

Ex. PGS 1004

United States Patent [19]

Workman et al.

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[45] **Date of Patent:** **Aug. 4, 1998**

[54] **ADAPTIVE CONTROL OF MARINE SEISMIC STREAMERS**

[75] **Inventors:** **Ricky L. Workman; Ronald Edward Chambers**, both of Houston, Tex.

[73] **Assignee:** **Western Atlas International, Inc.**, Houston, Tex.

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[51] **Int. Cl.⁶** **G01V 1/38**

[52] **U.S. Cl.** **367/19; 367/16**

[58] **Field of Search** **367/16, 19, 20, 367/106, 130, 17; 114/253**

[56] **References Cited**

U.S. PATENT DOCUMENTS

| | | | |
|-----------|--------|-------------------------|----------|
| 3,931,608 | 1/1976 | Cole | 340/7 PC |
| 4,033,278 | 7/1977 | Waters | 144/245 |
| 4,087,780 | 5/1978 | Itria et al. | 340/7 |
| 4,187,492 | 2/1980 | Delignieres | 367/19 |
| 4,404,664 | 9/1983 | Zachariadis | 367/19 |
| 4,463,701 | 8/1984 | Pickett et al. | 114/245 |
| 4,729,333 | 3/1988 | Kirby et al. | 114/244 |
| 4,809,005 | 2/1989 | Counselman | 342/352 |
| 4,890,568 | 1/1990 | Dolengowski | 114/246 |
| 4,912,682 | 3/1990 | Norton, Jr. et al. | 367/19 |
| 5,031,159 | 7/1991 | Rouquette | 367/130 |

| | | | |
|-----------|---------|--------------------|---------|
| 5,353,223 | 10/1994 | Norton et al. | 364/421 |
| 5,443,027 | 8/1995 | Owsley et al. | 114/244 |
| 5,532,975 | 7/1996 | Elholm | 367/16 |

OTHER PUBLICATIONS

M. Schoenberger and J. F. Misfud, "Hydrophone Streamer Noise", *Geophysics*, vol. 39, No. 6, pp. 781-793.

Franklyn K. Levin in "Short Note: The Effect of Binning on Data from a Feathered Streamer", *Geophysics*, vol. 49, No. 8, pp. 1386-1387.

Mamdouh R. Gadallah, "Reservoir Seismology", *Pennwell*, 1994, pp. 209-237.

Manin et al., "Recent Developments in Source and Streamer Positioning" *First Break*, vol. 6, pp. 183-188, Jun. 1981.

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[57] **ABSTRACT**

A method for controlling the position and shape of marine seismic streamer cables, whereby a plurality of real time signals from a marine seismic data acquisition system and a plurality of threshold parameters from an input device are received. The real time signals are compared to the threshold parameters to determine if the streamer cables should be repositioned. The streamer cables are repositioned when the real time signals exceed the threshold parameters.

