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(54) **CONTROL SYSTEM FOR POSITIONING OF A MARINE SEISMIC STREAMERS**

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(51) **Int. Cl.**

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G01V 1/38 (2006.01)

(52) **U.S. Cl.** **114/244**; 367/19

(58) **Field of Classification Search** 114/162, 114/163, 242, 244, 246, 253

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,375,800 A	4/1968	Cole et al.	114/235
3,412,705 A	11/1968	Nesson	115/12
3,434,446 A	3/1969	Cole	114/235
3,440,992 A	4/1969	Chance	114/235
3,560,912 A	2/1971	Spink et al.	340/3
3,605,674 A	9/1971	Weese	114/235 B
3,648,642 A	3/1972	Fetrow et al.	114/235

3,774,570 A	11/1973	Pearson	114/235 B
3,896,756 A	7/1975	Pearson et al.	114/235 B
3,931,608 A	1/1976	Cole	367/17
3,943,483 A	3/1976	Strange	340/7 PC
3,961,303 A	6/1976	Paitson	367/17
4,033,278 A	7/1977	Waters	114/245
4,063,213 A	12/1977	Itria et al.	367/17
4,087,780 A	5/1978	Itria et al.	367/17
4,222,340 A	9/1980	Cole	114/245
4,227,479 A	10/1980	Gertler et al.	114/312
4,290,124 A	9/1981	Cole	367/18

(Continued)

FOREIGN PATENT DOCUMENTS

AU 199853305 12/1997

(Continued)

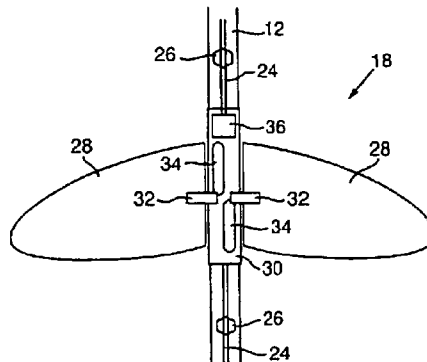
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(57) **ABSTRACT**

A method of controlling a streamer positioning device (18) configured to be attached to a marine seismic streamer (12) and towed by seismic survey vessel (10) and having a wing and a wing motor for changing the orientation of the wing. The method includes the steps of: obtaining an estimated velocity of the streamer positioning device, calculating a desired change in the orientation of the wing using the estimated velocity of the streamer positioning device, and actuating the wing motor to produce the desired change in the orientation of the wing. The invention also involves an apparatus for controlling a streamer positioning device including means for obtaining an estimated velocity of the streamer positioning device, means for calculating a desired change in the orientation of the wing using the estimated velocity of the streamer positioning device, and means for actuating the wing motor to produce the desired change in the orientation of the wing.

34 Claims, 3 Drawing Sheets



U.S. PATENT DOCUMENTS

4,313,392	A	2/1982	Guenther et al.	114/244
4,323,989	A	4/1982	Huckabee et al.	367/17
4,404,664	A	9/1983	Zachariadis	367/19
4,463,701	A	8/1984	Pickett et al.	114/245
4,484,534	A	11/1984	Thillaye du Boullay	114/244
4,694,435	A	9/1987	Magneville	367/17
4,709,355	A	11/1987	Woods et al.	367/16
4,711,194	A	12/1987	Fowler	114/245
4,723,501	A	2/1988	Hovden et al.	114/144 B
4,729,333	A	3/1988	Kirby et al.	114/244
4,745,583	A	5/1988	Motal	367/18
4,766,441	A	8/1988	Phillips	343/709
4,767,183	A	8/1988	Martin	350/96.23
4,843,996	A	7/1989	Darce	114/245
4,890,568	A *	1/1990	Dolengowski	114/246
4,890,569	A	1/1990	Givens	114/349
4,912,684	A	3/1990	Fowler	367/76
4,992,990	A	2/1991	Langeland	367/19
5,042,413	A	8/1991	Benoit	114/244
5,052,814	A	10/1991	Stubblefield	367/15
5,402,745	A	4/1995	Wood	114/244
5,443,027	A	8/1995	Owsley et al.	114/244
5,507,243	A	4/1996	Williams et al.	114/245
5,517,202	A	5/1996	Patel	343/709
5,517,463	A	5/1996	Hornbostel et al.	367/13
5,529,011	A	6/1996	Williams, Jr.	114/245
5,532,975	A	7/1996	Elholm	367/16
5,619,474	A	4/1997	Kuche	367/17
5,642,330	A	6/1997	Santopietro	367/131
5,790,472	A	8/1998	Workman et al.	367/19
5,913,280	A *	6/1999	Nielsen et al.	114/242
5,973,995	A *	10/1999	Walker et al.	367/20
6,011,752	A	1/2000	Ambs et al.	367/17
6,011,753	A	1/2000	Chien	367/21

