Aug. 22, 1950 G. M. STROBINO 2,519,718

GYROSCOPIC SHIP ROLL INDICATOR

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Fig. 1.

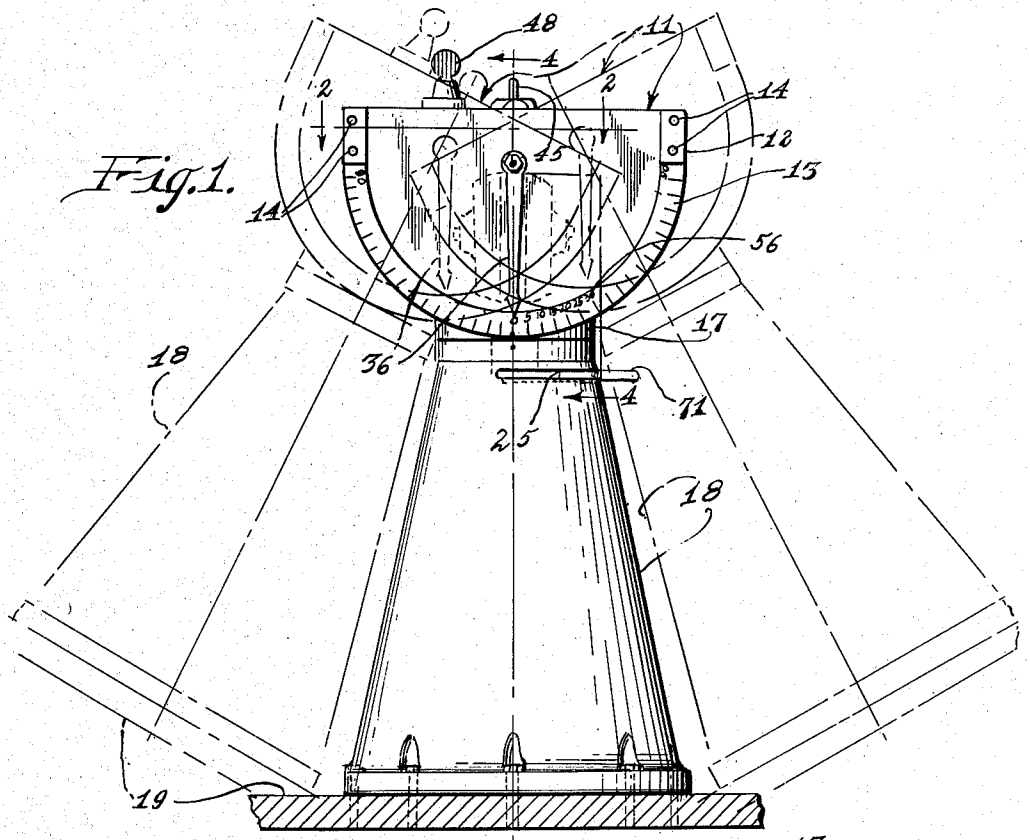
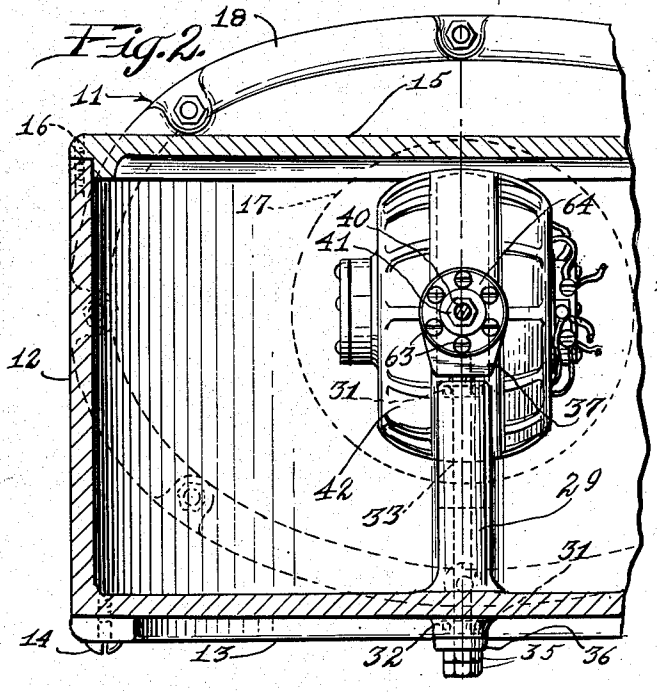


Fig. 2.



