Feb. 15, 1966 W. E. HULL 3,234,657

MAGNETIC COMPASS

Original Filed April 29, 1957 2 Sheets-Sheet 1

Fig 1

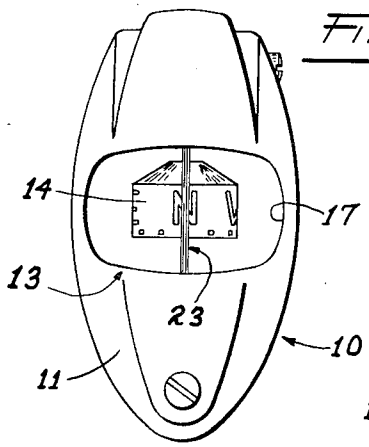


Fig 2

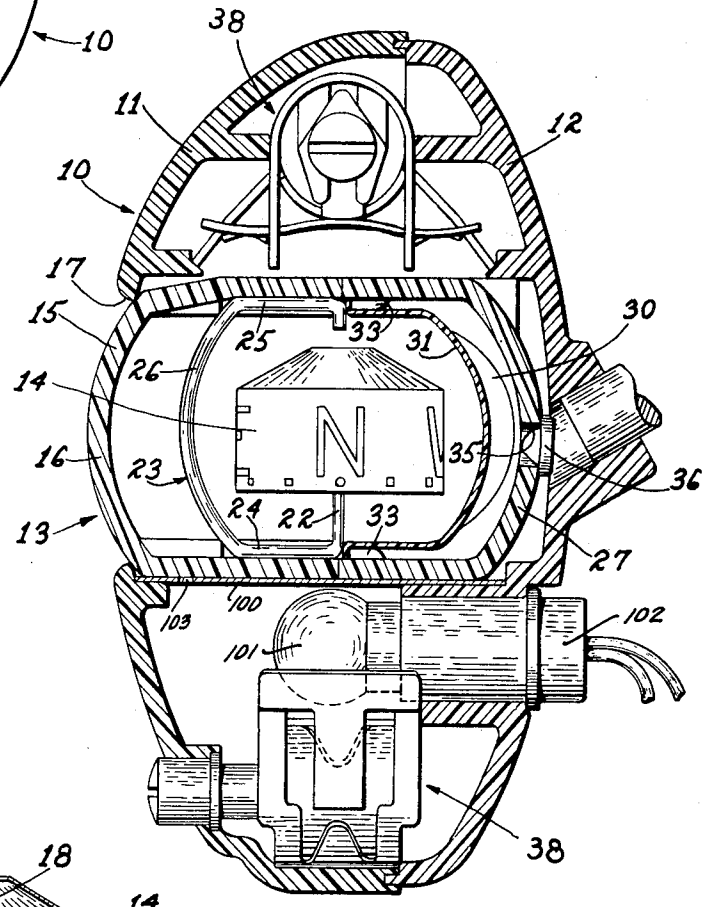
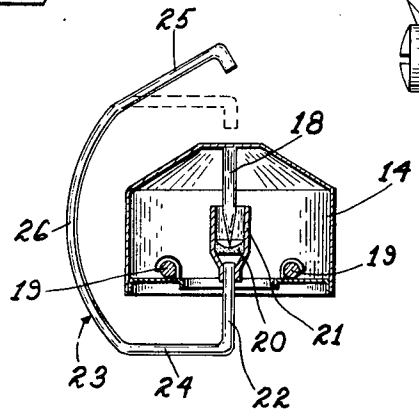


