

TITLE OF THE INVENTION

[0001] CALIBRATABLE FLUID LEVEL MONITORING GAUGE

BACKGROUND OF THE INVENTION

5 FIELD OF THE INVENTION

[0002] The present invention relates to liquid level float gauges. More specifically, the invention relates to a liquid level float gauge that can be re-calibrated after installation.

DESCRIPTION OF RELATED ART

10 [0003] Conventional liquid level gauges are known for measuring and displaying the level of a liquid in an enclosed vessel, for example, a vessel enclosing an electric power transformer. One such gauge, commonly referred to as a vertical liquid level gauge, is disposed on a top of the vessel and includes a float disposed within the enclosed
15 container and in contact with the surface of a dielectric fluid at least partially covering the transformer. As the level (i.e., height) of the liquid changes, the float is displaced vertically.

[0004] The vertical displacement of the float is then converted to a rotational motion, which rotational motion causes rotation of a first,

internal magnet, disposed above the float, below a seal formed between the container contents and the atmosphere, and proximate a top of the enclosed container. The internal magnet is magnetically coupled to a second, external magnet, disposed above (i.e., on the atmosphere side
5 of) the seal formed between the container contents and the atmosphere. Accordingly, rotation of the internal magnet causes rotation of the external magnet.

[0005] A shaft is fixed with respect to the external magnet such that rotation of the external magnet causes corresponding rotation of the
10 shaft. Disposed at the distal end of the shaft, opposite the external magnet, is a pointer, or indicator, that, in conjunction with a gauge dial, displays the level of the liquid in the container.

[0006] Such conventional gauges, however, are not readily calibrated and, subsequently, re-calibrated. Specifically, because the shaft is fixed
15 to the external magnet, and because the pointer is fixed to the shaft, the position of the pointer with respect to the height of the float is pre-established. Thus, for example, if an initial liquid height is different from enclosure to enclosure, the initial readout of gauges on the enclosures will be different. However, it may be desirable to have an
20 initial level, whatever that level may be, be associated with a single pointer position. Similarly, if the nominal liquid level changes, it may be

desirable to re-calibrate the gauge to set that level to the single pointer position.

[0007] Accordingly, there is a need in the art for a simply constructed liquid level gauge that is easily calibrated and re-calibrated.

5 BRIEF SUMMARY OF THE INVENTION

[0008] This invention addresses the foregoing needs in the art by providing a novel liquid level gauge, in which a rotating liquid level indicator is movable in couple with the translational displacement of a float, but also relative to the translational displacement, to calibrate the
10 gauge.

[0009] In a first aspect of the invention, a vertical fluid level gauge for displaying a fluid level in an enclosed vessel includes a float portion and a gauge portion. The float portion is disposed within the enclosed vessel and includes a float and a first rotating member. The float
15 portion converts a vertical displacement of the float caused by a change in the fluid level into a rotational displacement of the first rotating member. The gauge portion is disposed on an exterior of the enclosed vessel and includes a second rotating member, a pointer, and a clutch mechanism selectively engaging the pointer to the second rotating
20 member. The gauge portion is arranged with respect to the float portion such that the second rotating member is rotatably coupled to

the first rotating member. The clutch mechanism selectively engages the pointer to the second rotating member such that the pointer rotates with the second rotating member to provide a visual indication of the fluid level, and disengages the pointer from the second rotating member to allow movement of the pointer with respect to the second rotating member.

[0010] In another aspect of the invention, a vertical fluid level gauge for measuring a fluid level in an enclosed space includes a rotational member, a rotatable mechanism, a clutch member, and a relative motion facilitator. The rotational member has a rotational position corresponding to a vertical height of a float disposed in the enclosed space. The rotatable mechanism is in communication with the rotational member. The mechanism includes a pointer that indicates to an observer the rotational position of the rotatable mechanism. The clutch member biases the rotatable mechanism against the rotational member with a biasing force sufficient to engage the rotatable mechanisms with the rotational member, thereby causing the rotatable mechanism to rotate with the rotational member. The relative motion facilitator is disposed on at least one of the rotational member and the rotatable mechanism for allowing the biasing force provided by the clutch member to be overcome, thereby disengaging the rotatable mechanism

from the rotational member to rotate the rotatable mechanism with respect to the rotational member.

