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SUPPORTING MEANS FOR A GYROSCOPE

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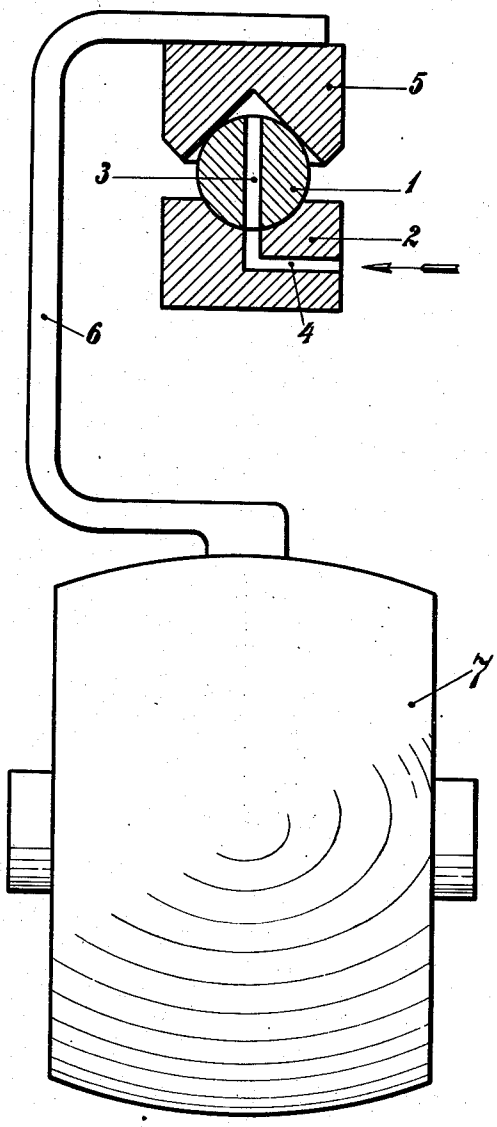


Fig. 1.

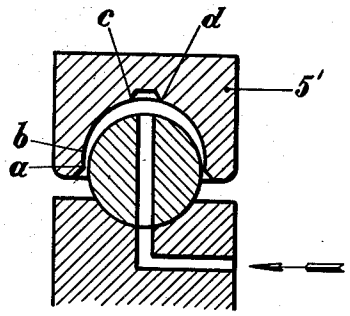


Fig. 2.

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SUPPORTING MEANS FOR A GYROSCOPE

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4 Claims. (Cl. 308—9)

My invention relates to supporting means for a gyroscope particularly to the supporting means for a gyroscope in an apparatus used for making underground measurements of the inclination and direction of bore holes.

It is an object of the invention to mount the gyroscope in such a way that it can move with exceptional freedom, so that notwithstanding its low directing force it always assumes the right position, and that this freedom of movement is maintained even when the apparatus is in a slanting position.

According to the invention the gyroscope is supported by means of a liquid cushion or film, positioned between two members, one of which, the supporting member connected to the fixed part or casing of the apparatus, has a spherical surface and the other, the supported member connected to the gyroscope, cooperates with the spherical surface in such a way that a space is formed between the two members, into which a liquid, for instance oil, can be introduced under pressure, said liquid being able to escape through the annular gap formed between the two members.

An embodiment of the invention is shown on the accompanying drawing in which Fig. 1 shows diagrammatically the gyroscope with its support in vertical section and Fig. 2 a vertical section through a modified support.

The support includes (Fig. 1) a ball 1, which is carried by a member 2. Both have a channel (3 and 4), into which a liquid under pressure, for instance oil, is introduced from a pump or a tank.

Supported by the ball there is a cap 5, which is conically shaped inside, and to which the gyroscope 7 is fixed by means of a bent arm 6 in such a way that the centre of gravity of the whole lies in the axis of symmetry of the inner cavity of the cap 5.

When there is no supply of oil or other suitable liqu'd the cap touches the ball in a circular line; as soon, however, as oil is supplied under sufficient pressure the supported cap is lifted over a small distance, oil flowing through the annular gap between ball and cap, so that the two parts do not touch and the gyroscope is supported by an oil cushion. It is not necessary that the oil pressure is always exactly constant; if for instance the oil pressure slightly increases, the cap rises to a somewhat higher position, the gap between ball and cap becomes wider so as to enable an increased outflow of oil, and the pressure under the cap decreases until a new equilibrium position is reached. The cap is prevented from touching the ball at the sides, since the horizontal components of the forces caused by the oil pressure, which act on the cap fully balance each other. Moreover the capillary forces and the form of the cap assist in keeping the ball free from the cap.

Fig. 2 shows a somewhat different form of cap, the inner surface of which comprises a cylindrical part *ab* connecting up to a ball-shaped part *bc*. In the middle the cap has a cavity *cd*, into which the oil can enter on the apparatus being taken into operation when the cap still rests on the ball.

If the oil is supplied by a pump, the slight vibrations caused thereby increase the freedom of movement of the system. In such case the oil after its escape out of the oil space between supporting and supported member can be easily sucked up by the pump and used over again.

What I claim is:

1. Supporting means for a gyroscope comprising a supporting and a supported member having a space between them for the introduction of a liquid under pressure, in which the first member has a convex spherical supporting surface and the supported member the form of a cap with an internal cavity, fitting about the spherical surface for universal movement relative thereto the gyroscope being rigidly connected to the supported member in a suspended position in such a way that the centre of gravity of the whole lies in or nearly in the prolongation of the axis of symmetry of the internal cavity of the cap the density of said liquid being insufficient for the liquid of itself to support the supported member.

2. A support according to claim 1 in which the supporting member is a ball provided with a passage constituting a liquid supply conduit, and in which the internal cavity of the cap comprises a cylindrical part, the diameter of which is slightly greater than the diameter of the ball.

3. A support according to claim 1 in which the supporting member is a ball provided with a passage constituting a liquid supply conduit, and in which the internal cavity of the cap has a conical surface.

4. A supporting means for a gyroscope, comprising a supporting and a supported member having a space between them for the introduction of a liquid under pressure, said first member having a convex spherical supporting surface, and the supported member having the form of a cap with an internal cavity, said cap fitting about the spherical surface for universal movement relative thereto and being adapted, upon passage of the liquid

between the two members, to be entirely separated from the supporting member, and to be supported by the liquid film, the density of said liquid being insufficient for the liquid of itself to support the supported member, said gyroscope being rigidly connected to the supported member in a suspended position in such manner that the center of gravity of the entire apparatus lies substantially in the prolongation of the axis of symmetry of the said internal cavity of the cap.

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