Fig 3



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Fig 4

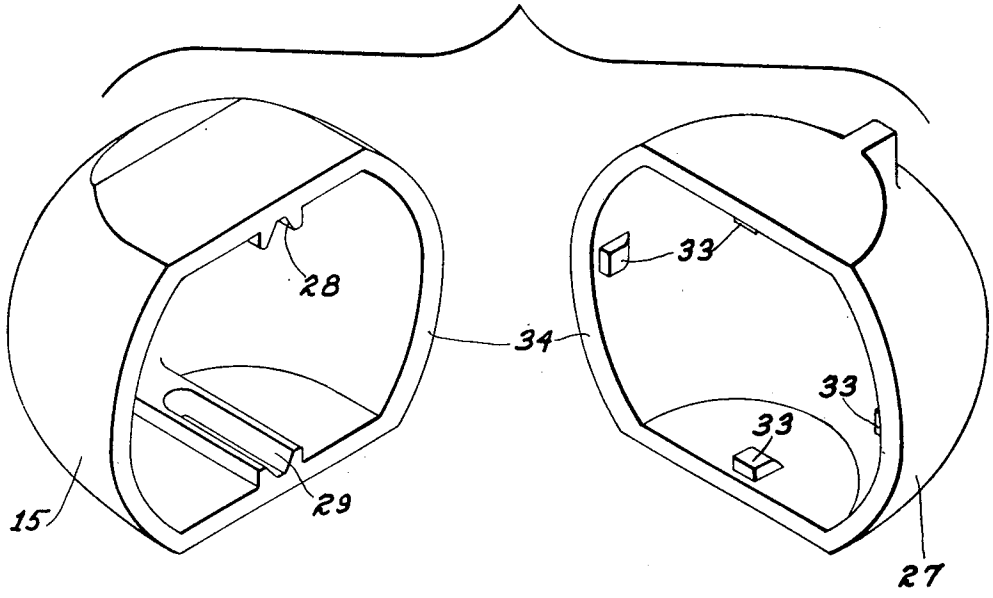


Fig 5

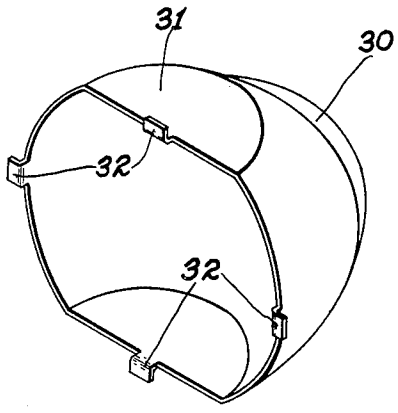
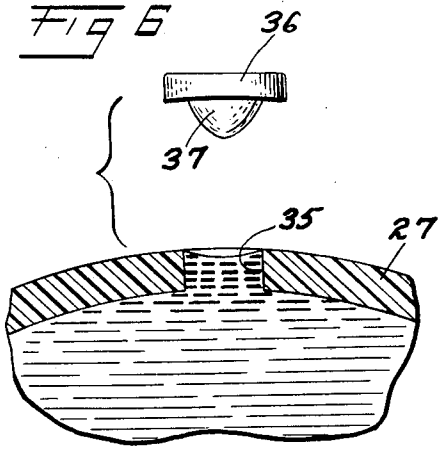


Fig 6



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United States Patent Office 3,234,657 Patented Feb. 15, 1966

3,234,657

MAGNETIC COMPASS

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Original application Apr. 29, 1957, Ser. No. 655,757, now Patent No. 3,079,698, dated Mar. 5, 1963. Divided and this application July 13, 1962, Ser. No. 209,570
4 Claims. (Cl. 33—222)

The present invention relates to compasses, more particularly to magnetic compasses of the type suitable for use in boats, aircraft, motor vehicles and the like, and the principal object of the invention is to provide new and improved compasses of the character described.

This application is a division of my co-pending application for Letters Patent entitled "Magnetic Compass," Serial Number 655,757, filed April 29, 1957, now Letters Patent 3,079,698, and which is in turn a continuation-in-part of Letters Patent 2,943,398.

The present invention provides a compass wherein a resilient wire-like member supporting a card and magnet assembly and at its intermediate portion providing a lubber line, has portions respectively underlying and overlying the assembly and held in predetermined position by resilient engagement in respective grooves formed in the compass housing, to provide a simplified construction. This and other advantages will readily become apparent from a study of the following description and from the drawings appended thereto.

In the drawings accompanying this specification and forming a part of this application there is shown, for purpose of illustration, an embodiment which the invention may assume, and in these drawings:

FIGURE 1 is a front elevational view of an embodiment of the improved compass,

FIGURE 2 is an enlarged, side elevational view thereof, the near side of the outer casing being removed and certain parts being shown in section to illustrate the interior construction,

FIGURE 3 is a sectional view of a detail prior to assembly,

FIGURE 4 is a perspective view of two details prior to their assembly with each other,

FIGURE 5 is a perspective view of another detail, and

FIGURE 6 is an enlarged, fragmentary sectional view of still another detail.

With reference to FIGURES 1 and 2, the present invention comprises an outer casing **10** of plastic or the like which encloses the about to be described compass mechanism. To facilitate assembly of the various parts, it is preferable to form the casing to provide a front portion **11** and a rear portion **12** which are adapted to be secured together by screws or the like, not shown.

