiple capacitors of different sizes to an ignition coil in overlapping, partially overlapping and non-overlapping pulses to generate a desired wave shape in the primary.

SUMMARY OF THE INVENTION

[0003] It is an object, according to the present invention, to provide a capacitive discharge ignition system capable of generating a spark discharge between the spark plug electrodes with a higher breakdown voltage capability, greater secondary current, and spark duration much longer than typical for the type of ignition coil in use.

[0004] It is a further object, according to the present invention, to be able to adjustably and selectively modify or disable the higher voltage capability, greater secondary current, and extended duration spark to obtain the best possible spark plug life.

[0005] When engine operation conditions require higher voltage capability, greater secondary current or spark durations previously unavailable from capacitive discharge ignitions, the modified spark can be enabled. This allows the use of a capacitive spark ignition system for a wide range of possible ignition requirements.

[0006] Briefly, according to the present invention, there is provided a capacitive discharge (CD) ignition system for an internal combustion engine. The ignition system comprises a storage capacitor and diode in series therewith, and a power supply connected in series with

the storage capacitor and diode. An ignition transformer has primary and secondary windings. The primary winding of the ignition transformer and the storage capacitor are connected in series through a controllable switch. A spark plug is connected in series with the secondary winding of the ignition transformer. The improvement comprises a circuit provided to control the controllable switch in synchronism with the engine such that when the switch is to discharge, a first pulse from the storage capacitor to the primary of the ignition coil. The switch is reopened at a specific time during the damped sinusoidal voltage waveform initiated by the first pulse to avoid doing negative work and then closed to discharge a subsequent pulse to reinforce the ringing action in the ignition secondary circuit. The subsequent pulse is supplied at a specific time or phase of the secondary voltage waveform by the controllable switch and capacitor to reinforce the voltage created by the previous "ON" state of the switch delivering the first pulse. The number of times the second switch is reopened and closed and the ON time period for which the switch remains closed may be controlled to control the coil breakdown voltage capability and/or the duration and amplitude of the extended spark current.

[0007] Preferably, the control circuit for the controllable switch causes the switch to be opened and closed a variable number of times during each firing event until a spark breakdown is sensed. Preferably, the controllable switch causes the switch to be opened and closed a variable number of times up to a maximum number during each firing event to limit the highest available breakdown voltage of the coil.

[0008] According to one embodiment, the control circuit for the controllable switch causes the switch to be opened and closed a variable number of times until a spark breakdown is sensed and the secondary breakdown voltage required by the engine is estimated by counting the number of reinforcing primary pulses sent before the breakdown event is sensed. Preferably, the control circuit for the controllable switch drives the switch at an adjustable rate so as to improve the resolution of the secondary voltage sensing function.

[0009] According to one embodiment, the control circuit drives the switch to establish the time period for which the switch remains closed such that the amplitude of the extended arc current of the spark is controlled. Preferably, the control circuit for the controllable switch causes the pulse train to continue to send additional pulses to drive the secondary current higher until a desired secondary current level is reached.

[0010] According to one embodiment, the control circuit for the controllable switch causes the pulse train for the control of the switch to continue to send additional pulses to drive the secondary current higher until a desired maximum secondary current level is reached and

then suspends sending pulses until the current falls to a value below a desired minimum secondary current level when pulses are then sent again.

[0011] According to another embodiment, the control circuit for the controllable switch causes the pulse train for the control of the switch to continue to send additional pulses to drive the secondary current higher until a desired maximum secondary current level is reached and then suspends sending pulses until the current falls to a value below a desired minimum secondary current level when pulses are then sent again to establish a desired total time of the spark duration.

[0012] According to one embodiment, the control circuit for the controllable switch operates in a closed loop manner by measuring the behavior of the circuit parameters, such as secondary voltage, to establish the exact wave shape of the pulse train sent to the controllable switch.

[0013] According to an alternate embodiment, the control circuit for the controllable switch operates in an open loop manner by using a stored memory map to establish the exact wave shape of the pulse train sent to the controllable switch.

[0014] According to an alternate embodiment, the control circuit for the controllable switches establishes the duration and amplitude of the extended arc current of the spark to be controlled independently of the initial breakdown voltage required to initiate the spark.

[0015] According to an alternate embodiment, the control circuit for the controllable switch establishes the secondary power versus time wave shape to produce a spark having a desired energy envelope.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] Further features and other objects and advantages will become clear from the following detailed description made with reference to the drawings in which:

[0017] Fig. 1 illustrates the basic circuit of a high tension capacitive discharge ignition system with a control circuit for opening and closing the switch between the storage capacitor and the ignition coil according to one embodiment of the present invention;

[0018] Fig. 2 is an oscilloscope picture showing the open circuit output voltage for an ignition coil driven by a first pulse and a reinforcing pulse according to one embodiment of the present invention;

[0019] Figs. 3, 4, and 5 are oscilloscope pictures showing the open circuit output voltage for an ignition coil driven according to prior art techniques;

[0020] Figs. 7 and 8 are oscilloscope pictures showing the open circuit output voltage for an ignition coil driven by a first pulse and multiple reinforcing pulses according to additional embodiments of the present invention;

[0021] Fig. 9 is an oscilloscope picture showing the secondary current, secondary voltage and traditional control signal for the controlled switch; and

[0022] Figs. 10 and 11 are oscilloscope pictures showing the secondary current, secondary voltage and control signals according to alternate embodiments of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0023] Referring now to Fig. 1, there is shown a basic capacitive discharge circuit for a high tension ignition system which comprises a storage capacitor (C1), a diode (D1), and power supply connected in series. An ignition transformer (TR1) has primary and secondary windings. The primary winding is in series with the storage capacitor and a controllable switch (S1). A spark plug is connected in series with the secondary winding of the ignition transformer. An electronic control circuit (EC1) drives the controllable switch.

[0024] Referring to Fig. 2, in one embodiment of the present invention, the electronic control circuit is operated in synchronism with the engine and controls the open (conducting) and closed (non-conducting) periods of the switch such that the switch (S1) is initially closed for a period of time (T1) to transfer energy to the ignition coil primary; the switch (S1) is then opened for a second period of time (T2); the switch S1 is again closed for a time (T3); and then switch S1 is opened for a time (T4) and so on creating a pulse train as determined by the control circuit. The switch (S1) is controlled to provide a successive string of control pulses. Each of the individual pulse times has duration and spacing as determined by the control circuit. The pulses are arranged in time to occur when it is possible to reinforce the ringing action of the coil secondary voltage resulting from the previous pulses in order to increase the open circuit breakdown voltage capability of the ignition transformer.

[0025] The electronic control circuit may comprise a programmable microcontroller with input ports for sensing one or more positions relative to the rotation of the crank shaft, such as top dead center of the first cylinder, an input for the sensing the current and/or voltage in the secondary circuit of at least one ignition transformer, and outputs for opening and closing one or more controllable switches.

[0026] By way of comparison, Fig. 3 illustrates an oscilloscope picture showing the typical open circuit output voltage for an ignition coil driven in the standard manner. For a switch S1, "ON" time of about 40 microseconds, this coil produces an output of -30,000 volts at the

spark plug. The output voltage for this coil will not increase significantly from this value regardless of the "ON" duration time for switch S1, even though the energy sent to the coil increases in direct proportion to the "ON" time of S1.

[0027] As shown in Fig. 2, the output voltage increased approximately 30% as compared with a coil driven in the standard manner. The increased output voltage is about 10,000 volts higher than could be achieved with the traditional drive approach at any of the input energies tested. The primary was supplied by a capacitor charged to 185 volts in all cases.

[0028] By way of further comparison, Fig. 4 illustrates an oscilloscope display showing the typical open circuit output voltage for an ignition coil driven in the standard manner with the "ON" time for switch S1 increased to about 80 microseconds to increase the input energy delivered to the coil. Note that there is no significant increase in the output voltage of the ignition coil; it is still about 30,000 volts. Also note for later reference the "hump" in the secondary voltage waveform.