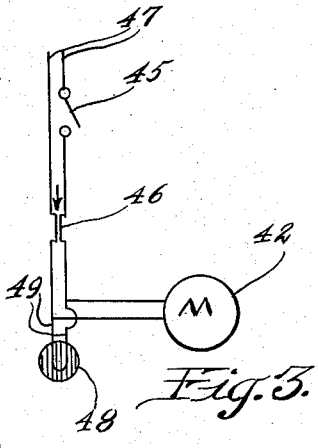


Fig. 3.

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Fig. 4.

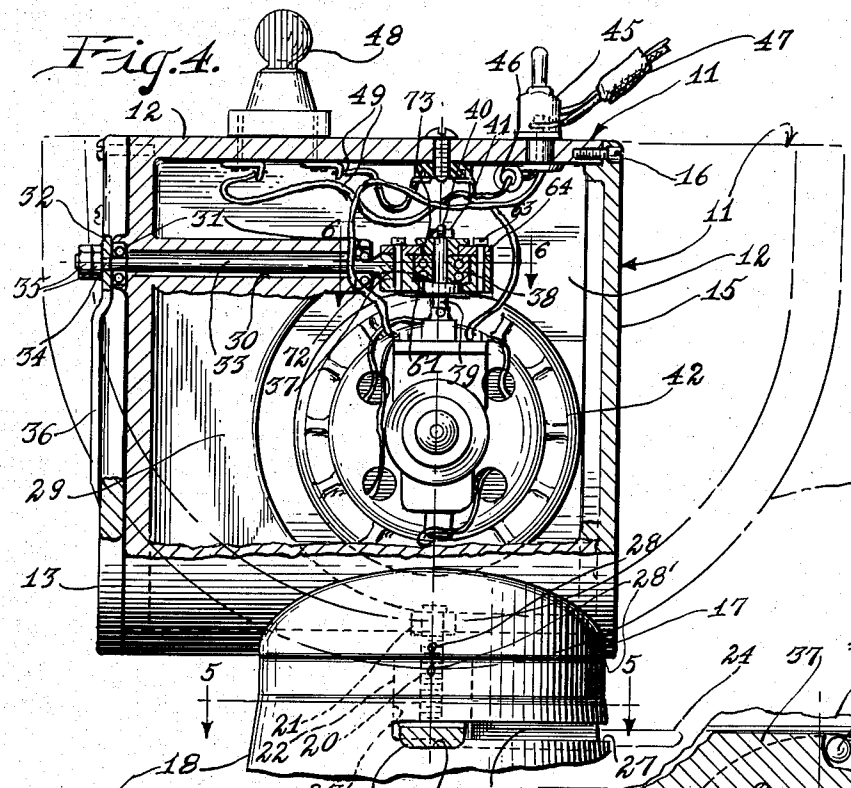

Fig. 6.

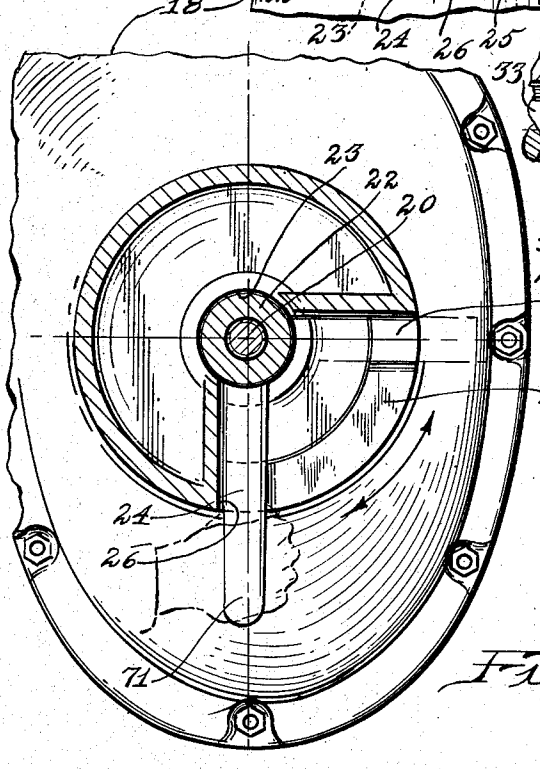

Fig. 5.