6,016,286	A	1/2000	Olivier et al.	367/17
6,144,342	A	11/2000	Bertheas et al.	343/709
6,459,653	B1	10/2002	Kuche	367/17
6,525,992	B1	2/2003	Olivier et al.	367/17
6,549,653	B1	4/2003	Osawa et al.	382/162
6,879,542	B2	4/2005	Soreau et al.	367/17
6,932,017	B1 *	8/2005	Hillesund et al.	114/244

FOREIGN PATENT DOCUMENTS

AU	734810	B	6/2001
CA	2270719		12/1997
DE	69702673	T	4/2001
EP	0193215		1/1986
EP	0319716		6/1989
EP	0321705		6/1989
EP	0525391		2/1993
EP	0390987		12/1993
EP	0613025		8/1994
EP	0581441		8/1997
EP	0909701		1/2003
GB	2093610		9/1982
GB	2122562		1/1984
GB	2320706		7/1998
GB	2331971		6/1999
GB	2342081		4/2000
NO	992701		6/1999
WO	WO95/31735		11/1995
WO	WO96/21163		7/1996
WO	WO97/11395		3/1997
WO	WO97/30361		8/1997
WO	WO97/45006		12/1997
WO	WO98/28636		7/1998
WO	WO99/04293		1/1999

* cited by examiner

Fig. 1.