[0029] By way of further comparison, Fig. 5 illustrates an oscilloscope display showing the typical open circuit output voltage for an ignition coil driven in the standard manner with the "ON" time for switch S1 increased to about 100 microseconds (250% increase from Fig. 3) with no significant increase in the output voltage of the ignition coil. The maximum open circuit output voltage is about -30,000 volts. Also note the increase of the amplitude of the second "hump" in the secondary voltage waveform. Conventional drive of the coil based upon the currently accepted technique results in a maximum coil output voltage for a given supply voltage regardless of input power consumed as controlled by the switch S1 "ON" time.

[0030] It is generally accepted that the maximum output voltage of the coil is limited by the primary voltage and the turns ratio of the primary to the secondary winding. It will be shown that this is not the case.

[0031] By changing the control signal for S1 to a pulse train of two pulses at a specific time as shown in Fig. 2, instead of a single pulse, the output voltage of the coil is driven to a higher voltage than that shown in Figs. 3, 4 or 5 (-40,000 volts versus -30,000 volts). Even though the cumulative "ON" time of switch S1 as shown in Fig. 3 is only slightly greater (about 50 microseconds) than in Fig. 2 and far less than the "ON" time for S1 shown in Fig. 4 (about 80 microseconds), the coil output voltage is higher. The power consumed on the primary side is, however, less in the same proportion as the "ON" time of switch S1.

[0032] Based upon the observation of the waveform of Fig. 4, the trailing part of the drive provided by switch S1 is wasted since no increase in voltage occurs during or after its

addition. In fact, the first positive ring of the secondary waveform is eliminated and the first negative ring is reduced in amplitude. In effect, the extended pulse after the first negative transition is doing negative work.

[0033] Referring to Fig. 6, changing the control signal for S1 to a pulse train of three pulses according to the present invention instead of a single pulse, the output voltage of the coil is driven to about 48,000 volts even though the cumulative "ON" time of switch S1 is only about 70 microseconds. The input energy is increased about 75% and the output voltage increased about 60% as compared with the standard drive method. The increased output voltage is about 18,000 volts higher than could be achieved with the traditional drive approach at any input energy with the primary supply of 185 volts. Also, the input power consumed is still far less than in the technique shown in Fig. 5.

[0034] Referring to Fig. 7, additional energy added to the coil primary at a certain time or phase of the secondary waveform increases the output voltage of the coil. As shown in Fig. 5, the same amount of energy (S1 "ON" time 100 microseconds) added as a single pulse without regard to the timing or phase of the secondary waveform does not increase the coil output voltage at all. The total ON time of switch S1 in Fig. 7 is equal to the total ON time of S1 in Fig. 5, but the maximum output voltage of the coil is significantly higher (at least -51,000 volts versus -30,000 volts). At this point, the input power consumed is equal to the case of Fig. 5.

[0035] Referring again to Fig. 7, the drive energy added to the coil primary at the time or phase angle of the secondary waveform as shown above greatly increases the output voltage capability of the coil. This increased voltage is a result of driving the coil with a pulsed signal whereby each pulse reinforces the secondary effects of the previous pulse. This behavior is similar to that of an RLC circuit in a resonant condition, although the actual requirements for a truly resonant circuit on the coil secondary are not being fulfilled.

[0036] Fig. 7 establishes that it is possible to drive a given ignition coil with a series of timed pulses which will cause the open circuit voltage capability to increase as a result of each pulse. This allows a coil which, by its design limits and physical construction (turns ratio), has previously been unable to achieve the voltage required for secondary breakdown of the spark to occur, and to continue to operate even though much higher secondary voltages may now be required by the engine. Possible causes of the higher engine voltage demand could include worn spark plugs, poor fuel quality, changed air/fuel ratio, higher engine load and increased cylinder pressure at the time of the ignition firing.

[0037] An ignition diagnostic can be made by sensing the flow of secondary current and counting the number of drive pulses sent by S1. Since each pulse increases the output voltage, the actual required breakdown voltage can be positively identified by counting the drive pulses required to cause a secondary current to flow. Additionally, by always sending at least one more pulse after the one causing the secondary voltage breakdown, a safety margin on operating voltage and energy can be readily maintained. Since the number of pulses required to cause the secondary breakdown is proportional to the breakdown voltage and the spark plug voltage requirement is an indicator of the condition of the spark plugs, the need for plug replacement can be readily determined.

[0038] Instead of sensing secondary current, the occurrence of the spark breakdown could also be determined by a measurement of the secondary voltage collapsing to a lower level which could be sensed a number of ways, for example, by capacitive or transformer coupling to a low voltage circuit. While the breakdown voltage can be determined with only limited resolution (about 10,000 volts) by counting pulses in the example of Fig. 2, a series of smaller drive pulses to S1 can be used for finer resolution of this voltage.

[0039] An additional independent refinement for the determination of the secondary breakdown voltage of the coil can also be made since the time delay of the breakdown after the onset of each of the drive pulses is also proportional to the actual voltage achieved up to that moment. For example, the leading edge of the second pulse plus 7.5 microseconds of delay prior to the breakdown is -35,000 volts as shown in Fig. 7.

[0040] In a circuit arrangement of the type shown in Fig. 1, it is also possible to determine the breakdown voltage by measuring the drop in the storage capacitor voltage that has occurred as a result of the cumulative primary drive pulses draining its energy prior to the secondary breakdown being achieved. The larger the drop in voltage of the storage capacitor the greater the voltage demand.

[0041] Referring to Fig. 9, the secondary current which results from a traditional control signal to switch S1 has a waveform shape which is roughly equivalent to a triangle. The power (Watts) supplied by the coil to the load is equal to the secondary current multiplied by the secondary voltage during the time that the current is flowing in the spark gap. The energy (Joules) delivered to the spark gap is integral with respect to time of the power waveform. A formula which can be used to estimate the spark energy in Joules is:

[0042]
$$E_{spk} = ((1/2(V_{spk\ Max} - V_{spk\ Min})) + V_{spk\ Min}) \times (1/2 I_{spk\ Peak}) \times (\text{Spark duration})$$
 where:

[0043] Espk is in Joules, Vspk is in Volts, Ispk is in Amps and Spark duration is in Seconds.

[0044] Referring to Fig. 10, multiple control pulses to switch S1 can be used to increase energy multiple times. What can also be seen above is that the timing of the S1 control pulses can be used to control the shape of the secondary current waveform versus time. The shape of the VI integral with respect to time is the shape of the “energy envelope” of the spark waveform. The energy envelopes of the various spark waveforms can be used to create a reference framework to correlate the actual energy transfer process of the various sparks to the mixture between the electrodes. It is important to note that the concept of the energy envelope allows for the measurement and control of both the magnitude and timing of the energy transfer to the mixture.

[0045] Referring to Fig. 11, the control of the secondary current waveform by the pulsing of switch S1 is time critical and very small changes in the shape of the “energy envelope” delivered to the spark gap can be easily made.

[0046] Since the actual energy envelope is the integral of the power (the product of the secondary voltage and current waveforms) and since the secondary voltage waveform remains fairly constant over the time period of interest, it is possible to say that the shape of the energy envelope is directly related to the shape of the secondary current wave form with respect to time.

[0047] While the applicant does not wish to be bound by any particular technical theory of operation, it is apparent that even though no discrete capacitor exists in the secondary circuit of the ignition coil, the parasitic distributed capacitance of the coil winding, spark plug lead wire and spark plug can act as a capacitor for temporary energy storage during the time between pulses prior to breakdown. This “coil” is being externally driven to a near resonant condition by a technique referred to as forced resonance. In forced resonance, the forcing function's frequency is selected to be close to the natural frequency of the coil so that it will try to resonate. The forcing function adds primary drive energy at just the right moment during the secondary ring down cycle so that the secondary voltage change is reinforced. This makes the voltage amplitude of the coil secondary winding grow larger and larger. While tuned circuits have previously been proposed for use in ignition systems, these systems have all relied upon carefully selected components connected in a critical manner including a discrete capacitor. The approach used in this system is capable of working even though the secondary circuit parameters may vary widely.