[0011] In a still further aspect of the invention, a vertical fluid level gauge for displaying a fluid level in an enclosed vessel includes a float
5 portion, a second magnet, a pointer, and a clutch mechanism. The float portion has a first magnet that rotates correspondingly to a change in the level of the fluid in the vessel. The second magnet is disposed on the outside of the vessel and is magnetically coupled to the first magnet such that the second magnet rotates correspondingly with the first
10 magnet. The pointer mechanism provides a visual representation of the rotational position of the second magnet. The clutch mechanism selectively engages and disengages the pointer mechanism with the second magnet such that the pointer mechanism rotates with and with respect to the second magnet, respectively.

15 [0012] A better understanding of these and other objects, features, and advantages of the invention may be had by reference to the figures and the detailed description of the invention, which illustrate and describe preferred embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

20 [0013] Figure 1 is a perspective view of a fluid level monitoring gauge according to a preferred embodiment of the invention.

[0014] Figure 2 is an exploded perspective view of the float portion of the fluid level monitoring gauge of Figure 1.

[0015] Figure 3 is an exploded perspective view of the gauge portion of the fluid level monitoring gauge of Figure 2.

- 5 [0016] Figures 4A and 4B are top elevational views detailing the relationship between a switch and a cam surface of a rotatable mechanism according to a preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

- 10 [0017] A preferred vertical oil level gauge will now be described with reference to Figures 1–4.

- [0018] As illustrated in Figure 1, a vertical fluid level gauge 2 according to the present invention generally comprises a gauge portion 4 and a float portion 6. The vertical gauge 2 is mounted on a top of a vessel 1 containing a fluid 3, such as a dielectric fluid at least partially covering a transformer (not shown) contained within the vessel 1. In the depicted embodiment, the vessel 1 includes a body 1a and a vertical pipe 1b fixedly mounted on a top of the body 1a. So mounted, the gauge portion 4 is disposed outside of the vessel 1 and the float portion 15 6 is disposed within the vessel 1 (e.g., within the pipe 1b). For example, a threaded neck 8 may be provided between the gauge portion 4 and
- 20

the float portion 6. The threaded neck 8 preferably is engageable with a standard threaded aperture provided on the conventional vessel. When the gauge 2 is disposed on the vessel, the gauge portion 4 preferably is rotatable with respect to the threaded neck, such that the gauge may be oriented according to user preference.

[0019] The float portion 6 of the vertical fluid level gauge 2 will now be described with reference to Figure 2. In the preferred embodiment, the float assembly includes a pair of floats 10a, 10b generally cylindrical in shape. A block 12 is disposed between the two floats 10a, 10b. The floats 10a, 10b and the block 12 preferably are disposed about and fixed to a float tube 14. One or more of the block and floats may be fixed to the float tube 14. End caps 16 preferably are provided to maintain the floats 10a, 10b and the block 12 on the tube 14. In addition, a float pin 18 preferably is disposed in the block 12. A distal end of the float pin 18 protrudes radially outwardly from the block 12, a distance greater than an outer diameter of the floats.

[0020] The floats 10a, 10b, block 12, and float tube 14 each include an aperture formed axially therethrough, and are disposed for relative movement with respect to a shaft 20 in a translational, or axial, direction. At least the block 12 (and thereby the float pin 18) is fixed to the shaft in a rotational direction, such that when the block and float pin rotate about an axis of the shaft, the shaft rotates therewith. For

example, two roll pins 19 are pressed into the block 12 and are at least partially disposed in the aperture formed axially through the block 12.