10 Claims, 3 Drawing Sheets

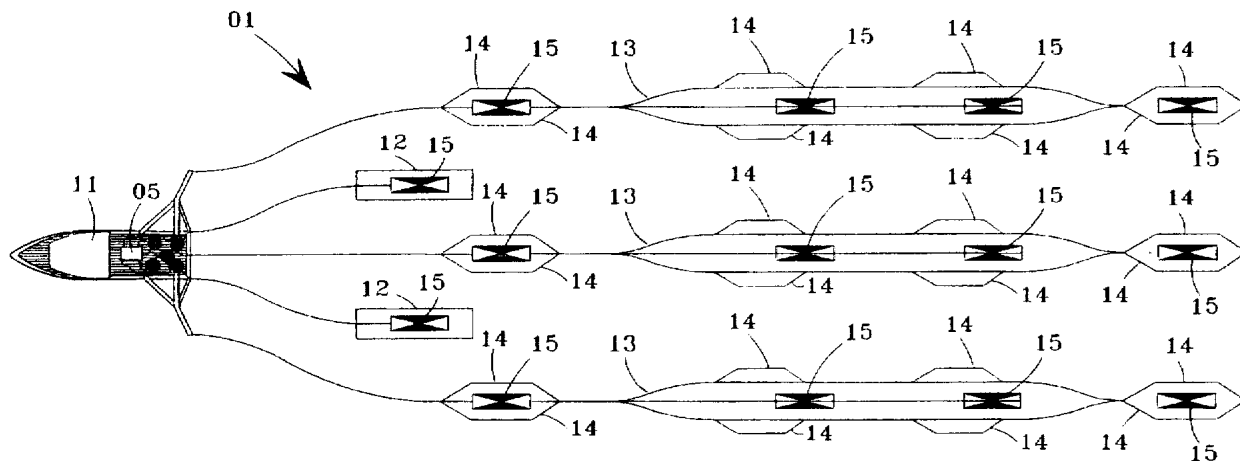


Fig. 1