[0048] In the present invention, an electronic means is used to drive each coil in a manner as to cause the increasing voltage either based upon measured behavior of the secondary (closed loop control) or based upon the use of an appropriate predefined drive pattern of primary pulses stored in a memory device (open loop control).

[0049] Having thus described my invention with the detail and particularity required by the Patent Laws, what is desired protected by Letters Patent is set forth in the following claims.

THE INVENTION CLAIMED IS:

1. In a capacitive discharge ignition system for an internal combustion engine comprising: a storage capacitor and diode in series therewith; a power supply connected in series with the storage capacitor and diode; an ignition transformer having primary and secondary windings; and a controllable switch; the primary winding of the ignition transformer and the storage capacitor being connected in series through the controllable switch; a spark plug connected in series with the secondary winding of the ignition transformer; the improvement comprising an electronic control circuit for driving the controllable switch which is operating in synchronism with the engine such that the switch is initially closed for a period of time to transfer energy to the ignition coil primary, that after this time, the switch is then opened for a second period of time and then the switch is again closed creating a pulse train, such that the switch is controlled by a successive string of control pulses to the switch, each of the individual pulse times having a duration and spacing as determined by the control circuit, these pulses being arranged in time to occur when it is possible to reinforce the ringing action of the ignition transformer secondary voltage resulting from the previous primary pulses, such that the open circuit breakdown voltage capability of the ignition transformer is increased.

2. A device according to claim 1, wherein the control circuit for the controllable switch causes the switch to be opened and closed a variable number of times during each firing event until a spark breakdown is sensed.

3. A device according to claim 1, wherein the control circuit for the controllable switch causes the switch to be opened and closed a variable number of times up to a maximum number during each firing event to limit the highest available breakdown voltage of the coil.

4. A device according to claim 1, wherein the control circuit for the controllable switch causes the switch to be opened and closed a variable number of times during each firing event until a spark breakdown is sensed and the secondary breakdown voltage required by the engine is estimated by counting the number of reinforcing primary pulses sent before the breakdown event is sensed.

5. A device according to claim 1, wherein the control circuit for the controllable switch drives the switch at an adjustable rate during the reinforcing time periods available so as to improve the resolution of the voltage sensing function.

6. A device according to claims 1, 2, 3, 4 and 5, wherein the control circuit for the controllable switch operates in a closed loop manner by measuring the behavior of the circuit parameters to determine the exact wave shape of the pulse train sent to the controllable switch.

7. A device according to claims 1, 2, 3, 4 and 5, wherein the control circuit for the controllable switch (S1) operates in an open loop manner by using a stored memory map to determine the exact wave shape of the pulse train sent to the controllable switch.

8. In a capacitive discharge ignition system for an internal combustion engine comprising: a storage capacitor and diode in series therewith; a power supply connected in series with the storage capacitor and diode; an ignition transformer having primary and secondary windings; and a controllable switch; the primary winding of the ignition transformer and the storage capacitor being connected in series through the controllable switch; a spark plug connected in series with the secondary winding of the ignition transformer; the improvement comprising an electronic control circuit for driving the controllable switch which is operating in synchronism with the engine such that the switch is initially closed for a period of time to transfer energy to the ignition coil primary, that after this time, the switch is then opened for a second period of time and then the switch is again closed creating a pulse train, such that the switch is controlled by a successive string of control pulses to the switch, each of the individual pulse times having a duration and spacing as determined by the control circuit, these pulses being arranged in time to occur when it is possible to reinforce the ringing action of the ignition transformer secondary voltage resulting from the previous primary pulses, such that the secondary circuit current capability of the ignition transformer is increased.

9. A device according to claim 8, wherein the control circuit drives the switch to establish the time period for which the switch remains closed such that the amplitude of the extended arc current of the spark is controlled.

10. A device according to claim 8, wherein the control circuit for the controllable switch causes the pulse train to continue to send additional pulses to drive the secondary current higher until a desired secondary current level is reached.

11. A device according to claim 8, wherein the control circuit for the controllable switch causes the pulse train for the control of the switch to continue to send additional pulses to drive the secondary current higher until a desired maximum secondary current level is reached and then suspend sending pulses until the current falls to a value below a desired minimum secondary current level when pulses are then sent again.

12. A device according to claim 8, wherein the control circuit for the controllable switch causes the pulse train for the control of the switch to continue to send additional pulses to drive the secondary current higher until a desired maximum secondary current level is reached and then suspend sending pulses until the current falls to a value below a desired minimum secondary current level when pulses are then sent again, for a desired total time of the spark duration.

13. A device according to claims 8, 9, 10, 11 and 12, wherein the control circuit for the controllable switch operates in a closed loop manner by measuring the behavior of the circuit parameters to determine the exact wave shape of the pulse train sent to the controllable switch.

14. A device according to claims 8, 9, 10 and 11, wherein the control circuit (EC1) for the controllable switch operates in an open loop manner by using a stored memory map to determine the exact wave shape of the pulse train sent to controllable switch.

15. A device according to claims 8, 9, 10 or 11, wherein the control circuit for the controllable switches enables the duration and amplitude of the extended arc current of the spark to be controlled independently of the initial breakdown voltage required to initiate the spark.

16. A device according to claim 12, wherein the control circuit for the controllable switch enables the secondary power versus time wave shape to be controlled to produce a spark having a desired energy envelope.

