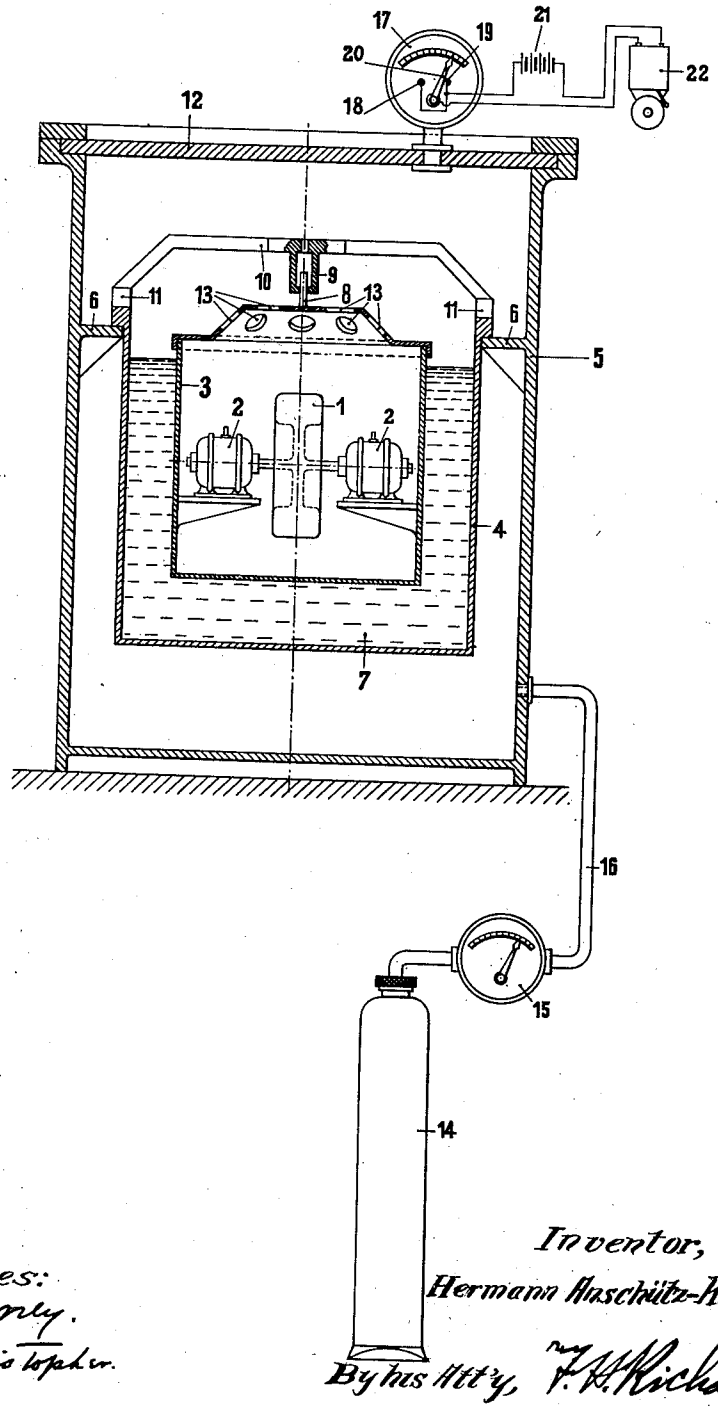
H. ANSCHUTZ-KAEMPFE.

GYROSCOPIC COMPASS.

APPLICATION FILED JULY 16, 1914.

1,180,815.

Patented Apr. 25, 1916.



Witnesses:
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UNITED STATES PATENT OFFICE.

HERMANN ANSCHÜTZ-KAEMPFE, OF NEUMÜHLEN, NEAR KIEL, GERMANY.

GYROSCOPIC COMPASS.

1,180,815. Specification of Letters Patent. Patented Apr. 25, 1916.

Application filed July 16, 1914. Serial No. 851,265.