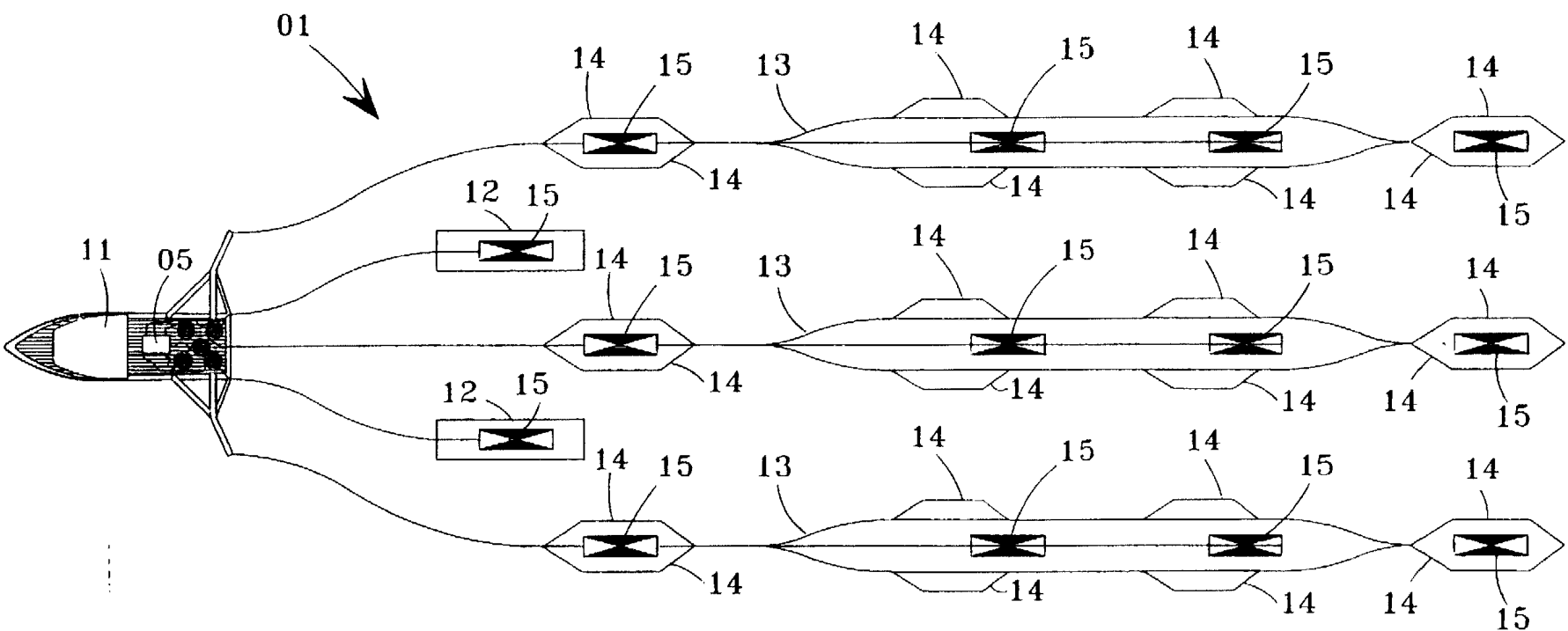
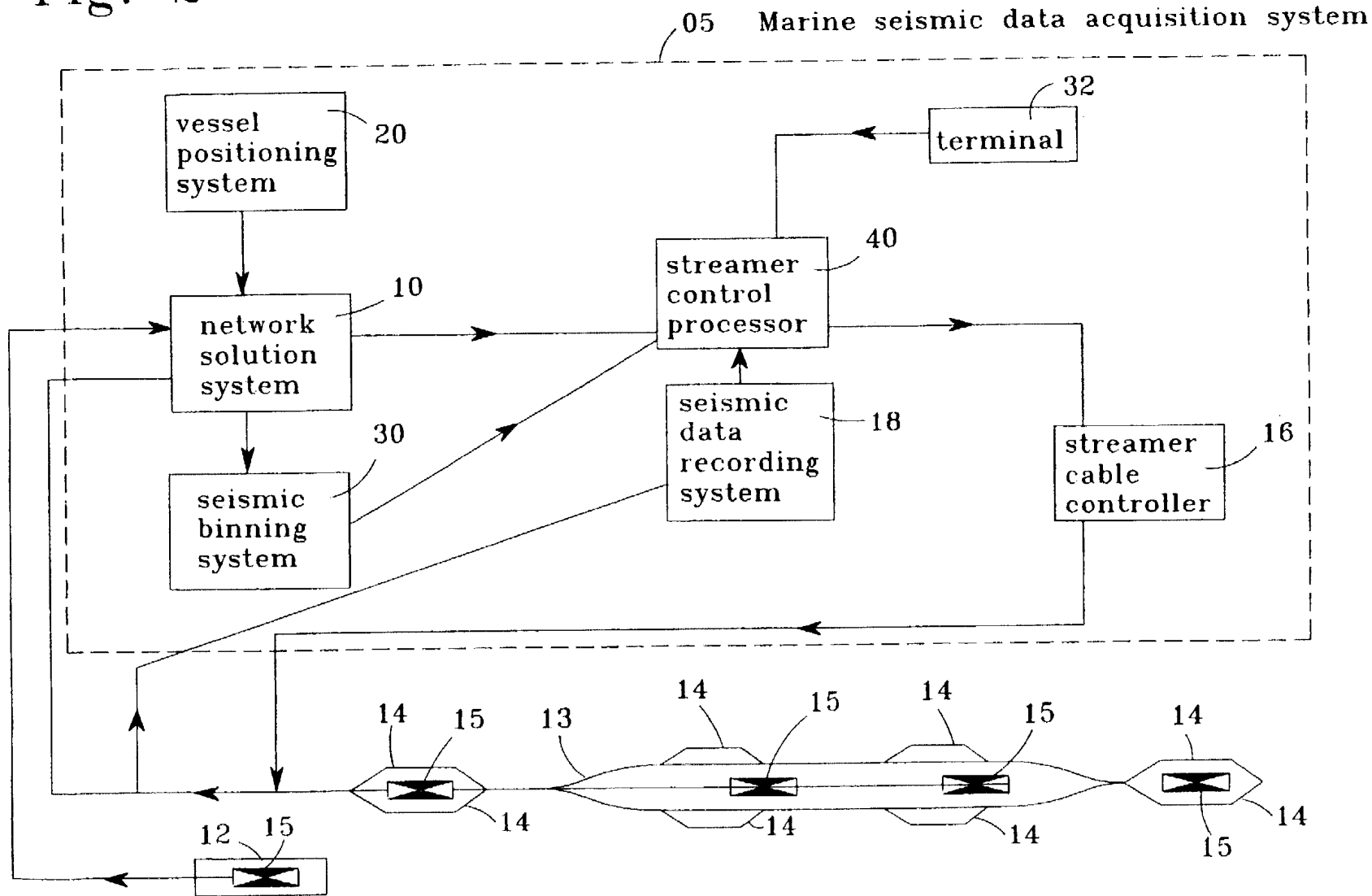