HIGH TENSION CAPACITIVE DISCHARGE IGNITION WITH REINFORCING TRIGGERING PULSES

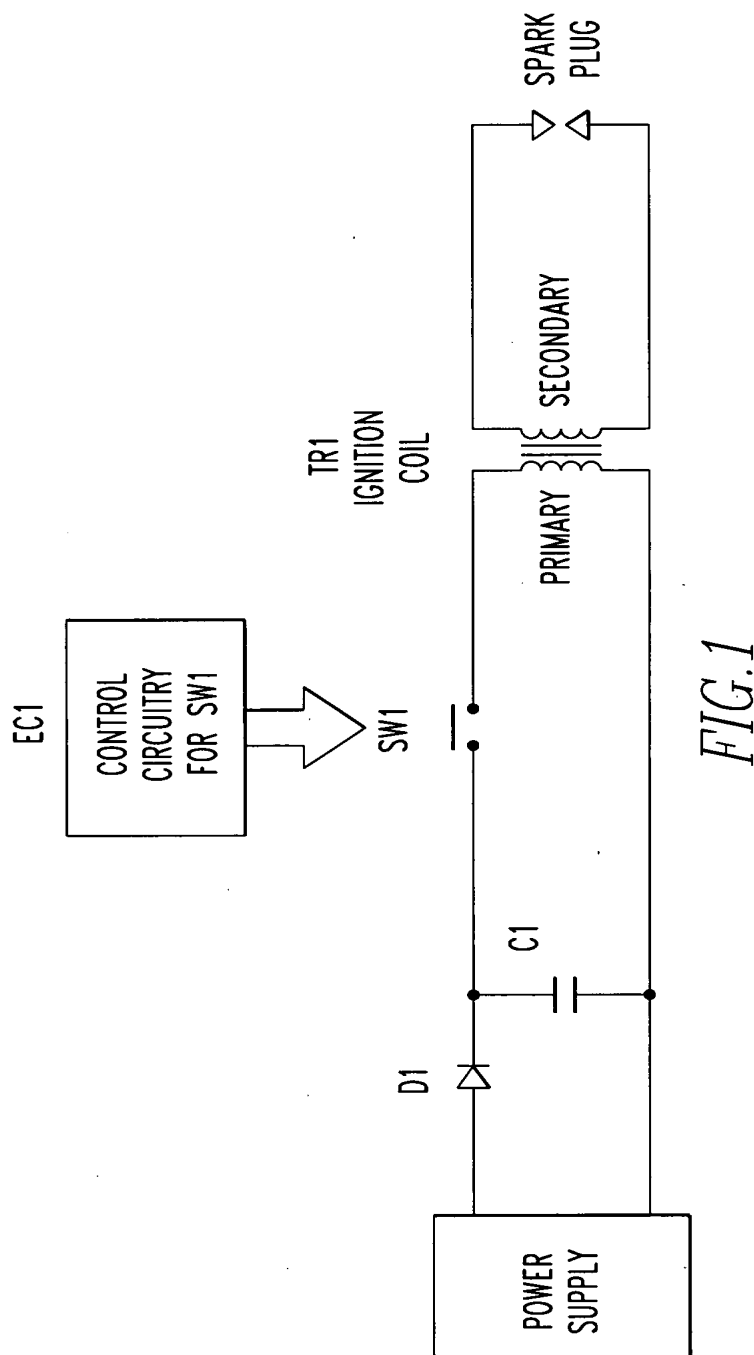
ABSTRACT OF THE INVENTION

A capacitive discharge ignition system in which a controllable switch is positioned between a storage capacitor and the primary winding of an ignition transformer. The switch is controlled to create a train of pulses to the primary winding timed to reinforce the ringing action of the ignition transformer.

“High Tension Capacitive Discharge Ignition
With Reinforcing Triggering Pulses”

Inventor: Joseph M. Lepley
Attorney Docket No. 0069-062971

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Inventor: Joseph M. Lepley
Attorney Docket No. 0069-062971

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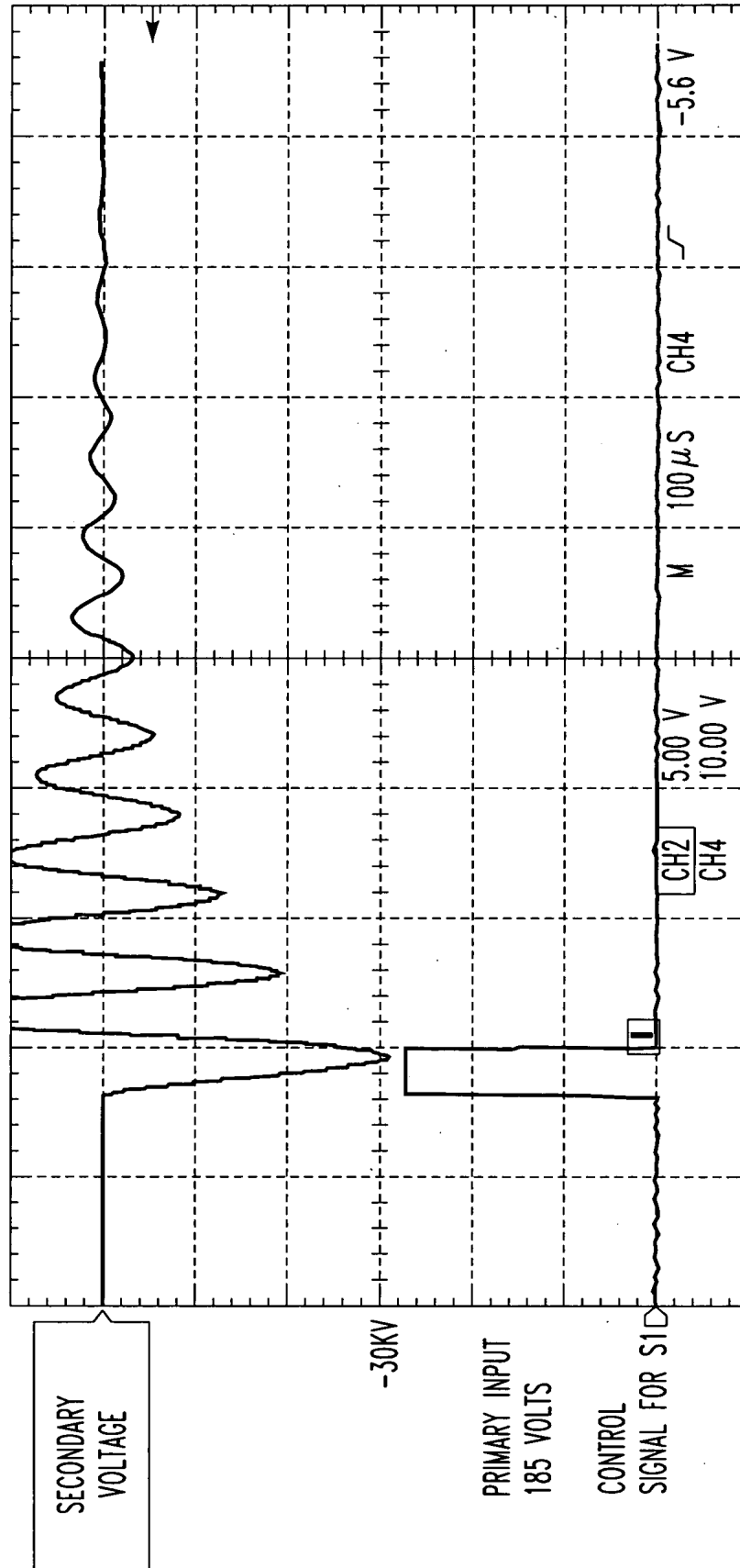


FIG. 3

“High Tension Capacitive Discharge Ignition
With Reinforcing Triggering Pulses”

Inventor: Joseph M. Lepley
Attorney Docket No. 0069-062971

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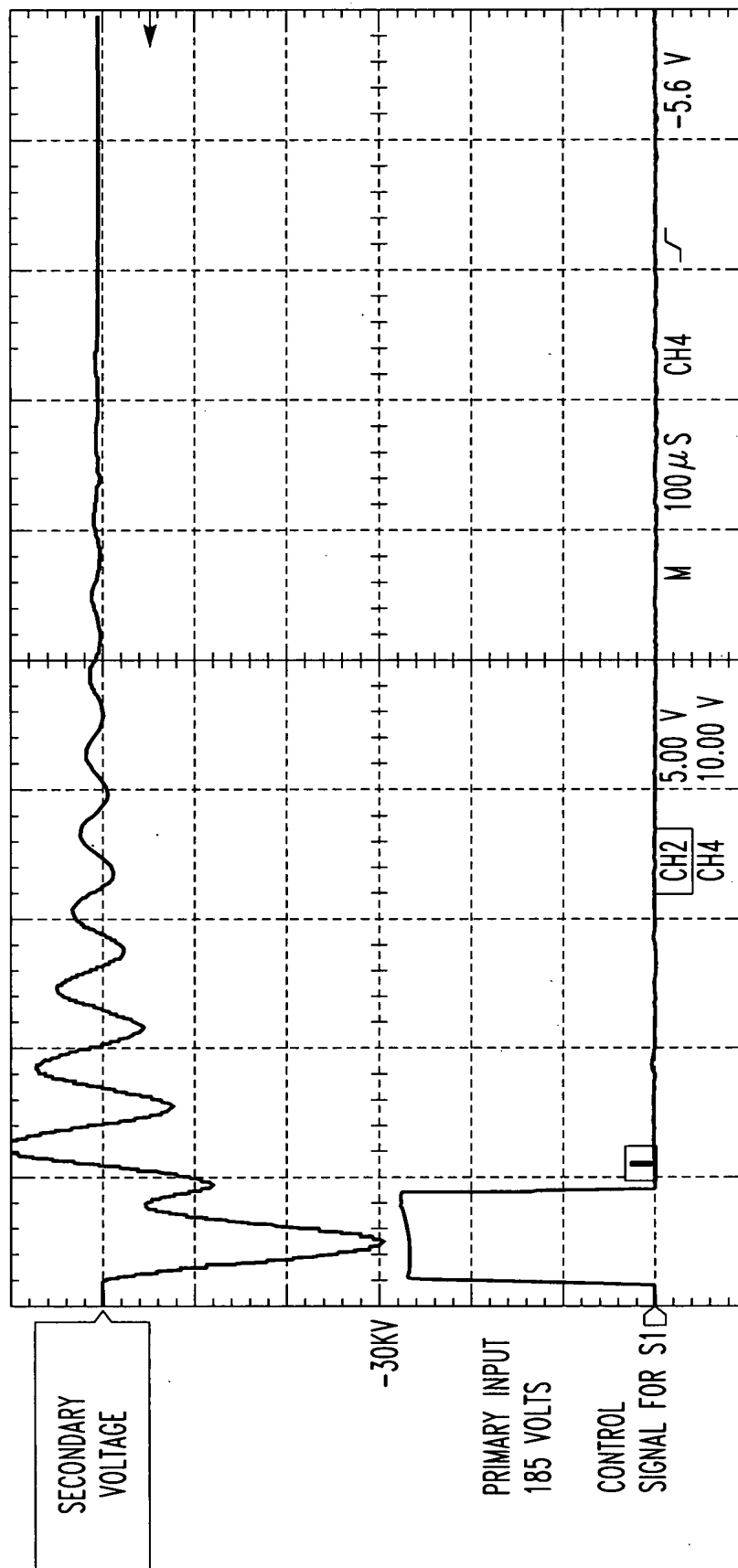