Positioned substantially centrally of casing **10** is an assembly which comprises a housing **13** in which a compass card **14** is rotatably mounted. The front portion **15** of housing **13** is rounded at **16** and at least this portion of the housing is transparent so that the compass card may be seen and read through the housing wall. Front portion **11** of casing **10** is apertured at **17** to provide a window through which the front portion of housing **13** is visible. As will be apparent, rounded portion **16** of housing portion **15** magnifies compass card **14** and makes it appear larger, thus making the compass easier to read.

In the present embodiment and as seen in FIGURE 2, housing **13** rests upon an opaque plate **100**. A light bulb **101**, carried by a suitable socket **102** which is in turn carried by the rear portion **12** of outer casing **10**, is positioned beneath plate **100**. At the present time, one or more suitable apertures **103** are formed in plate **100** to permit light from bulb **101** to escape to the interior of housing **13** so as to illuminate the compass card **14**. In order to provide a desirable soft lighting effect on the

compass card, aperture **103** is disposed adjacent the front wall **16** of the housing **13** intermediate the periphery of the compass card and the periphery of the housing so as to illuminate that portion of the compass card visible through the housing wall **16**.

Compass card **14** is conventional in that it comprises an inverted cup of non-magnetic material having a central depending stud **18** (see FIGURE 3) whose lower end tapers to a point to provide a low friction pivot. Card **14** has the usual magnets **19** secured thereto for making it responsive to the earth's magnetic lines of force and the exterior of the card carries the usual indicia.

As in conventional constructions, stud **18** rests in a concavity formed in the upper surface of a jewel **20** which is secured inside a sleeve **21**. The lower end of sleeve **21** is soldered or otherwise secured to an upstanding portion **22** of a supporting member **23** which is non-magnetic and preferably somewhat resilient.

In the present embodiment, supporting member **23** has a lower portion **24** which extends transversely of portion **22**, an upper portion **25** which lies in substantially the same plane as portion **24**, and an intermediate connecting portion **26**. In the position of parts shown in full lines in FIGURE 3, portion **25** of supporting member **23** is spaced apart sufficiently from portion **24** so that the compass card may be assembled, as shown, with the supporting member. However, as will later be disclosed, subsequent assembly operations will spring portion **25** and maintain it in the dot-dash line position to prevent disassembly between the compass card and the supporting member. As will be understood, portion **26** serves not only to connect portions **24**, **25**, but also serves as a lubber line.

As heretofore disclosed, compass card **14** is encased in a housing **13**. This housing is preferably substantially flat on top and bottom and as best seen in FIGURE 24, comprises the previously mentioned front portion **15** together with a rear portion **27**. As will appear, these portions are adapted to be fused together to form the complete housing. The inside of housing portion **15** is formed to provide spaced, inwardly directed respective upper and lower grooves **28** and **29** for receiving the supporting member **23**.

To assemble compass card **14** and supporting member **23** with housing portion **15** and after compass card stud **18** has been inserted in sleeve **21** to rest upon jewel **20**, supporting member portion **25** will be sprung to its dot-dash line position shown in FIGURE 3 and the assembly then slid into housing portion **15** with member portion **26** foremost. As indicated, supporting member portion **24** will be slid into groove **29** while portion **25** will be slid into groove **28**. It is to be understood that the spacing between grooves **28**, **29** is such that supporting member portion will be held in the dot-dash line position shown in FIGURE 3 and in the full line position shown in FIGURE 2, to prevent disassembly of the compass card from the supporting member. The resiliency of the supporting member will tightly wedge the latter and the housing portion **15** together against unintentional disassembly as will be clear.

As in conventional constructions, housing **13** is adapted to be filled with a suitable liquid to dampen oscillatory movement of the compass card and since the housing is sealed, means must be provided to permit expansion and contraction of the dampening liquid resulting from temperature variations. The present invention provides a highly effective, low cost construction for accommodation of this expansion and contraction and such construction possesses none of the disadvantages of the prior art constructions as hereinabove pointed out.

The present invention is similar to one of the previously mentioned prior art constructions in that it provides a

bubble of air or other compressible fluid within the housing; however, this bubble is trapped within the housing and is hidden from view regardless of the position in which the assembled compass is held. Briefly, the bubble is encased in a transparent, flexible envelope which is permanently secured in a predetermined position within the housing.

As best seen in FIGURES 2 and 5, a thin, preferably transparent membrane **30** of a suitable plastic or the like (which is, of course, insoluble in the dampening liquid) encloses the bubble. In the present embodiment, membrane **30** is cemented to the exterior of a thin, preferably transparent body **31** which is configurated similar to housing portion **27** but which is smaller so as to fit therewithin. In order to maintain body **31** in position, it is formed with a plurality of ears **32** (herein shown to be four in number) which engage the interior of housing portion **27** and which also engage respective lugs **33** which project from the interior of the curved side walls and from the flat, top and bottom walls of this housing portion. Under certain circumstances, it may be desirable to cement or otherwise secure membrane **30** directly to the interior of the housing portion.