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GYROSCOPIC SHIP ROLL INDICATOR

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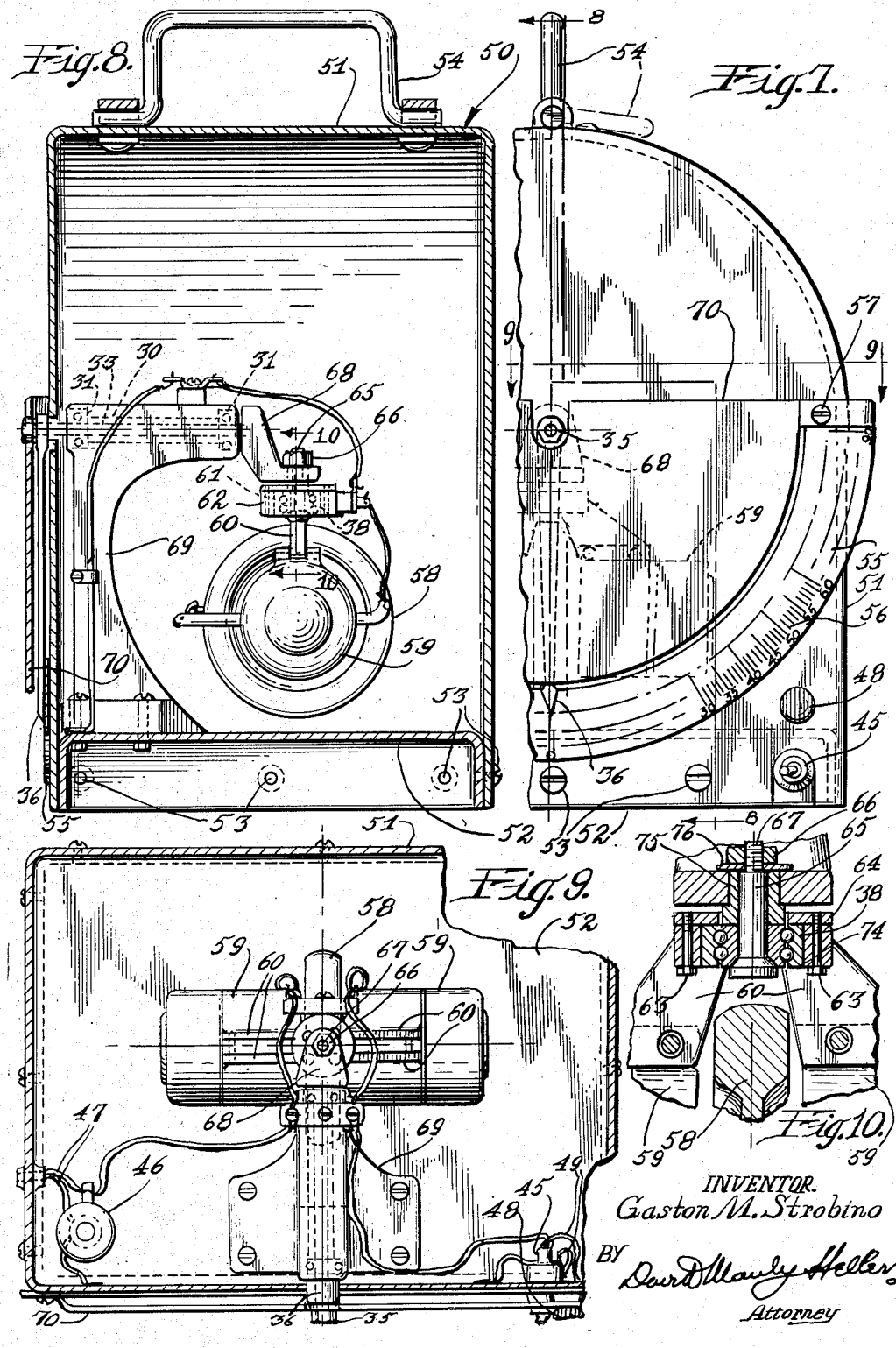

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UNITED STATES PATENT OFFICE

2,519,718

GYROSCOPIC SHIP ROLL INDICATOR

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Application October 11, 1947, Serial No. 779,370

2 Claims. (Cl. 33—204)

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My invention relates to gyroscopic ship roll indicators.