FIG. 4

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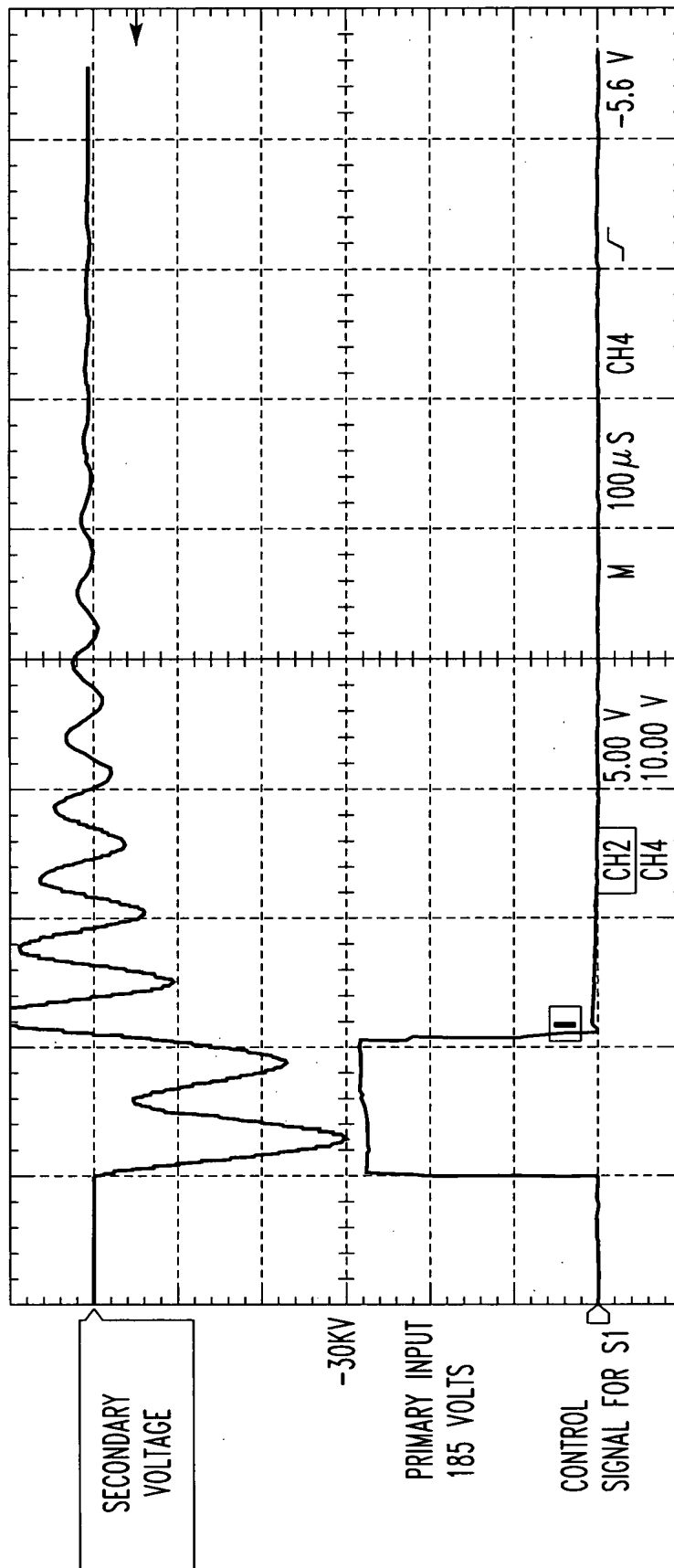


FIG. 5

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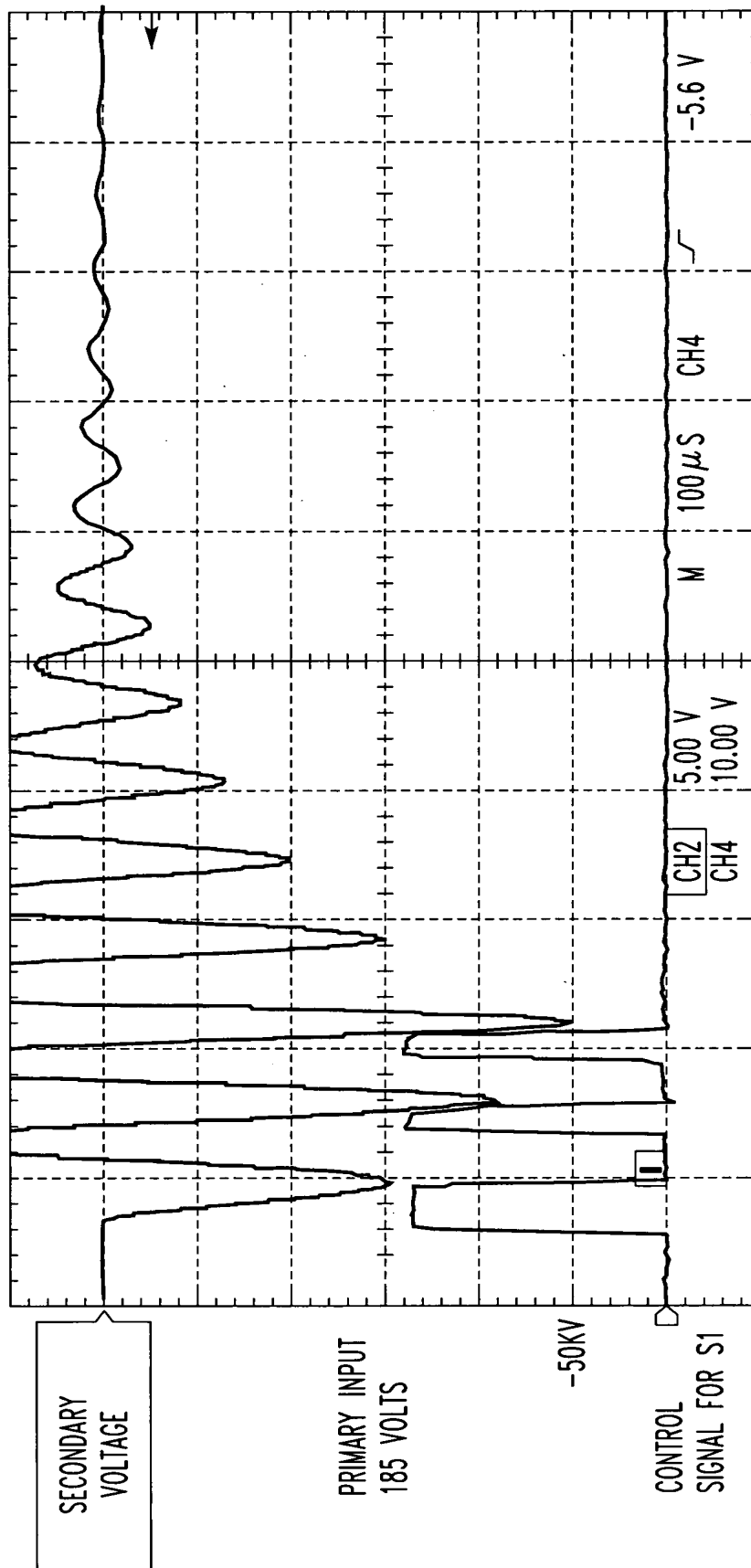