With the support member and the compass card assembly positioned in housing portion **15** and with body **31** positioned in housing portion **27**, faces **34** of the housing portions will be sealed together. In the present embodiment, one or both faces **34** will be moistened with a suitable liquid which softens the material. The faces will then be pressed together and held until the liquid evaporates thus leaving the two housing portions fused together into an integral, leak-proof unit. Obviously, instead of a softening liquid, the two housing portions may be secured together by means of a suitable cement. It will be seen in FIGURE 2 that after assembly, supporting member **23** engages body **31** and prevents shifting thereof within the housing.

With housing portions **15, 27** fused or otherwise secured together, the completed housing will be filled with the usual dampening liquid through an aperture **35** formed in housing portion **27**. It is to be understood that it is important the interior of the housing be completely filled and that no free air bubble be entrapped therein because a free air bubble would create the impression that some of the dampening liquid had escaped from the housing.

As illustrated in FIGURE 2, aperture **35** in housing **13** is adapted to be closed by means of a cap **36** which overlies aperture **35** and which is preferably formed of substantially the same material as is housing portion **27**. Referring to FIGURE 6, the underside of cap **36** is adapted to be moistened with a suitable softening liquid which may be similar to that used in fusing housing portions **15, 27** together. The cap will then be pressed against the exterior of housing portion **27**, so as to overlie aperture **25**, until the softening liquid evaporates to thereupon fuse cap **36** to the housing and provide a leak-proof joint therebetween.

In order to insure that no air bubbles will be trapped beneath cap **36** the cap is provided with a tapered projection which fits within aperture **35**. As the cap is positioned in place, the projection will displace a quantity of liquid from the housing to insure that no air is entrapped beneath the cap. Further, projection **37**, as it enters the aperture, insures that cap **36** is properly positioned overlying the aperture.

It should be pointed out that a more dependable closure is obtained by fusing cap **36** to the exterior of the housing than by wedging a plug into the aperture as has been done in prior art devices. With the present construction, shrinkage of the housing in the cap will not result in leakage since any stresses imposed by such shrinkage will be spread over a relatively large area thus reducing the possibility of separation between the housing and the cap which would result in leakage of the dampening liquid from the housing.

With housing **13** assembled as heretofore described, a workable, accurate compass is provided. However, this compass would be accurate only when used in a locality free of local magnetic fields. In the event the compass is used in an automobile or aircraft or the like, it is necessary to provide means for neutralizing the effect of such local field on the compass in order to permit it to read accurately.

Neutralization of these local magnetic fields is accomplished by means of suitable compensating devices which are adjusted to set up a counter magnetic field which is, in its effect on the compass card, equal to and in the opposite direction to the local field. These compensating devices are contained within casing **10** and are indicated generally by the reference character **38** and since they are the subject of my co-pending application for Letters Patent herein above mentioned and form no part of the present invention, they will not herein further be described.

In view of the foregoing it will be apparent to those skilled in the art that I have accomplished at least the principal object of my invention and it will also be apparent to those skilled in the art that the embodiment herein described may be variously changed and modified, without departing from the spirit of the invention, and that the invention is capable of uses and has advantages not herein specifically described, hence it will be appreciated that the herein disclosed embodiment is illustrative only, and that my invention is not limited thereto.

I claim:

1. A compass comprising a magnetic body, a wire-like member underlying and pivotally supporting said body and having vertically spaced portions, and a housing for said body having groove means for closely receiving respective member portions therein to hold said member and thus said body in predetermined position within said housing.

2. The construction of claim **1** wherein said housing is formed of two housing parts secured together and wherein said groove means are formed in one of said housing parts.

3. A compass comprising a compass card having markings for indicating various magnetic heading, a wire-like member having a first portion underlying said card and providing a pivotal support about which said card is rotatable about a generally vertical axis, a second portion overlying said card and limiting movement thereof away from said first member portion, and an intermediate portion connecting said first and second member portions and spaced transversely of said pivotal support axis to provide a lubber line, and a housing enclosing said card and said member and providing vertically spaced grooves for respectively receiving said first and second member portions to maintain said member and thus said card in predetermined position within said housing.

4. The construction of claim **3** wherein said first and second member portions are resiliently biased away from each other and wherein such portions are sprung into respective housing grooves.

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