To all whom it may concern:

Be it known that I, Dr. HERMANN ANSCHÜTZ-KAEMPFE, a subject of the Emperor of Germany, residing at Heikendorfer Weg 9, Neumühlen, near Kiel, Germany, have invented certain new and useful Improvements in Gyroscopic Compasses, of which the following is a specification.

The theory of gyroscopic compasses shows that, all other conditions being equal, they operate most efficiently when the gyroscope or gyroscopes, generally driven by electric motors, rotate with the greatest speed. The tendency is therefore to raise the number of revolutions to the highest possible limit. In itself this high rotative speed could be carried up to the bursting moment imposed by the stresses in the material of the gyroscopic bodies owing to centrifugal force. But there are also various other difficulties in the way of such a considerable increase of speed; the friction between the surface of the gyroscope and the surrounding air increases almost as the square of the number of revolutions. Directly owing to that friction and indirectly owing to the necessary increase in the power of the driving motor, heat is generated which must be continuously carried away. In order to remove this disadvantage, it has been suggested to run the gyroscopes in a vacuum or in a chamber containing rarefied air, or to cool them constantly by an energetic circulation of air. The first method has the disadvantage that heat in a vacuum can only be carried away by radiation, which results in a considerable difference in the heating of the various parts of the gyroscopic compass. In other words, a portion of the apparatus will have a fairly considerably higher temperature during working. Moreover, to maintain a permanent vacuum involves constructive difficulties, for instance carefully made packing. As regards the second of the above mentioned methods, the exhausting of the cooling air offers difficulties. Moreover the motor must be correspondingly larger than for the first method. In the present embodiment, the said disadvantages are obviated by running the gyroscope body in a light gas (for instance hydrogen, helium, illuminating gas or the like). Owing to the small density of the said gas, the surface friction of the gyroscope is reduced to a very considerable extent, while the energetic movement of the gas within the closed space brings about an excellent exchange of heat.

In the accompanying drawing there is diagrammatically disclosed one embodiment of my invention.

The gyroscope 1 is shown as being supported by its driving motors 2—2, the said motors being suitably supported for rotation on the wall of the housing 3. The said housing 3 is contained in a second housing 4 which is itself inclosed by an outer housing 5 which last said housing forms an outer casing for the apparatus. At the interior of the outer housing 5 there is arranged a plurality of ledges 6—6, which ledges support the second housing 4, by means of a suitable offset engaging rim 11. The intermediate container 4 may preferably be left open to the chamber in the outer container 5, and in the present instance I have arranged on the edge or rim 11 thereof a supporting cross bar 10, which cross bar has arranged thereon a bearing 9, which bearing supports the inner gyroscopic housing 3 in axial alinement with the transverse axis of the gyroscope 1.

The maintaining of the gyroscopic container 3 in its operative axis will now be described. The said container 3 has a cover arranged thereon, which cover bears at its upper end a pivot 8, which pivot 8 is mounted in the previously mentioned bearing 9. In order to keep said gyroscopic container 3 in its operative position and to keep said pivot in engagement with the bearing 9, I preferably employ a buoyant supporting means, in the present instance quicksilver, and which is indicated by the numeral 7. Enough quicksilver is introduced into the intermediate container 4 to maintain the gyroscopic container 3 in its operative pivotal position. I also provide, when using the previously noted light gases, to maintain the same in the gyroscopic chamber under a pressure somewhat higher than the normal atmospheric pressure, and in order to do this means to be hereinafter described must be provided therefor.

The outer container 5 has a cover 12 arranged thereon, which cover is a gas-tight fit thereon, so that any medium introduced into the chamber of the container 5 is prevented from escaping. The gaseous medium permeates into the chamber of the gyroscopic housing 3 by passing through the openings 13 arranged in the cover thereof.