The shaft 20 preferably has a square cross-section and the two roll pins are arranged proximate opposite sides of the shaft 20. In this manner,

5 the float pin 18 moves relative to the shaft in the direction of the axis of the shaft 20, but rotation of the block 12 about the axis of the shaft 20 will cause likewise rotation of the shaft 20. Other couplings also are contemplated that allow the block (and thus the floats) to move relative to the axis in a transverse direction and that rotate the shaft when the
10 block rotates, i.e., that transform linear motion to rotational motion.

[0021] A support tube 22 is positioned about the floats, block, float tube, and shaft, and a slot 24 is arranged in the external surface of the support tube 22. When the float portion 6 is assembled, the distal end of the float pin 14 is captured in the slot 24. In this manner, the slot 24

15 acts as a guide to impart rotational motion to the shaft, via the float pin 18. More specifically, a change in height of fluid within the vessel causes the float to move axially with respect to the support tube. By forming the slot 24, for example, in a helical manner about the support tube 22, the translational motion of the float within the tube support will
20 also result in a rotational motion of the block in which the float pin is disposed. In this manner, movement of the float in an axial, transverse

direction results in rotation of the shaft, because the shaft is rotatably fixed to the float pin.

[0022] A first magnet 26 is fixed to the top end of the shaft 20, such that when the shaft 20 rotates, so, too, does the first magnet 26. The first magnet preferably is disposed within a housing 28. The housing 28 preferably also includes the threaded neck 8 that facilitates attachment of the gauge to a conventional vessel.

[0023] The upper, gauge portion 4 will now be described with reference to Figure 3. The gauge portion 4 preferably includes the housing 28, and a cover 30 disposed on the housing 28. The housing 28 and the cover 30 form a substantially cylindrical enclosure in which the inner workings of the gauge are housed. The cover 30 preferably includes a cut-out providing a viewing area for viewing at least a pointer representing the fluid level in the vessel, as will be described in more detail below.

[0024] A pointer assembly 32 is disposed within the housing 40 to provide a visual representation of the fluid level in the vessel. The pointer assembly preferably includes a second magnet 34, a lower hub 36, and a cam/pointer mechanism 38. The lower hub 36 preferably is fixed with respect to the second magnet 34. Accordingly, when the

second magnet 34 rotates about an axis, the lower hub 36 also rotates about that axis.

[0025] The second magnet 34 is disposed within the housing 28 so as to be in coupled communication with the first magnet 26 of the lower, float portion 6. In particular, the float portion 6 and the pointer assembly 32 are disposed with respect to the housing 28 such that an axis of rotation for the shaft 20 of the float assembly is coincident with an axis of rotation of the gauge assembly 32. A seal preferably is formed within the housing 28 between the first magnet 26 of the float portion 6 and the second magnet 34 of the pointer assembly 32 of the gauge portion 4. The seal retains fluid within the vessel, without leaking to the atmosphere, but rotational displacement of the first magnet disposed within the vessel is transferred to the second magnet disposed outside the vessel.

[0026] The cam/pointer mechanism 38 preferably is engaged to the lower hub and second magnet with a clutch. Accordingly, the cam/pointer mechanism is both movable with and with respect to the lower hub 36 and second magnet 34. In particular, a clutch mechanism 42 preferably is provided to facilitate the clutch engagement. For example, as shown in the preferred embodiment of Figure 3, the cam/pointer assembly 38 is placed on the lower hub 36 and a fastener secures the cam/pointer assembly to the lower hub. For example, a nut

35 may be tightened on a threaded portion of the lower hub 36 to secure the cam/pointer assembly to the lower hub. Moreover, a wave washer 43 is provided between the cam/pointer mechanism 38 and the nut 35.