Prior Art

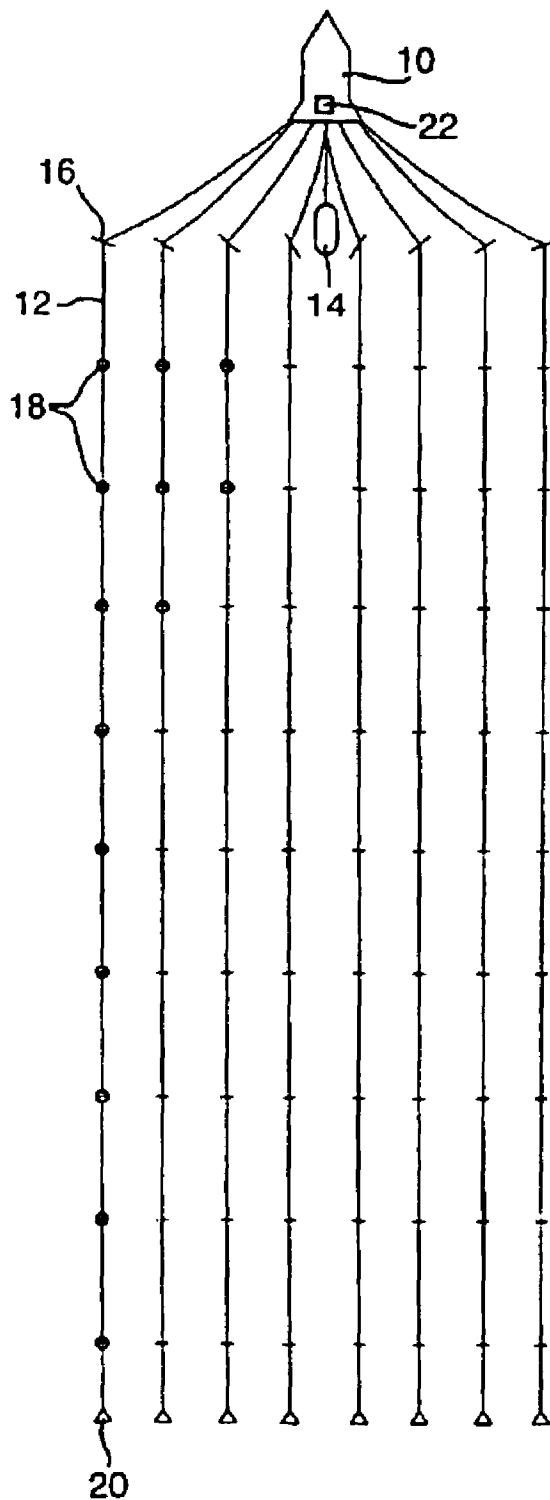


Fig.2.

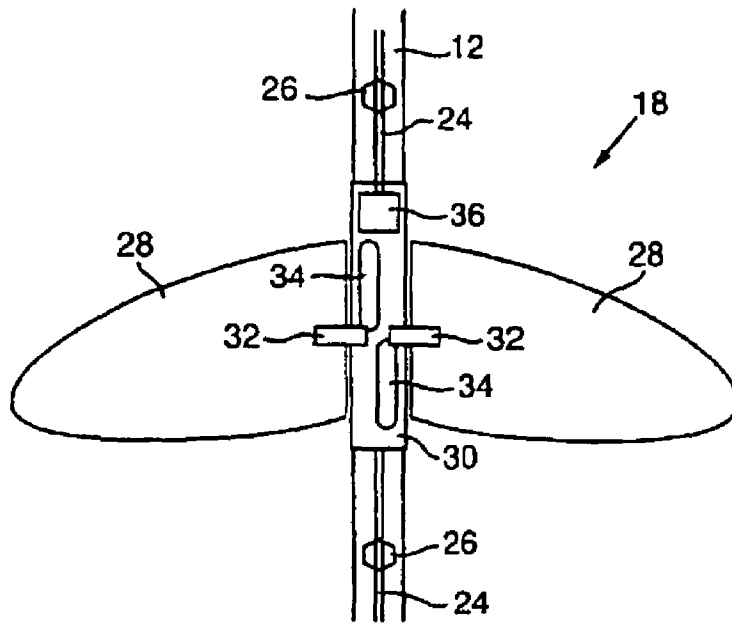
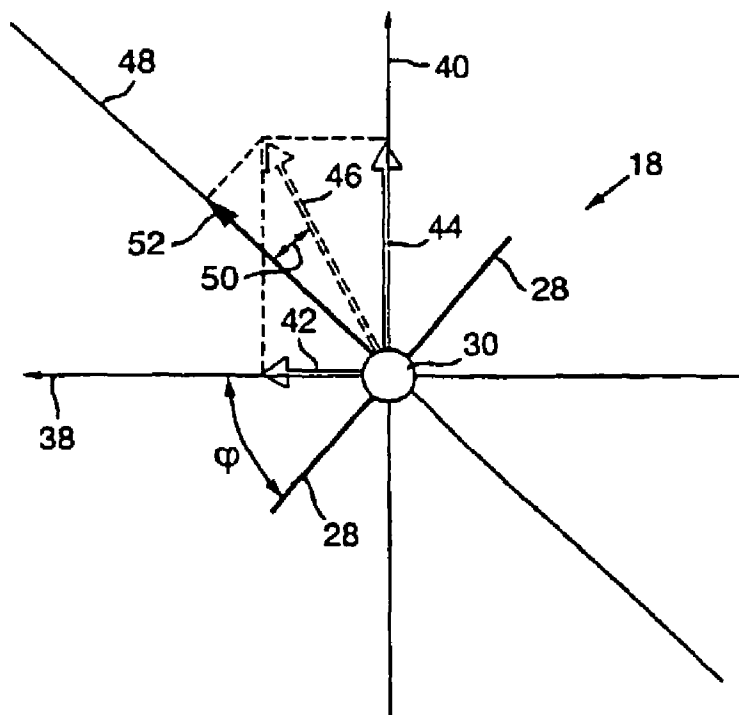


Fig.3.



