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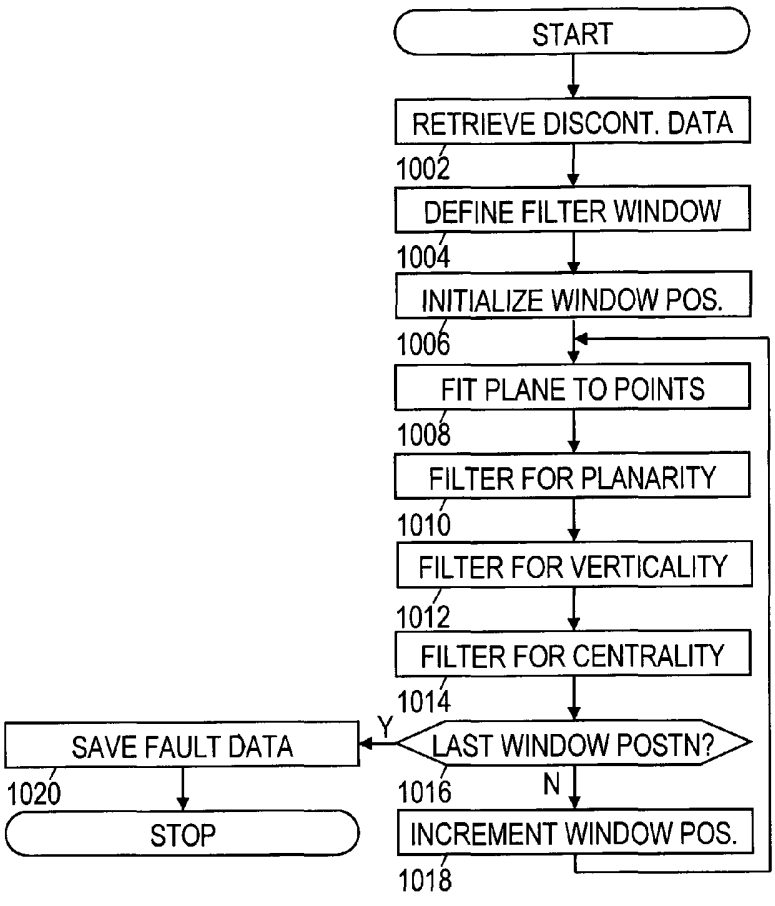
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[Continued on next page]

(54) Title: A FAULT FILTER FOR SEISMIC DISCONTINUITY DATA



(57) Abstract: Various methods are disclosed for identifying faults in a seismic data volume. In some method embodiments, the fault identification method comprises determining a planarity value for each of multiple positions of an analysis window in the data volume. The planarity value may be indicative of the planarity of discontinuities in the analysis window, and may be further filtered by limits on the verticality and centrality of the discontinuities. Thus a filter may be determined for suppressing relatively non-planar, relatively non-vertical, and relatively uncentered discontinuities from a discontinuity display, thereby enhancing a display of faults present in the seismic data volume.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US05/45452

A. CLASSIFICATION OF SUBJECT MATTER
IPC: **G01V 1/24**(2006.01),**1/26**(2006.01),**1/28**(2006.01)

USPC: 367/38,40,41,42;702/16
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
U.S. : 367/38,40,41,42; 702/16

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
GeoRef: fault and seismic and covariance, fault eigenvalue planar

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	Gersztenkorn, et al. Eigenstructure-based computations as an aid to 3-D structural and stratigraphic mapping. Geophysics, Vol. 64 (Spember-October 1999), pages 1468-1479	1-5, 13-18, 30-34 --- 6-12
X	Tingdahl, et al. Estimating falut-attribute gradient analysis, principal component analysis, and the localized Hough transform. SEG Expanded Abstracts 2003, Pages 1-4	1, 13, 30, 34
Y	Marfurt, et al. Coherency calculations in the presence of structural dip. Geophyics, Vol. 64 January February 1999	6-12
A	IS 5892732 (Gersztenkorn) 6 April 1999 (06.04.1999)	1-18, 30-34
A	US 6490528 (Cheng, et al) 3 December 2002 (03.12.2002)	1-18, 30-34
A	US 6697737 B2 (Jones, et al) 24 Feb. 2004 (23.02.2004)	1-18, 30-34

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search
09 August 2006 (09.08.2006)

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US05/45452

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
Please See Continuation Sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of any additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.: 1-18 and 30-34

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US05/45452

C. (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5260911 (Mason, et al) 9 Nov. 1993 (09.11.1993)	1-18, 30-34

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US05/45452

BOX III. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claim(s) 1-18 and 30-34, drawn to a fault identification method.

Group II, claim(s) 1-26, drawn to a method of seismic exploration.

Group III, claim(s) 27-29, drawn to a seismic survey system.

The inventions listed as Groups I-III do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

Inventions I/II and III are related as process and apparatus for its practice.

Inventions I and II are related as combination and subcombination.