An important object of my invention is to provide a ship roll indicator, which may be attached to the deck of a ship, having a graduated dial of 180°, and within its case a gyroscopic motor suspended from the indicator needle shaft so that, as the ship rolls with the waves, constantly changing the pitch of the ship's deck and ship roll indicator panel, the indicator needle will, at all times, be unwaveringly maintained in a vertical position with the earth's center, so that the angle of the roll or pitch may be easily read upon the said graduated indicator dial.

A further object of my invention is to provide a ship roll indicator, which being mounted upon a pedestal on the ship's deck, may be fixedly adjusted horizontally in an arc of 90° on the said pedestal in order to indicate either the fore and aft pitch of the ship, or the port to starboard roll of the ship, depending on whether the indicator dial is aligned to fore and aft, or to port and starboard.

A still further object of my invention is to provide a non-vibrating ball bearing universal mount means for suspending the said gyroscopic motor, allowing the gyroscopic motor to precess or rotate in a horizontal plane to compensate automatically when the indicator is in a position other than its true orientation, the said mount means affording pendulating movement in a vertical plane to the said gyroscopic motor.

A still further object of my invention is to provide a modification in the form of a portable ship roll indicator that may be found desirable for smaller ships, and which may be used in the same manner as the hereinbefore described ship roll indicator.

A still further object of my invention is to provide in my modification a gyroscopic wheel, powered by two oppositely wound motors mounted upon the same shaft.

A still further object of my invention is to provide a gyroscopic ship roll indicator of a simple and sturdy construction that may be economically manufactured.

The following description and the accompanying illustrations will disclose other objects and advantages that are included in my invention, in which like parts are designated by like numerals, and in which

Fig. 1 is a front view of my ship roll indicator mounted upon its pedestal on the ship's deck and showing, in phantom lines, the action of the roll of the ship.

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Fig. 2 is an enlarged cross-sectional view of my invention taken substantially on lines 2—2 of Fig. 1.

Fig. 3 is a schematic diagram of the electrical wiring of my invention.

Fig. 4 is an enlarged cross-sectional view of my invention taken substantially on line 4—4 of Fig. 1.

Fig. 5 is a cross-sectional view of my invention taken substantially on line 5—5 of Fig. 4.

Fig. 6 is an enlarged cross-sectional view of a portion of my invention taken substantially on line 6—6 of Fig. 4.

Fig. 7 is the front view of a portion of a modification of my invention.

Fig. 8 is a cross-sectional view taken substantially on line 8—8 of Fig. 7.

Fig. 9 is a cross-sectional view taken substantially on line 9—9 of Fig. 7.

Fig. 10 is a cross-sectional view of a portion of my invention taken substantially on line 10—10 of Fig. 8.

Referring to the illustrations, one form of my invention is generally designated 11 and consists of a semi-cylindrical housing 12, on the front of which is mounted, by screws 14, a dial segment 13. The housing 12 may be formed of plastic or metal, and is provided with a removable panel 15 on its rear side, held by screws 16 onto the housing 12.

The semi-cylindrical housing 12 is supported by a neck 17, pivotally mounted and held in place by stud bolt 20 and nut 21 on a pedestal 18 which is securely fastened to the ship's deck 19. A reduced extension 22 of neck 17 extends into a counterbored recess 23 in the top of the pedestal 18, and attached thereto is a lever 24. The lever 24 rides in a slot 25 of a 90° arc in the pedestal 17, the said lever being of a resilient construction and so mounted as to be caused to snap into engagement with the recesses 26 and 27, one at each end of the slot 25, acting as a locking means, to maintain the housing 12 in either a fore and aft, or port to starboard, alignment.

