March 21, 1933. C. F. GREEN 1,902,497

INDICATING DEVICE

Filed April 26, 1930

Fig.1.

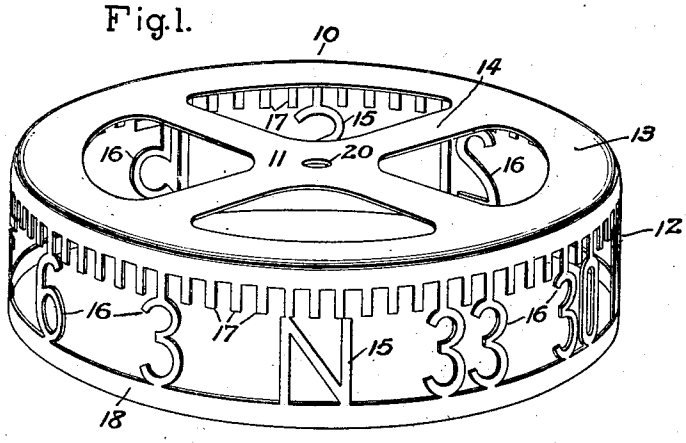
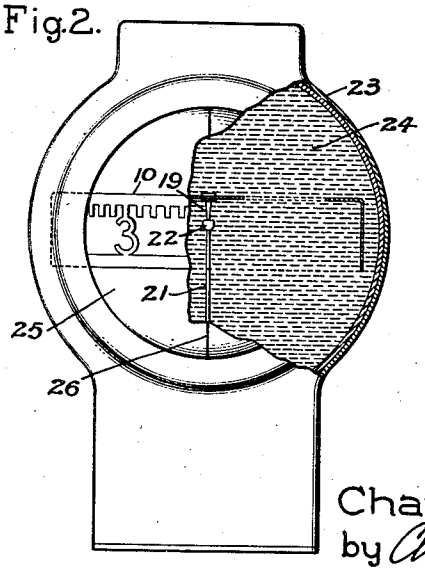


Fig.2.



Inventor:
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Patented Mar. 21, 1933 1,902,497

UNITED STATES PATENT OFFICE

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INDICATING DEVICE

Application filed April 26, 1930. Serial No. 447,716.

This invention relates to indicating devices and more particularly to indicating devices in which a movably mounted indicating member is immersed in a damping liquid; and has for an object the provision of a rigid, light and efficient indicating member having improved indicating markings thereon.

The invention has particular application to magnetic compasses in which the card member or rose is immersed in a suitable damping liquid and has for a further object the provision of means for improving the damping of the movement of the card in the liquid without adding to its weight.

In carrying the invention into effect in one form thereof I cut away or otherwise remove the major portion of the body of the indicating member to leave solid markings and graduations attached to a supporting portion of the body, but having the greater portion of their outlines separate therefrom.

In illustrating the invention in one form thereof I have shown it as embodied in a magnetic compass but it is to be understood that the invention is applicable to other indicating devices in which the movable indicating member is immersed in a liquid medium.

For a better and more complete understanding of the invention reference should now be had to the following specification and the accompanying drawing in which Fig. 1 is an enlarged view of a compass card embodying the invention and Fig. 2 is an elevation partly in section of a magnetic compass in which the card of Fig. 1 is used as the indicating member.

Referring now to the drawing the card 10 is constructed of any suitable material and is preferably made in the form of an inverted cup having a top portion 11 and a cylindrical side wall 12. Quadrantal segments of the top portion are cut away or otherwise removed to provide a supporting member comprising the rim 13 and the spider 14.

The major portion of the side wall is also cut away as shown to leave suitable compass markings shown as comprising the solid letters 15, digits 16 and intermediate graduations comprising teeth-like projections 17, arranged in spaced apart relationship and suspended from the upper supporting rim 13. Although not essential to the invention the side wall 12 may also be cut away to leave a lower rim 18 which serves to increase the rigidity and strength of the structure.

As shown in the drawing the letters 15, digits 16 and graduations 17 are arranged in spaced apart relationship with respect to each other and are circumferentially disposed with respect to a central axis. It is to be observed that although the indicating markings comprising the letters 15, digits 16 and graduations 17 are attached to the supporting rim 13, that the major portion of their outlines is separate therefrom.

The material from which the card 10 is fabricated is preferably a thin light weight metal substance such for example as thin sheet copper or aluminum but may also be made of non-metallic materials such for example as celluloid.

Although any suitable method may be employed to form the card 10, this is preferably done by forming a thin sheet of material such for example as sheet copper having a thickness of between 5 and 10 mils into a blank inverted cup by the well-known methods of punching, pressing or drawing and then removing the portions which are to be cut away by the use of suitable cutting dyes.

