

ratio being deteriorated for the high frequency acoustic waves.

~~One purpose~~ Embodiments of the present invention ~~is~~ seek to ~~propose~~ provide a technique to acquire marine seismic data which has broad dynamics with respect to the depth of the reflectors able to be located, and which ~~is~~ may be simple and efficient with respect to operations and economics.

10 PRESENTATION OF THE INVENTION

~~According to the invention, there is provided a seismic wave acquisition method using at least one streamer towed by a vessel and comprising a plurality of seismic receivers, characterized in that the streamer comprises a head portion in which the depth of the receivers increases the further they lie away from the vessel, so that said head portion has a first slant angle, and a tail portion comprising at least one section having a second slant different to said first slant.~~

An aspect of the present invention provides a method for acquiring seismic waves in water, the method comprising:

towing with a vessel at least one streamer including

a plurality of seismic receivers, said at least one streamer being equipped with a plurality of birds for controlling its depth in the water, said plurality of birds being spaced apart along a length of the at least one streamer;

adjusting a first set of the plurality of birds such that the streamer comprises a straight line head portion having a first slope in which a depth of

the receivers increases with a distance of the receivers from the vessel;

adjusting a second set of the plurality of birds such that the streamer comprises a tail portion including at least one straight line section having a second slope different from the first slope, wherein the tail portion comprises at least first and second sections having receivers with a depth that increases with the distance from the vessel, the first section being closest to the vessel and having a slant greater than that of the second section laying furthest from the vessel; and recording the seismic waves, which are reflected and/or refracted by a subsurface to be surveyed, with the plurality of seismic receivers while towing the at least one streamer with the straight line head portion having the first slope and the at least one straight line section of the tail portion having the second slope,

wherein the plurality of receivers are distributed on both the head portion and the tail portion.

Another aspect of the present invention provides a method of acquiring seismic waves in water, the method comprising:

towing with a vessel at least one streamer comprising a plurality of seismic receivers, the at least one streamer being equipped with a plurality of birds that are configured to control their depths in the water, the plurality of birds being spaced apart along a length of the at least one streamer; and individually

adjusting the plurality of birds, starting from a head of the at least one streamer, such that depths of the receivers increase with a distance from the vessel and the at least one streamer comprises at least first and second straight line portions with different slopes, each of the first and second portions including corresponding receivers and birds,

wherein the second straight line portion comprises at least first and second sections having receivers with a depth that increases with the distance from the vessel, the first section being closest to the vessel and having a slant greater than that of the second section laying furthest from the vessel, and

wherein the receivers record seismic waves,

reflected and/or refracted by a subsurface to be surveyed, while the first and second straight line portions have the different slopes.

Another aspect of the present invention provides a seismic system configured to acquire seismic waves related to a subsurface to be surveyed, the system comprising:

at least one seismic source towed by, but not directly attached to, a vessel and configured to emit the seismic waves;

at least one streamer;

a plurality of seismic receivers distributed along a length of the at least one streamer and configured to record the seismic waves; and depth control devices

spaced apart along a straight line head portion and a tail portion of the at least one streamer,

wherein a first set of the depth control devices are

adjusted so that in the straight line head portion of

5 the at least one streamer, a depth of first receivers

increases the further they lay distant from the vessel,

the straight line head portion having a first slope

relative to a surface of the water, and a second set of

the depth control devices are adjusted so that in the

10 tail portion of the at least one streamer, at least one

straight line section has second receivers and the at

least one straight line section has a second slope

different from the first slope, and

wherein the tail portion comprises at least first and

15 second sections having the second receivers with a

depth that increases with the distance from the vessel,

the first section being closest to the vessel and

having a slant greater than that of the second section

laving furthest from the vessel.

PRESENTATION OF THE FIGURES

Other characteristics and advantages of the invention will become further apparent from the following description which is solely illustrative and
25 non-limiting, and is to be read with reference to the appended drawings in which:

- figures 1 and 2 illustrate acquisition devices belonging to the prior art;

- figures 1' and 2' illustrate spectra of a shallow event, obtained using the devices illustrated figures 1 and 2;
- 5 - figures 3 and 4 illustrate two embodiments of an acquisition device according to the invention;