5 [0027] During normal operation, the nut 35 and wave washer 43 apply sufficient axial force to the cam/pointer mechanism to maintain a fixed relationship between the lower hub and the cam/pointer mechanism. Accordingly, the cam/pointer mechanism 38 rotates together with the second magnet. However, when the axial force coupling the
10 cam/pointer mechanism 38 to the lower hub 36 is overcome, the cam/pointer mechanism may be moved relative to the lower hub 36. To facilitate this relative motion, the lower hub 36 is formed with a groove 37 in a top thereof. A tool, for example, a flathead screw driver may be used in conjunction with the slot 37 to impede rotational motion of the
15 lower hub (and thus the second magnet), thus overcoming the force applied by the clutch mechanism 42, and the cam/pointer mechanism 38 is rotationally movable. For example, a user may move the cam/pointer mechanism 38 simply by grasping the cam/pointer mechanism 38 and manually rotating same.

20 [0028] The cam/pointer mechanism 38 preferably includes a pointer 38a and a main body 38b having a cam surface. The pointer 38a extends radially outwardly from the main body 38b. In particular, the

pointer 38a preferably consists of an arm extending radially outwardly from the cam body and a flanged tab extending substantially axially at a distal end of the arm. The cam/pointer mechanism preferably is arranged such that the pointer 38a is arranged proximate a dial 44

5 disposed in the viewing area provided by the cutout 31 in the cover 30. The relative position of the pointer 38a with respect to the dial indicates the fluid level within the vessel. In the preferred embodiment of the invention, the cam surface and the pointer are arranged as a unitary structure. Alternatively, the pointer 38a and main body 38b with cam
10 surface may be fabricated as separate components, and later assembled or otherwise fixed with respect to each other.

[0029] As should be appreciated from the foregoing discussion, as the fluid level in the pressurized vessel changes, i.e., as the level raises and lowers, the floats 10a, 10b correspondingly raise and lower. As the
15 floats raise and lower, the float pin 18 cooperates with the groove 24 formed in the support tube 22 to rotate the shaft 20 and attached first magnet 26 in the float portion 6 of the gauge 2. This rotation of the first magnet 26 also causes rotation of the second magnet 34 disposed in the gauge portion 6 of the gauge 2. The second magnet 34 is
20 coupled to the cam/pointer mechanism 38 via the clutch mechanism, such that the cam/pointer mechanism also rotates, and the position of the pointer 38a of the cam/pointer mechanism 38 with respect to the

dial 44 provides an observer with a visual indication of the fluid level within the vessel.

[0030] In addition to providing a visual indication of the fluid level, the present gauge also may be readily re-calibrated, because the

5 cam/pointer mechanism 38 can be moved relative to the first and second magnets 26, 34, via the clutch mechanism described above. The gauge also may be recalibrated. That is, the cam/pointer mechanism 38 may be moved relative to the second magnet 34 so an operator may calibrate the gauge 2 such that the position of the pointer 38a of the
10 cam/pointer mechanism 38 corresponds to any position of the float (and thus any position of the fluid level within the vessel).

[0031] In conventional vessels it is desirable to maintain the fluid level in the vessel within an acceptable range, i.e., between a minimum and a maximum level. To this end, the present invention provides one or more

15 set point switches 46 arranged proximate to the body 38b of the cam/pointer mechanism 38 to operate in conjunction with the cam surface formed on the body 38b of the cam/pointer mechanism 38 to signal when the fluid reaches a set level. Each of the switches 46 preferably includes a switch body 46a, a cantilevered arm 46b, and a
20 roller 46c disposed at a distal end of the cantilevered arm 46b. The switches 46 are activated when the cantilevered arm 46b is displaced relative to the switch body 46a.

[0032] As best illustrated in Figure 4, the cam surface of the body 38b of the cam/pointer mechanism 38 is formed with multiple radii.

Specifically, the cam surface preferably includes a normal region having a first radius, and an alarm region having a second radius, different than

5 the first radius. Preferably, the roller 46c of each of the switches 46 is disposed to ride along the cam surface as the cam/pointer mechanism 38 rotates with respect to the switch 46. The radius of the normal

region of the cam surface is such that the roller rides therealong without activating the switch. However, the alarm region of the cam surface has

10 a radius smaller than that of the normal region. As will be appreciated,

as the cam/pointer mechanism 38 is rotated such that the alarm portion having the smaller radius contacts the roller 46c formed on the

cantilevered arm 46b of the switch 46, the cantilevered arm 46b is

biased away from the switch body 46a of the switch 46, thereby

15 activating the switch 46. In response to this activation, appropriate steps, including, but not limited to, activation of an audio alarm, may be taken to signal that the fluid in the vessel has reached a specific level.