It is also possible to use the well-known method of etching to remove portions of the blank inverted cup to leave the solid characters. When this method is employed the portions of the blank which are to remain as solid indicating characters are coated with lithographing ink and the blank is then placed in an acid bath and left until the bare portions of the blank have been cut away due to the chemical action of the acid.

The card 10 may also be formed by any of the well-known methods of electro-deposition. In forming the card with its solid markings by the methods of electro-deposition it has been found to be very satisfactory to employ a molybdenum blank having its surface recessed to correspond to the cut

away portions of the card; filling the recesses with a suitable material such for example as varnish or a compound and then depositing pure metal such for example as pure copper from a copper sulphate bath. The metal will preferably be deposited to a thickness of between 5 and 10 mils and may then be easily stripped from the matrix and the matrix used over again for the formation of other cards.

Due to the unequal masses of material in the digits and letters which are distributed circumferentially about the central axis, the card would be statically unbalanced with respect to the central axis if special precautions were not taken to balance the card. In order to provide a balanced card the quadrantal segments which are removed from the top surface 11 of the card are so designed that the masses of the remaining supporting rim 13 and the spider 14 together with the masses of the solid markings of the compass card form a structure which is balanced with respect to the central axis of the card.

After the markings of the card have been formed by any of the methods enumerated above or any other suitable methods they are given a coating of suitable luminous paint such for example as radium paint. One of the advantages of my invention is that the luminous paint may be quickly and easily applied to the markings by persons not possessed of any particular degree of skill and thus the cost of making the cards is thereby considerably reduced. Cards constructed in the above described manner have the further advantages of strength, rigidity and minimum weight.

When the invention is embodied in a compass a needle pointed pivot 19 made of a refractory material is secured in the central aperture 20 of the card 10 by any suitable fastening means. The card is supported as shown in Fig. 2 by means of a central post 21 which is provided at one extremity with a jeweled bearing 22 in which the pivot 19 is journaled. An outer wall or casing 23 defines a spherical bowl or chamber in which is contained a suitable damping liquid 24 such for example as alcohol. The front face of the bowl is cut away to provide an opening or window through which the markings on the card 10 may be viewed by the observer. A ground glass lens 25 is secured in the window and its surface is provided with a vertically disposed lubber-line 26 which cooperates with the solid markings on the card 10 to indicate the angular relationship between the lubber-line and the north-south axis of the earth's magnetic field. When in use as a compass, the card 10 will, due to its frictional contact with the liquid 22, be deflected from its normal position to the earth's magnetic field whenever the angular position of the body upon which it is mounted changes. When the deflecting force has ceased the card will seek to return and in so doing will swing past its normal position and finally will come to rest in a true north-south position after a series of oscillations of ever diminishing magnitude. The greater the amount by which the card swings past its normal position and the greater the number of oscillations of the card before it comes to rest the more unsatisfactory is the compass from the point of view of the navigator.

Due to the additional friction resulting from eddies caused by the movement of the solid markings through the damping liquid, cards constructed in accordance with my invention have very superior damping characteristics. For example, I have found that the amount by which the card swings past the normal after a given deflection is only about one-half as great as that for smooth cards not constructed in accordance with the invention. Accordingly the number of oscillations required for the card to come to rest is very greatly reduced. Thus, the navigator is able to bring the craft back to its true course or to change from one course to another in very much less time than would otherwise be required.

Although in accordance with the provisions of the patent statutes I have described the invention as embodied in concrete form I would have it understood that the elements shown in the drawing are merely illustrative and that the invention is not necessarily limited to the exact forms shown since alterations and modifications will readily suggest themselves to persons skilled in the art without departing from the true spirit of this invention or from the scope of the annexed claims.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A compass card comprising a central spider member, a circumferential rim portion attached to said spider, solid cardinal reference characters attached to said rim but having the major portion of their outlines separate therefrom, and intermediate graduations comprising teeth attached to said rim and projecting therefrom.

2. A compass card comprising a central supporting spider provided with a circular rim portion, solid reference characters attached to said rim but having the major portion of their outlines separate therefrom, a second rim attached to said reference character, and intermediate reference graduations comprising a plurality of teeth arranged in spaced-apart relationship and attached to one of said rims.

3. An indicating member comprising a cupped member having the major portion of its side wall cut away to provide a plurality of solid spaced apart markings of different masses circumferentially arranged

with respect to a central axis, and a support attached to said markings and having its mass unevenly distributed with respect to said central axis to form with said markings a balanced structure with respect to said central axis.

4. An indicating device comprising in combination, a wall defining a chamber, a fluid medium in said chamber, a supporting member movably mounted in said medium and means comprising solid indicating characters attached to said member and having the major portions of their outlines separate from said supporting member and intermediate graduations comprising a plurality of teeth-like projections attached to said supporting member and protruding into said medium for indicating the relative positions of said member and said wall and for damping the motion of said member in said medium.

In witness whereof, I have hereunto set my hand this 25th day of April, 1930.

CHARLES F. GREEN.