FIG. 6

“High Tension Capacitive Discharge Ignition
With Reinforcing Triggering Pulses”

Inventor: Joseph M. Lepley

Attorney Docket No. 0069-062971

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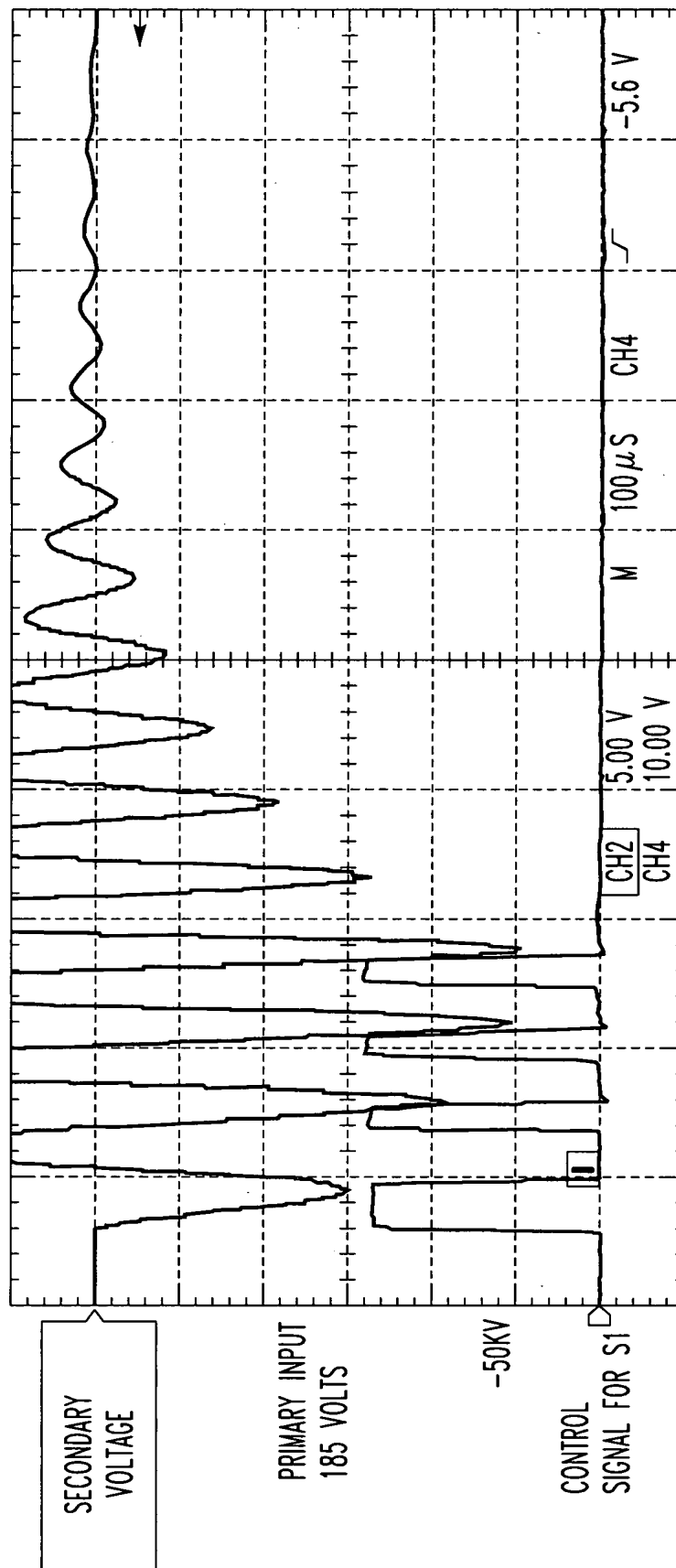


FIG. 7

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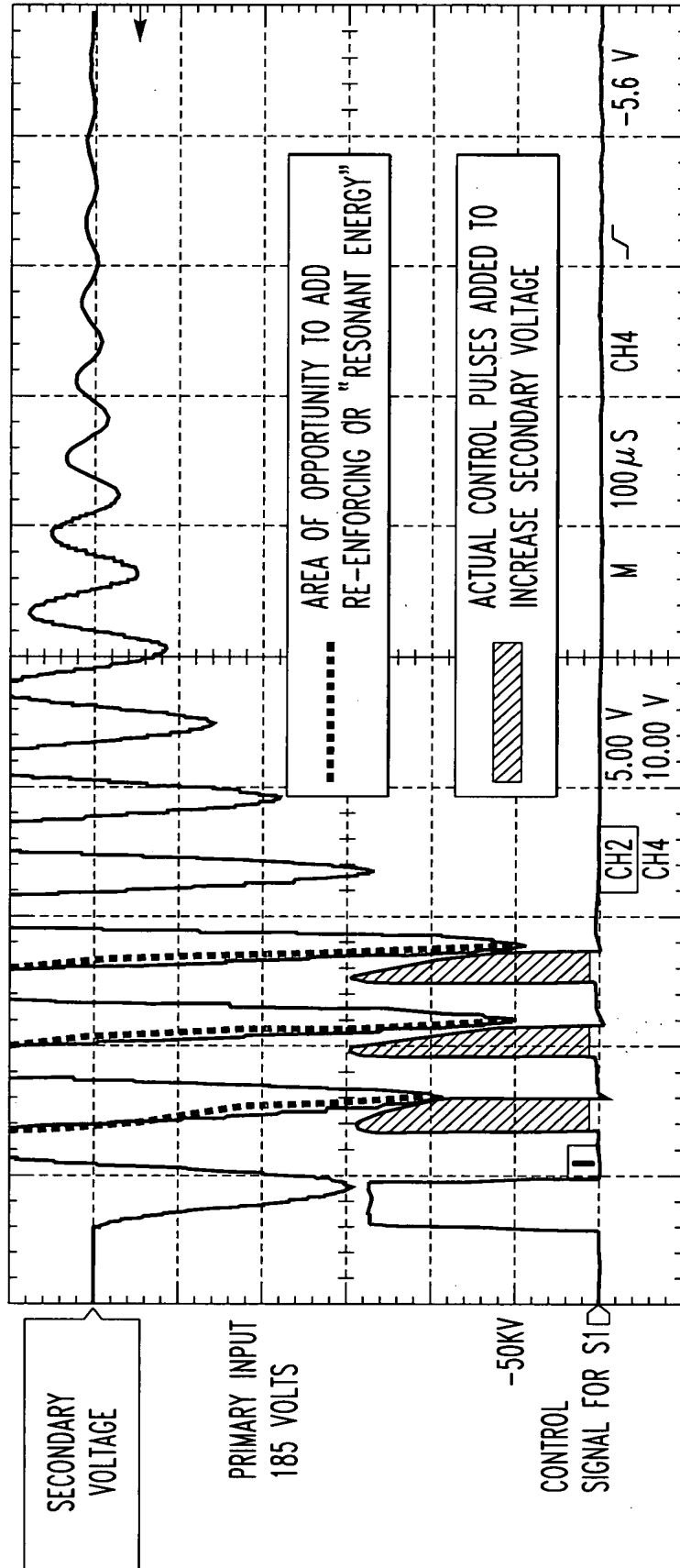