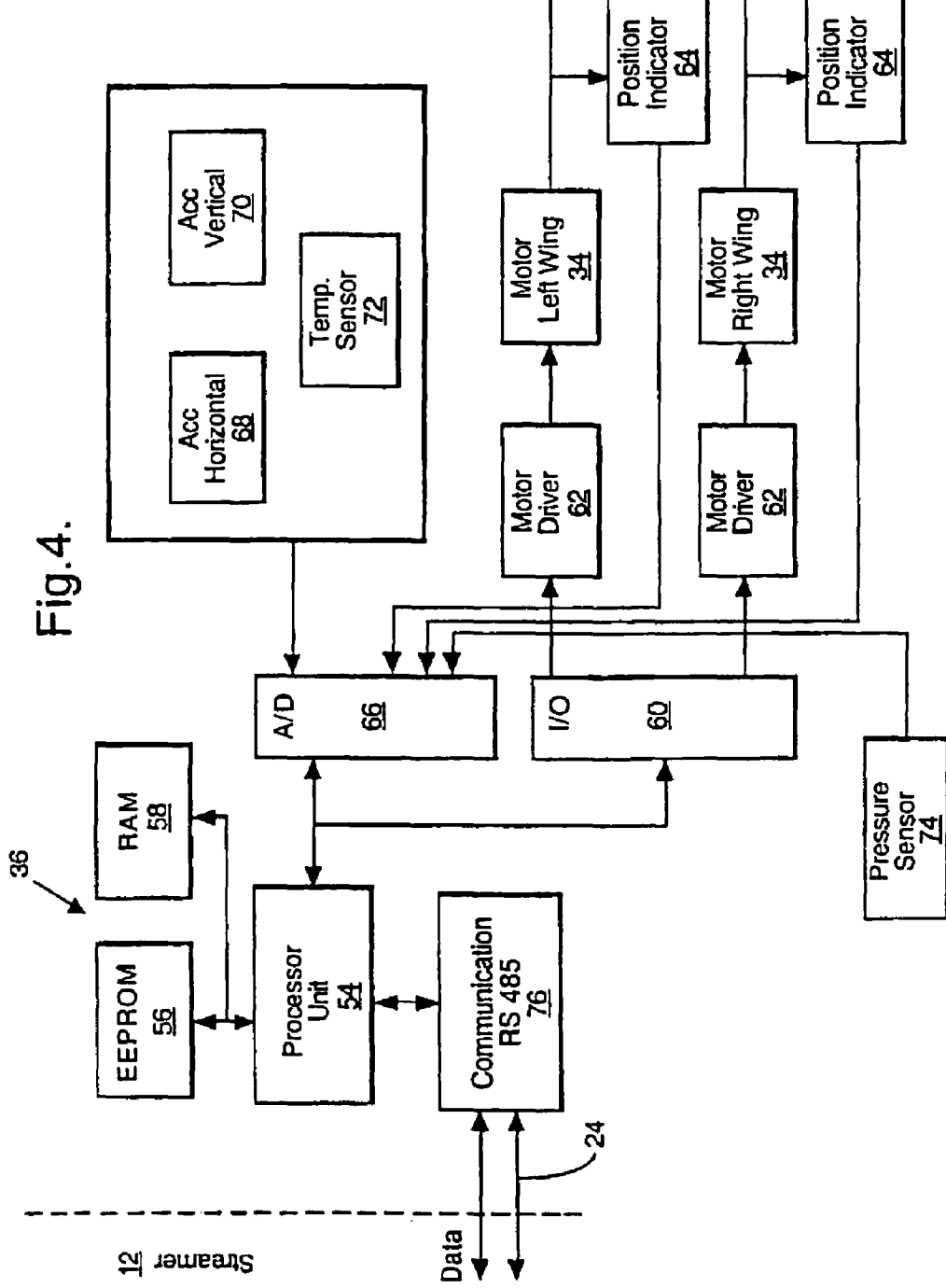


Fig. 4.

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