At a point in the circumference of the neck 17, an aligning mark 28 is formed. The said aligning mark 28 is located on a center line parallel with the dial 13. Two additional aligning marks 28' are located at points on the circumference of the pedestal top just above and in alignment with the two recessed ends 26 and 27 of the slot 25. The pedestal 18 is mounted on the ship's deck 19 so that the center line of the recessed slot ends 26 and 27 are parallel and in exact alignment with the fore and aft center

line, and the port to starboard center line of the ship.

Therefore, by grasping the handle 71 of the lever 24, and lifting or springing said lever from the recess 26 or 27, the indicator housing may be swung to a position to indicate the roll from fore and aft of the ship, or to indicate the roll from port to starboard of the said ship. The said aligning marks 28 and 28', when in registry, indicate the true position of the gyroscopic ship roll indicator.

A support bracket 29 is formed with, or suitably mounted in, the housing 12 and the top is drilled at 30. Ball bearing units 31 are mounted in the hole 30; one on the inner end, the other within a boss 32 on the front surface of housing 12. The said boss 32 providing the bearing surface for an indicator needle 36 which is mounted by means of lock nuts 35 on the reduced threaded end 34 of a shaft 33 journaled in the said ball bearing units 31.

Formed on the inner end of the shaft 33 is a bearing block 37 which serves as a support for the gyroscopic motor 42 allowing it to pendulate about a horizontal axis. The gyroscopic motor support means consists of a countersunk hole 61 in block 37 and a stud 39 attached to the said gyroscopic motor 42. Contained in the countersunk portion of hole 61 is a ball bearing unit 38, the outer cage of which is fixedly clamped by the plate 64 and screws 63 to block 37. The inner cage of ball bearing unit 38 is fixedly held between a shoulder 72 on stud 39 and a bushing 73, the flange of which rests on plate 64, held by lock nut 41 on the reduced threaded end 40 of the stud 39. This attaching means allows the gyroscopic motor to pivot about a vertical axis, providing together with its horizontal pivoting means, a universal joint which will allow the axis of the gyroscope to point horizontally whether or not its axis is aligned with the axis of the ship.

If desired, the arc of the horizontal pivot may be limited to the necessary 90° arc, as shown in Fig. 6, by a slot 43 in the bearing block 37 and a pin 44 in the casing of the gyroscopic unit 42. A switch 45 is mounted upon the top of housing 12 and controls the power input line 47 to the motor of the gyroscopic unit 42. A red signal light 48 may also be mounted upon the housing 12, and in parallel by wires 49 to the power intake lines 47, to indicate when the gyroscopic motor 42 is in operation. A voltage regulator or reducer 46 may be installed on line 47 if required.

The dial segment 13 is graduated as at 56 from zero to 90° each way from the center point, as shown in Fig. 1. The vertically positioned indicator needle 36 when touching the zero mark on dial 13 indicates, as shown in Fig. 1, that the ship's deck 19 is at right angles to a vertical plane through axis 33, any deviation from this position being sensed by the action of the suspended gyroscopic motor 42, thus indicating the degree of tilt of the said ship's deck 19 on the dial 13, as shown in phantom lines in Fig. 1.

A modified form of my invention is generally designated 50 and consists of a semi-cylindrical case 51, having a removable base 52, held to the case 51 by screws 53. A handle 54 is suitably mounted on the top of the said case 51. The semi-circular dial segment 55 is mounted by screws 57 on the face of the case 51. The dial segment 55 is graduated as at 56 to 180°, as previously described for the form illustrated in Fig. 1. The support bracket 69 is suitably mounted

on the base 52 and is provided with a drilled hole 30 and ball bearing units 31.

Mounted or formed upon the end of the shaft 33 is a supporting arm 68, on which is suspended, by means of bolt 65 and nut 66, a bearing block 62, in a central hole of which is contained a ball bearing unit 61. Formed on the bearing block 62 are bifurcated support arms 60 to which are attached two oppositely wound motors 59 mounted upon the same shaft with a gyroscopic wheel 58.

As indicated in Fig. 10, the outer cage of the ball bearing unit 38 is clamped between a shoulder 74 formed in the arms 60 and a plate 64 secured thereto by screws 63. The inner cage of the ball bearing unit 38 being held between the head of the bolt 65 and the head of a bushing 75. A washer 76 overlapping the bushing 75 and arm 68 is secured over the reduced threaded end 67 of the bolt 65 by lock nut 66, permitting rotation about a vertical axis for gyroscope 58.