FIG.8

**“High Tension Capacitive Discharge Ignition
With Reinforcing Triggering Pulses”**

Inventor: Joseph M. Lepley
Attorney Docket No. 0069-062971

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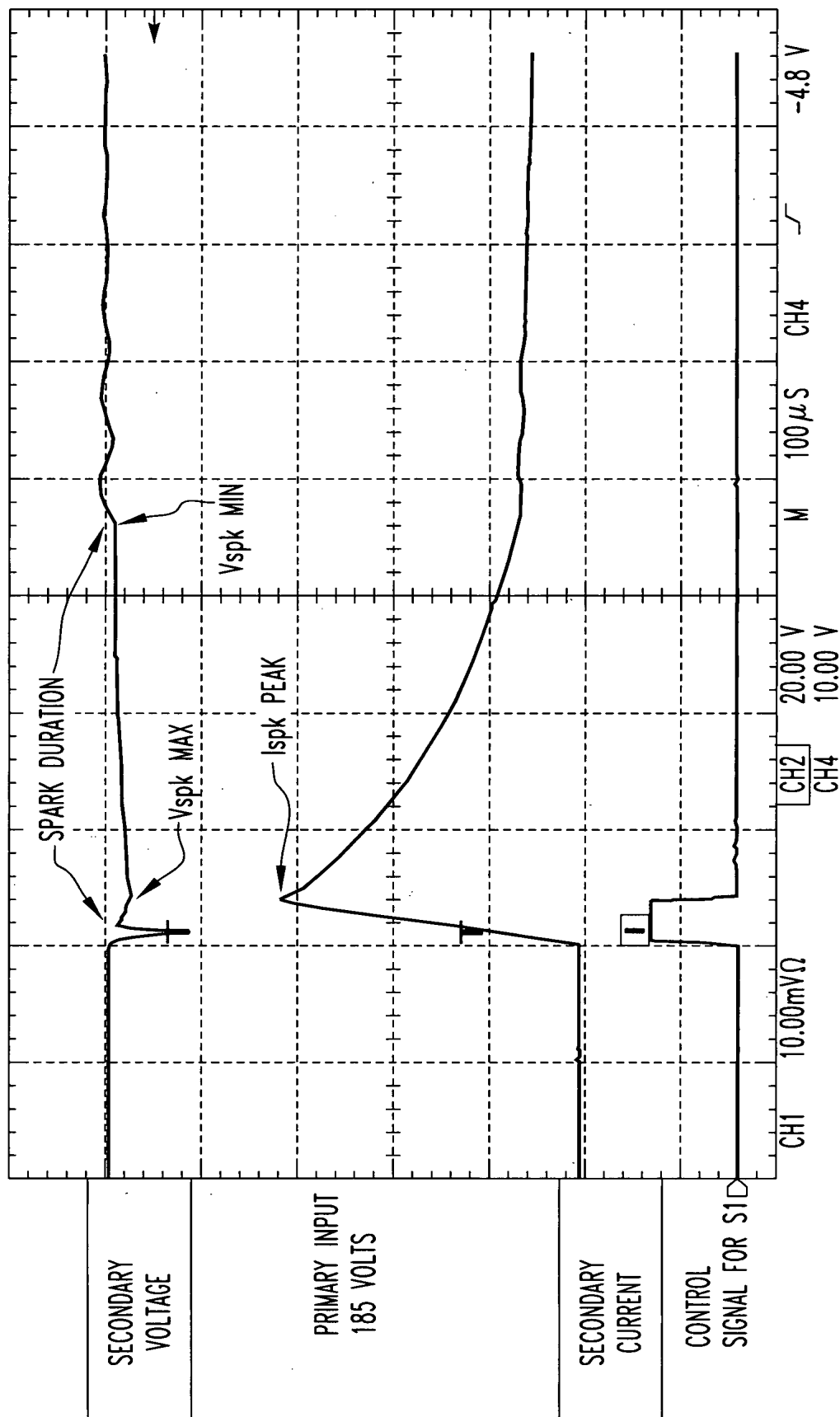


FIG. 9

“High Tension Capacitive Discharge Ignition
With Reinforcing Triggering Pulses”

Inventor: Joseph M. Lepley

Attorney Docket No. 0069-062971

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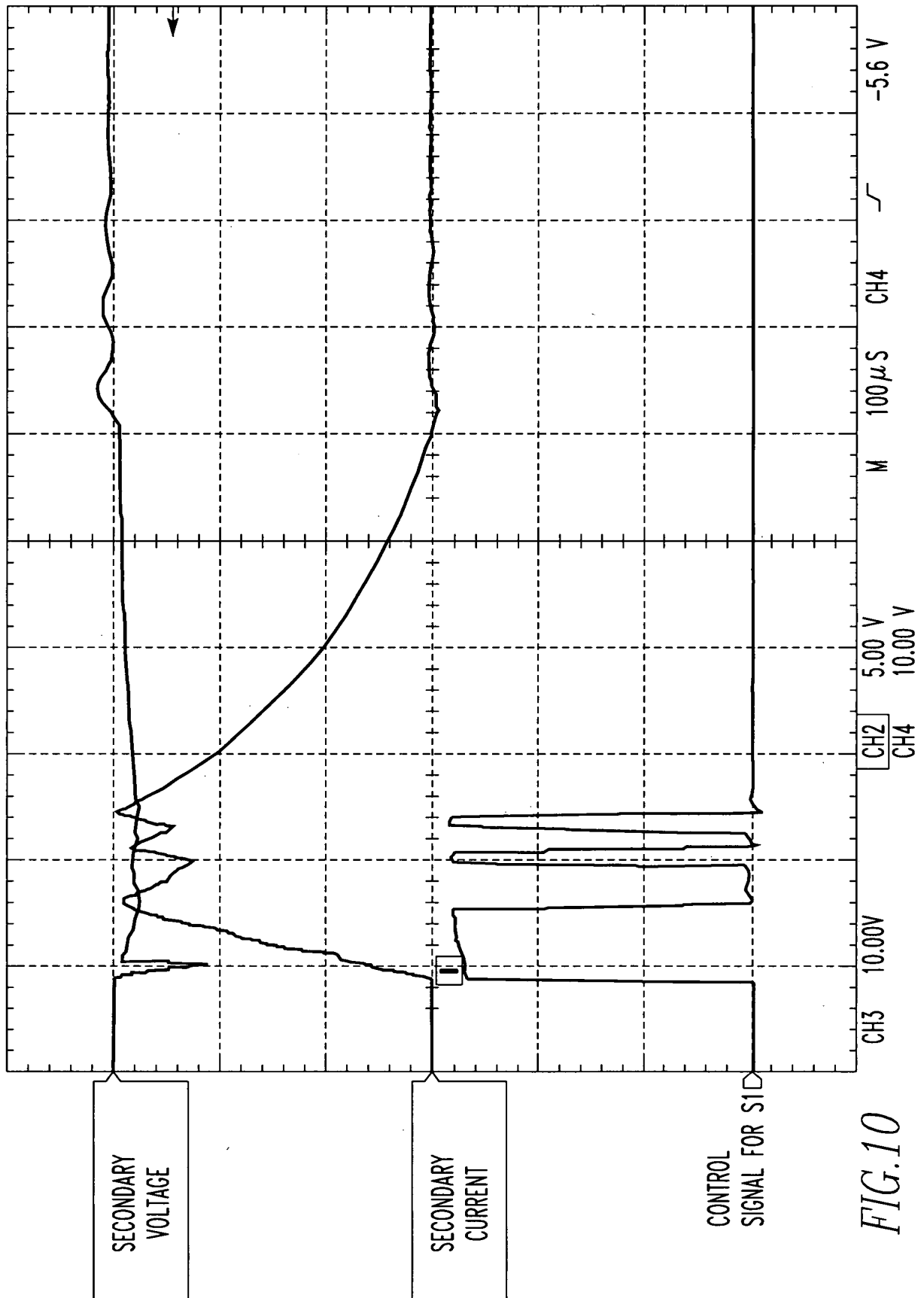