Fig. 2



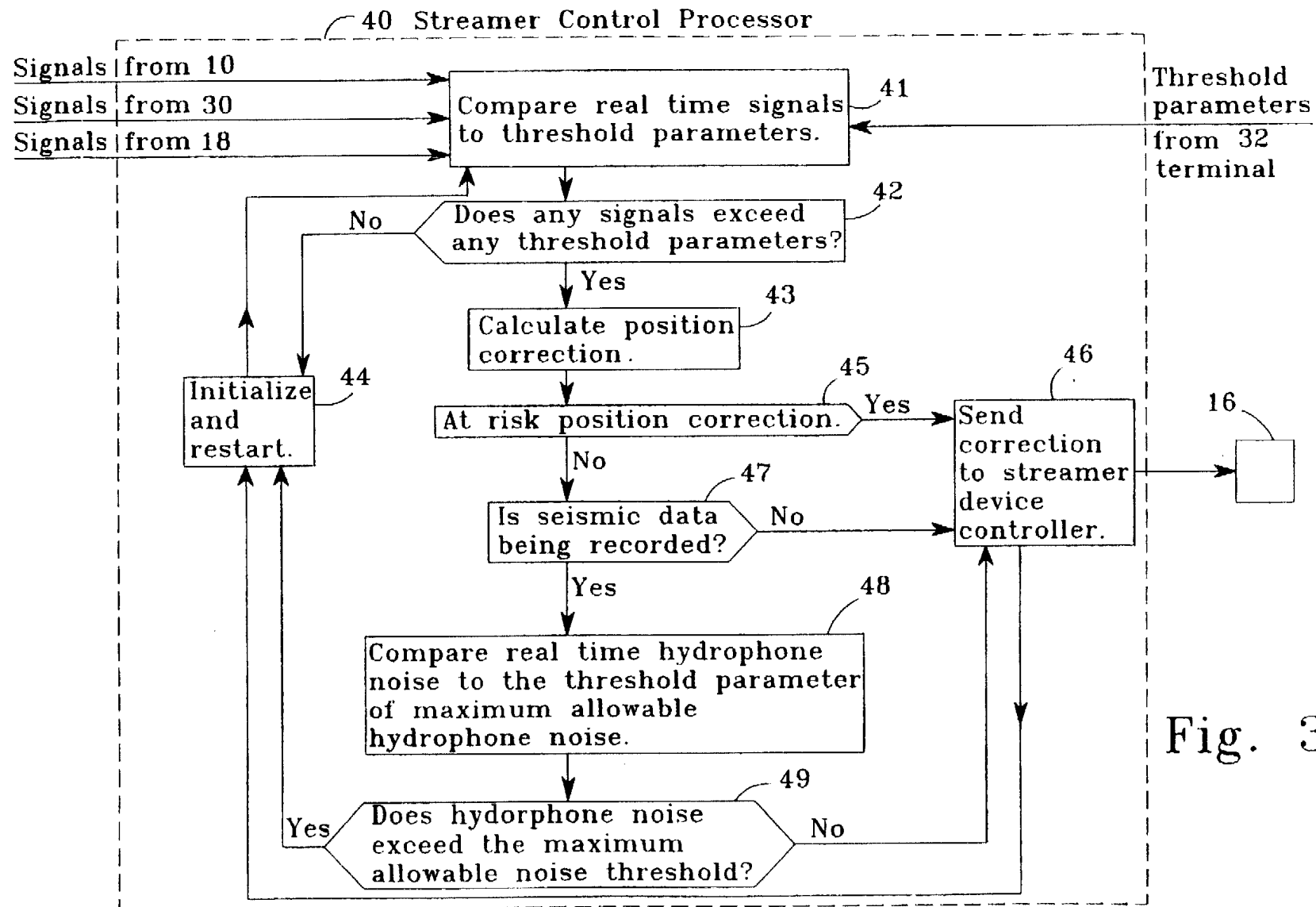


Fig. 3

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