

Claims

What is claimed is:

1. A method for gathering geophysical data, comprising:
 - 5 towing geophysical data gathering equipment behind a survey vessel in a body of water, thesaid equipment including at least one geophysical source and an array of sensor streamers extending behind thesaid vessel;
 - determining a geodetic location of a firststreamer steering reference point at a forward end of thesaid sensor streamers;
 - 10 determining a reference direction based on the first steering reference point and a selected location on the survey vessel; and
 - laterally deflecting both at least one sensor streamer included in thesaid array of sensor streamers and the at least one geophysical source, wherein the laterally deflecting is based onin response to the determined geodetic location of the firstsaid streamer steering reference point and thesaid determined reference direction.
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2. ~~The method of claim 1, further comprising towing a geophysical source behind said vessel and determining a geodetic location of a source steering reference point at a forward end of said array of sensor streamers,~~ determining a desired source lateral position with reference to the firstsaid source steering reference point and steering thesaid geophysical source so that thesaid geophysical source follows thesaid desired source lateral position.
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3. ~~The method of claim 2 wherein said source steering reference point is the same as the streamer steering reference point.~~
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34. ~~The method of claim 1, further comprising determining a geodetic location of a vessel steering reference point at a forward end of said array of sensor streamers and steering thesaid survey vessel so that the firstsaid vessel steering reference point follows~~ a preselected travel path.
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5. ~~The method of claim 4 wherein said vessel steering reference point is the same as the streamer steering reference point.~~

6. ~~The method of claim 4 further comprising towing a geophysical source behind said vessel and determining a geodetic location of a source steering reference point at a forward end of said array of sensor streamers, determining a desired source lateral position with reference to said source steering reference point and steering said geophysical source so that said geophysical source follows said desired source lateral position.~~

7. ~~The method of claim 6 wherein said source steering reference point is the same as the streamer steering reference point.~~

48. The method of any of claims 1, 2, or 3, 4, 5, 6 or 7 wherein the first~~said~~ streamer steering reference point is the forward end of a particular one of the~~said~~ sensor streamers included in the~~said~~ array of sensor streamers.

59. ~~The method of any of claims 1, 2, 3, 4, 5, 6 or 7 wherein said streamer steering reference point is the forward end of one of said sensor streamers included in said array of sensor streamers and further comprising determining a geodetic location of a second steering~~streamer ~~reference point, the second steering reference point being the~~of a forward end of a second one of the~~said~~ sensor streamers included in the~~said~~ array of sensor streamers and laterally deflecting the~~said~~ second streamer in response to the determined geodetic location of the~~said~~ second ~~streamer~~ steering reference point and the~~said~~ determined reference direction.

610. The method of any of claims 1, 2, or 3, 4, 5, 6 or 7 wherein determining the geodetic position of the first~~said~~ streamer steering reference point comprises determining a geodetic position of a forward end of at least two sensor streamers

included in thesaid array of sensor streamers, and determining the firststreamer steering reference point with respect to thesaid determined geodetic positions of the forward ends of the at least two sensor streamers.

5 ~~11. The method of any of claims 1, 2, 3, 4, 5, 6 or 7 wherein determining a reference direction comprises successively determining the geodetic position of said streamer steering reference point and determining reference direction from said successive determinations of the geodetic position of said streamer steering reference point.~~

10 ~~712. The method of any of claims 1, 2, or 3, 4, 5, 6 or 7 wherein determining thea reference direction comprises successively determining the geodetic position of the firstsaid-streamer steering reference point and determining thea reference direction from thesaid successive determinations of the geodetic position of the firstsaid-streamer steering reference point.~~

15 ~~8. The method of claim 7, and further comprising time filtering thesaid determined reference direction of travel.~~

20 ~~913. The method of any of claims 1, 2, or 3, 4, 5, 6 or 7 wherein determining thea reference direction comprises utilizing a preselected direction.~~

25 ~~1014. The method of any of claims 1, 2, or 3, 4, 5, 6 or 7 wherein laterally deflecting the at least one sensor streamer includes laterally deflecting the at least one sensor streamer toward a straight line that is parallel to the reference direction~~determining a reference direction~~ comprises measuring a direction between said streamer steering reference point and a selected location on said towing vessel.~~

~~1115. The method of any of claims 1, 2, or 3, 4, 5, 6 or 7 wherein determining thea reference direction comprises measuring a direction between the firstsaid-streamer~~

steering reference point and a selected location on said geophysical data gathering equipment.

12. A system, comprising:

at least one geophysical source and an array of streamers towable behind a survey vessel in a body of water; and

control equipment configured to:

determine a location of a first steering reference point at a forward end of the array of streamers;

determine a reference direction based on the first steering reference point and a selected location on the survey vessel;

laterally deflect both a selected streamer from the array of streamers and the at least one geophysical source based on the determined location of the first steering reference point and the determined reference direction.

13. The system of claim 12, wherein laterally deflecting the selected streamer includes laterally deflecting the selected streamer toward a straight line that is parallel to the reference direction.

14. The system of claim 12, wherein the control equipment is further configured to steer the survey vessel such that the first steering reference point follows a selected path.

15. The system of claim 12, wherein the equipment is further configured to determine a plurality of steering reference points, the plurality of steering reference points being located at forward ends of a corresponding plurality of streamers from the array of streamers.

~~16. A method for gathering geophysical data, comprising:~~

~~towing geophysical data gathering equipment behind a survey vessel in a body of water, said equipment including an array of sensor streamers extending behind said vessel;~~

~~determining a geodetic location of a vessel steering reference point at a forward end of said array of sensor streamers; and~~

~~steering said survey vessel so that said vessel steering reference point follows a preselected travel path.~~

~~17. The method of claim 16 further comprising towing a geophysical source behind said vessel and determining a geodetic location of a source steering reference point at a forward end of said array of sensor streamers, determining a desired source lateral position with reference to said source steering reference point, and steering said geophysical source so that said geophysical source follows said desired source lateral position.~~

~~18. The method of claim 17 wherein said source steering reference point is the same as the vessel steering reference point.~~

~~19. A method for gathering geophysical data, comprising:~~

~~towing geophysical data gathering equipment behind a survey vessel in a body of water, said equipment including a geophysical source and an array of sensor streamers extending behind said vessel;~~

~~determining a geodetic location of a source steering reference point at a forward end of said array of sensor streamers;~~

~~determining a desired source lateral position with reference to said source steering reference point; and~~

~~steering said geophysical source so that said geophysical source follows said desired source lateral position.~~