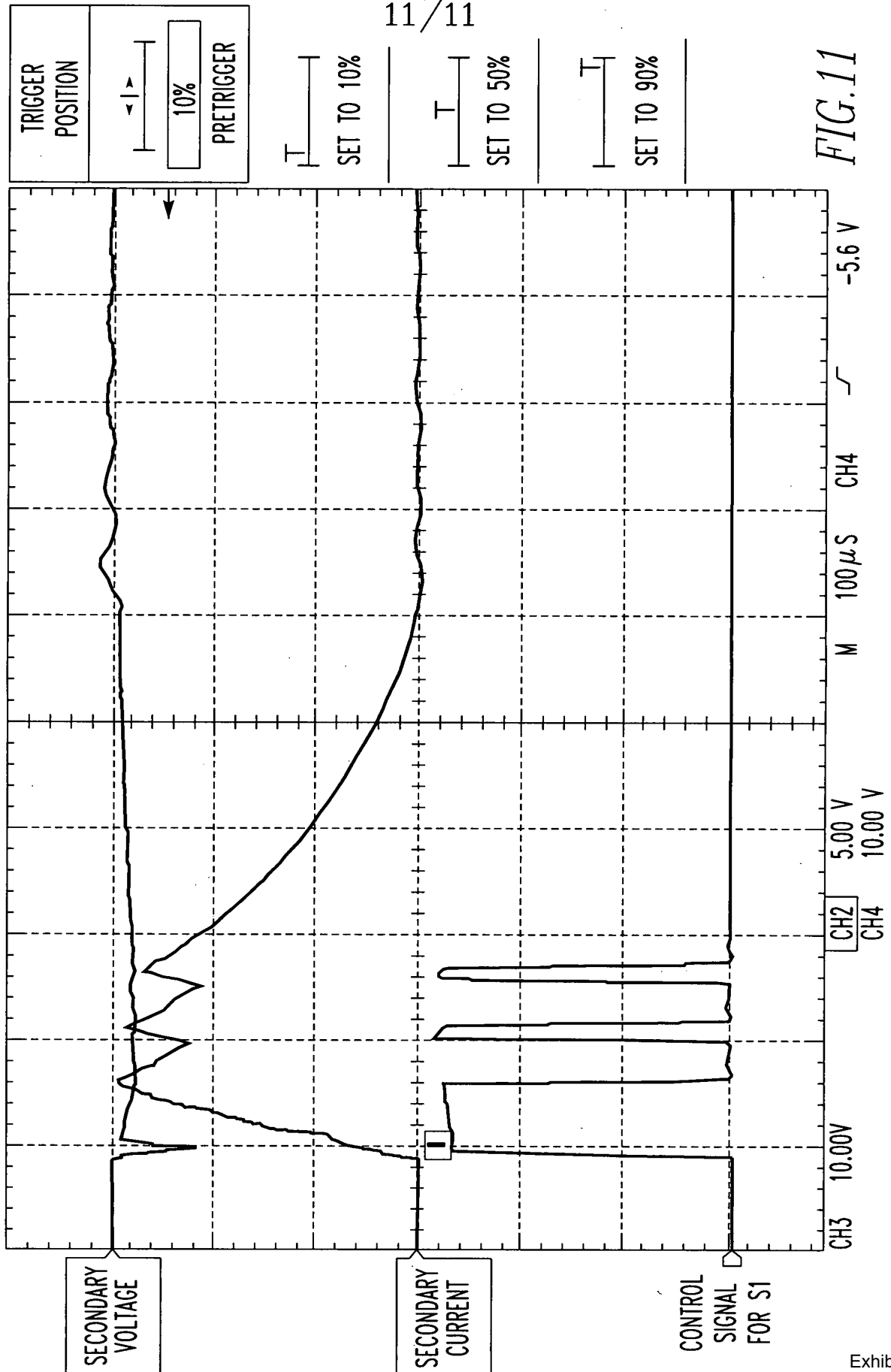
FIG. 10

**"High Tension Capacitive Discharge Ignition
With Reinforcing Triggering Pulses"**

Inventor: Joseph M. Lepley

Attorney Docket No. 0069-062971

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APPLICATION DATA SHEET (ADS)

APPLICATION INFORMATION

Application Type::	Regular
Subject Matter::	Utility
Title::	HIGH TENSION CAPACITIVE DISCHARGE IGNITION WITH REINFORCING TRIGGERING PULSES
Attorney Docket Number::	0069-062971
Request for Early Publication?::	No
Request for Non-Publication?::	No
Suggested Drawing Figure::	1
Total Drawing Sheets::	11
Small Entity?::	Yes
Petition Included?::	No
Secrecy Order In Parent Appl.?::	No

APPLICANT INFORMATION

Applicant Authority Type::	Inventor
Primary Citizenship Country::	US
Status::	Full Capacity
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Middle Name::	M.
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Name Suffix::	
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State or Prov. of Residence::	OH
Country of Residence::	US
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City of Mailing Address::	Girard
State or Prov. of Mailing Address::	OH
Postal or Zip Code::	44420

CORRESPONDENCE INFORMATION

Correspondence Customer Number::	28289
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REPRESENTATIVE INFORMATION

Representative Customer Number::	28289	
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ASSIGNMENT INFORMATION

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City of mailing address::	Girard
State or Prov. of Mailing Address::	OH
Country of Mailing Address::	USA
Postal or Zip Code::	44420

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MULTIPLE DEPENDENT CLAIM FEE CALCULATION SHEET Substitute for Form PTO-1360 (For use with Form PTO/SB/06)							Application Number 11702003		Filing Date 02/02/07	
							Applicant(s) Joseph M. Lepley			
							* May be used for additional claims or amendments			
CLAIMS	AS FILED		AFTER FIRST AMENDMENT		AFTER SECOND AMENDMENT					
	Indep	Depend	Indep	Depend	Indep	Depend	Indep	Depend	Indep	Depend
1	1						51			
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50							100			
Total							Total			
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Total							Total			
Depend	17						Depend			
Total							Total			
Claims	19						Claims			

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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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number

11/702,003**APPLICATION AS FILED – PART I**

(Column 1)

(Column 2)

SMALL ENTITY

OR

**OTHER THAN
SMALL ENTITY**

FOR	NUMBER FILED	NUMBER EXTRA
BASIC FEE (37 CFR 1.16(a), (b), or (c))		
SEARCH FEE (37 CFR 1.16(k), (l), or (m))		
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))		
TOTAL CLAIMS (37 CFR 1.16(i))	16 minus 20 =	*
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2 minus 3 =	*
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	
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))		

RATE (\$)	FEE (\$)
	150
	250
	100
X\$ 25	
X\$100	
180	180
TOTAL	680

RATE (\$)	FEE (\$)
X\$50	
X\$200	
360	
TOTAL	

* If the difference in column 1 is less than zero, enter "0" in column 2.

APPLICATION AS AMENDED – PART II

(Column 1)

(Column 2)

(Column 3)

SMALL ENTITY

OR

**OTHER THAN
SMALL ENTITY**

AMENDMENT A		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total (37 CFR 1.16(i))	*		Minus	**	=
Independent (37 CFR 1.16(h))	*		Minus	***	=
Application Size Fee (37 CFR 1.16(s))					
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					

RATE (\$)	ADDI- TIONAL FEE (\$)
X =	
X =	
180	
TOTAL	
ADD'T FEE	

RATE (\$)	ADDI- TIONAL FEE (\$)
X =	
X =	
360	
TOTAL	
ADD'T FEE	

(Column 1)

(Column 2)

(Column 3)

AMENDMENT B		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total (37 CFR 1.16(i))	*		Minus	**	=
Independent (37 CFR 1.16(h))	*		Minus	***	=
Application Size Fee (37 CFR 1.16(s))					
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					

RATE (\$)	ADDI- TIONAL FEE (\$)
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X =	
N/A	
TOTAL	
ADD'T FEE	

RATE (\$)	ADDI- TIONAL FEE (\$)
X =	
X =	
N/A	
TOTAL	
ADD'T 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.

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