Development of an auto-orienting geophone

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ABSTRACT

This note discusses development of an auto-orienting multicomponent geophone. Industry standard 3-component geophones available at present are equipped with leveling bubbles and directional arrows to aid in the deployment of the geophones on the spread. They also have one or more spikes on the base to couple the geophone to of the ground. Forcing the geophone into the ground while moving it back and forth to keep the leveling bubble centered, reduces the ground pressure around the spikes, thus reducing the coupling of the geophone. This in turn affects the quality of the signal recorded by the instruments. A auto-orienting multicomponent geophone would reduce the cost and the time it takes to set up a seismic survey by simplifying the deployment of the geophone spread.

DESCRIPTION

This device will simplify the placement of muticomponent geophones used for seismic surveys. The device may be planted on the ground within about 20 degrees of vertical and within a few minutes will have aligned the internal elements to a vertical or horizontal positions.

The prototype device consists of a central sphere which contains up to 3 motion sensing elements (Figure 1). For use as a 3-component geophone, these elements are maintained in mutually orthogonal positions. This sphere is contained within a spherical chamber inside the main body of the device. At the top of the internal sphere is a small projection which is caged within a conical shape cavity to provide a limited amount of angular motion about the vertical axis. This small projection also carries the wiring necessary to connect the internal geophone elements. The space between the sphere and the enclosing cavity is filled with supporting medium (e.g. fluid and /or mechanical) which allows the sphere to rotate and is uniform over the surface of the sphere (Figure 2). This space is small enough that the supporting medium will not flow easily around the sphere. This reduces pendulum effects with the horizontal motion of the case, while transferring the ground motion to the internal sphere and the geophone elements.

Other designs under development are orientation through passive or activate electromagnetic elements and a Gal'perin arrangement of the geophone elements.

An auto-orienting instrument like this could be useful in any motion detection applications on the surface, downhole, or marine.

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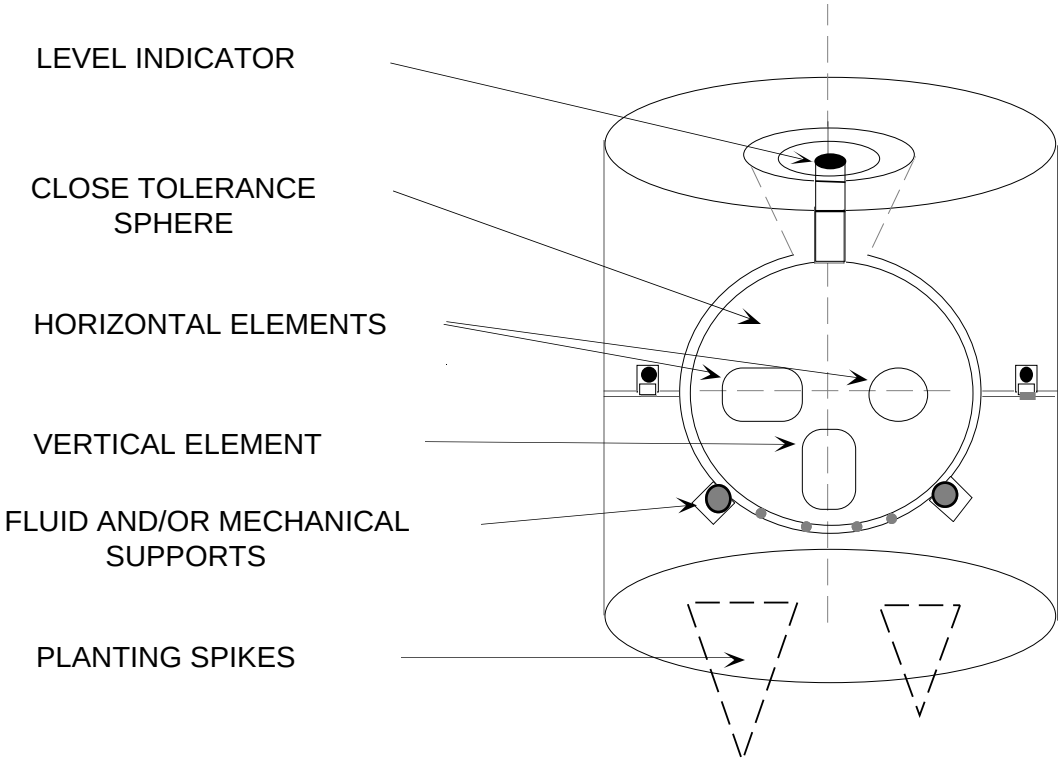

Fig.1 General schematic of a prototype auto-orientating geophone.

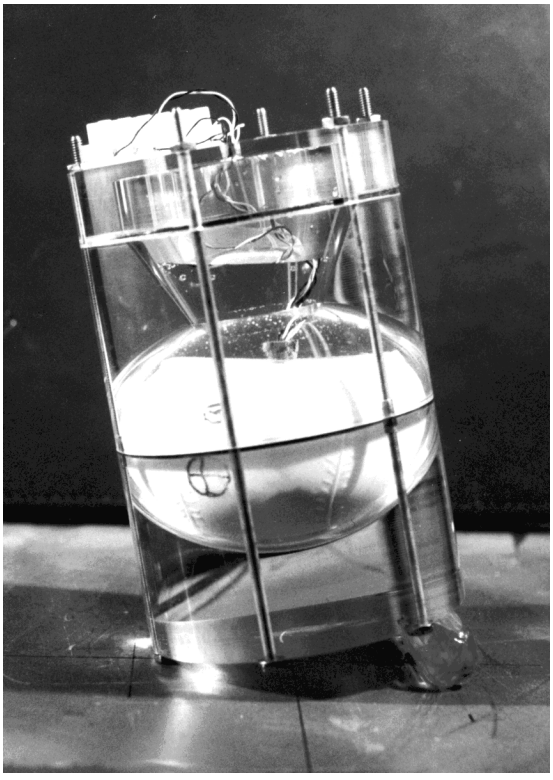

Fig.2 A prototype auto-orienting multicomponent geophone, constructed of transparent acrylic and a polyethylene sphere.