As a means for introducing the desired gases into the apparatus as above described, either under abnormal pressure or at normal pressure, I have shown in the drawing the customary compressed gas container 14 which is connected to the interior of the container 5 by means of a conduit 16. There is also shown, interposed between the said compressed gas container 14 and the container 5, a manometer of the well known type. This manometer is set to control the gas pressure in the container 5 to any predetermined amount. As a means for checking the control of the manometer 15 upon the internal pressures in the apparatus, I have arranged an alarm system which is electrically actuated and which will give warning when the pressures exceed or fall below the required pressure. This system comprises a manometer 17 similar to that shown at 15 with the exception that the same is connected into an electrical circuit wherein 18 and 19 are contact terminals, the same being connected on one arm of the circuit through a source of electrical current 21 to one terminal of an alarm device 22, in the present instance indicated as an electrical bell. The other arm of the circuit is connected to the manometer indicator needle 20 and its other end is connected to the opposite terminal of the alarm 22. It is obvious that any extreme variation in the interior pressures in the container 5 will operate to cause the needle 20 to move to one extreme or the other and in so doing will operate either one of the contacts 18 or 19 thereby closing the circuit and causing the alarm to operate.

While I prefer, as previously stated, to operate the gyroscopic apparatus in a gaseous atmosphere, the pressure of which may exceed the normal atmospheric pressure, there are instances where it is more feasible and practical to replace the air, in the gyroscopic chamber only, with media of lighter specific gravity, and to maintain the lighter media therein at or below the normal atmospheric pressure. I therefore do not desire to be limited to the use of gaseous medium under pressure, as my invention primarily consists in the method of the application, for air, under normal atmospheric pressures, of media of lighter specific gravity under any desirable pressure, in order to gain the advantage of the proportional decrease of skin friction upon the high speed elements of my apparatus.

What I claim is:—

1. An apparatus of the class described comprising a tank, gas lighter than air contained in said tank, and a gyroscope mounted in said tank to operate in said gas.

2. In an apparatus for reducing surface friction in gyroscopic compasses, the combination with a gyroscope, of a tank, and gas under pressure and lighter than air contained in said tank, the gyroscope being mounted in said tank to operate in said gas.

3. In an apparatus for reducing surface friction in gyroscopic compasses, the combination with a gyroscope, of a tank, gas under pressure and lighter than air contained in said tank, the gyroscope being mounted in said tank to operate in said gas, and a pressure gage for regulating the pressure relation between the interior of the tank and the outside atmosphere.

4. The method of operating gyroscopes in a medium of lighter specific gravity than air.

5. The method of operating the high speed elements of gyroscopic apparatus in a medium having less frictional resistance than air.

6. The method of operating gyroscopes in a chamber in which the air has been displaced by a lighter medium.

7. The method of operating gyroscopic apparatus in a closed chamber in which the air has been replaced by a gaseous medium of different specific gravity.

8. The method of operating gyroscopic apparatus in a closed chamber in which the air has been replaced by a gaseous medium of different specific gravity, said medium being under a different pressure than the atmospheric pressure.

9. The method of operating gyroscopic apparatus in a closed chamber containing a medium of lighter specific gravity than air, said medium being maintained at a higher than atmospheric pressure.

10. The method of operating gyroscopic apparatus in a closed chamber containing a gaseous medium of lighter specific gravity than air, said medium being maintained at a predetermined pressure.

11. The method of operating gyroscopic apparatus in a closed chamber containing a medium of different specific gravity than air, and automatically controlling the pressure of said medium in said chamber to a predetermined pressure.

12. The method of operating gyroscopic apparatus in a plurality of inclosed chambers, one of said chambers being closed to the outer atmosphere, and supplying gas to said chambers under a predetermined pressure from a controllable source of gas supply.

In witness whereof I have hereunto signed my name this 27th day of June, 1914, in the presence of two subscribing witnesses.

DR. HERMANN ANSCHÜTZ-KAEMPFE.

Witnesses:

WOLFGANG OTT,

W. GEOFFREY.