Power intake lines 47, a switch 45, a voltage reducer 46, and a warning light 48, similar to those already described, complete the modification to my ship roll indicator. A guard 70 may also be mounted over the front of casing 51 to protect the indicator hand 36, as shown in Figs. 7 and 8.

A most important feature of my invention, as illustrated in Fig. 10, is the universal joint connection between the gyroscopic motor unit and the hand indicator shaft. This connection is so designed that it affords to the gyroscopic unit a rotary motion about both its vertical and horizontal axes so that, especially since the gyroscopic motor, in its operation, always points toward the center of the earth, its previously described universal connection, through the shaft 33 to the indicator hand 36 will cause the said indicator hand 36 to point to the center of the earth regardless of the tilt or pitch of the ship in the plane of the indicator dial upon which the indicator needle is mounted.

Referring to Fig. 1, it will be seen in the illustrations, in solid lines, that the ship's deck is exactly horizontal and that the indicator hand 36 points to zero, indicating no pitch or tilt to the ship's deck. In the phantom line, the ship is shown tilting to the left and to the right, and it will be seen that, while the dial 13 tilts with the ship, the indicator hand 36 still maintains its vertical position indicating a tilt or pitch of about 30° in either direction. By means of the gyroscopic motor and the novel universal and secure connections between the said gyroscopic motor and the indicator hand, the indicator hand will be maintained, at all times, in a vertical and unwavering position regardless of the tilt or pitch either fore and aft, or port to starboard, of the said ship, and the degree of roll or tilt may be easily read upon the graduated split dial 13.

What might be stressed to more effectively illustrate the advantages of my invention is that if an indicator of similar construction but one without a stabilizing means, such as a gyroscopic motor, were to be used, then the indicator hand would have an independent vibratory motion making it difficult to read the tilt or roll of the vessel to which it may be attached. With my invention, the indicator hand, by virtue of its rigid connection to a gyroscope, automatically controlled by its precession, will always point to gravity.

The automatic compensating arrangement operating within an arc of 90°, heretofore de-

scribed, lends flexibility to the mechanism permitting the gyroscopic motor to orientate within the given arcuate adjustment to compensate for settings other than those measuring the roll of the ship between fore and aft, and port to starboard, positions.

I wish it to be understood that the forms of my invention, which has been illustrated and described, are to be regarded as suggestive rather than in restrictive or limiting sense; inasmuch as it is obvious that details of construction may be modified, as by the use of equivalent elements, without departing from the scope and spirit of my invention as hereinafter claimed.

Having thus described and disclosed my invention, what I claim as novel, and desire to secure by Letters Patent, is:

1. A ship roll indicator of the character described comprising, a base, a semi-cylindrical housing having a neck secured to the top of said base, a segment secured to one end of said semi-cylindrical housing, bearing bracket means within the said housing, a shaft journaled in the said bearing bracket means, an indicator needle secured to one end of the said shaft cooperating with the said segment, the said shaft provided with a bearing block on its other end, and gyroscopic means mounted swivelably on the said bearing block and free to motivate about its longitudinal axis, and orienting means consisting of a slotted portion adjacent the top of the said base, and resilient lever means secured to the neck of the said semi-cylindrical housing and

adapted to orient the said semi-cylindrical housing within an ambit of substantially 90°.

2. A ship roll indicator of the character described comprising, a base, a semi-cylindrical housing having a neck secured to the top of said base, a segment secured to one end of said semi-cylindrical housing, bearing bracket means within the said housing, a shaft journaled in the said bearing bracket means, an indicator needle secured to one end of the said shaft cooperating with the said segment, the said shaft provided with a bearing block on its other end, and gyroscopic means mounted swivelably on the said bearing block and free to motivate about its longitudinal axis, pin means on the said gyroscopic means cooperating with arcuate recess means on the said bearing block to limit the movement of the said gyroscopic means, and orienting means consisting of a slotted portion adjacent the top of the said base, and resilient lever means secured to the neck of the said semi-cylindrical housing and adapted to orient the said semi-cylindrical housing within an ambit of substantially 90°.

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