[0033] According to the preferred embodiment of the invention, the cantilevered arm is normally biased away from the switch body, into a

20 position in which the switch is activated. The normal region of the cam surface maintains the cantilevered arm of the switch in a position

relatively closer to the switch body, i.e., in the non-activated position.

The alarm region of the cam has a smaller radius, such that the cantilevered arm is allowed to return to its normal, activated position. In another embodiment, switches may be used that are activated upon relative movement of the cantilevered arm closer to the switch body.

- 5 When such switches are used, the normal region of the cam surface will have a smaller radius and the alarm region thereof will have a larger radius. Accordingly, the alarm region will move the cantilevered arm relatively closer to the switch body, thereby activating the switch.

[0034] While only one switch may be provided for signaling both the
10 upper and lower limits of the fluid level, first and second switches preferably are provided with the first switch used to indicate an upper fluid level limit and the second switch used to indicate a lower fluid level limit. As shown in the Figures, the switches 46 preferably are disposed on first and second switch brackets 48, 50, with each of the switch
15 brackets rotatable about an upper hub 52 having an axis of rotation coincident with the axis of rotation of the cam/pointer assembly 38. The upper hub 52 preferably is spaced axially from the lower hub 36. A spring 54 preferably is disposed between the first bracket 48 and the second bracket 50 on the upper hub 52 and a nut 56 or a similar
20 fastener is used to secure the switch brackets 48, 50 and the spring 54 on the upper hub 52. The spring provides a biasing force against both the first and second switch brackets to generally maintain those switch

brackets in a set position. However, the bias of the spring may be overcome by moving the switch brackets closer to each other in an axial direction. With the bias overcome, either or both of the switch brackets may be rotated about the axis of rotation, with respect to the gauge housing and/or with respect to each other.

[0035] As should be appreciated, rotating the switch brackets 48, 50, and thus the switches 48, relative to the cam/pointer mechanism about the axis of rotation of the cam/pointer mechanism will alter the range of motion of the cam/pointer mechanism through which the switches will not be activated. For example, when two switches are used, a first signaling a maximum fluid value and a second signally a minimum fluid value, the switches may be moved farther apart from each other to achieve a larger rotational area through which neither of the switches is activated. Similarly, by moving the switches closer to each other, the switches are activated in response to a smaller rotational displacement.

[0036] In addition, when the two switches are provided, the switch brackets preferably are configured to arrange the first and second switches at different axial positions. In this manner, the rollers of the switches contact the cam surface of the cam/pointer assembly at different axial regions. When two switches are thusly provided, the cam surface preferably has two distinct cam portions, one associated with

each of the two switches, with each of the portions including a distinct normal region and an alarm region, as described above.

[0037] A set point pointer preferably is associated with each of the set point switches 46. As shown in the figures, a first set point pointer 58 is disposed on the first switch bracket 48 and a second set point pointer 60 is disposed on the second switch bracket 50. The set point pointers 58, 60 provide a visual indication of the position of the pointer 38a of the cam/pointer mechanism 38 at which an associated switch 46 will be activated. For example, when a switch 46 is provided for activation at a minimum fluid level, the set point pointer 58, 60 associated with that switch is arranged such that the pointer 38a of the cam/pointer assembly 38b will be at the same rotational position thereas when the alarm region corresponding to the minimum fluid level activates the switch. Accordingly, a user may visually inspect the gauge to ascertain whether the fluid level in the vessel is approaching a set point, e.g., a maximum or minimum fluid level.

[0038] The set point pointers and the pointer of the cam/pointer assembly preferably are disposed in the cutout 31 of the cover 30. This cutout provides a viewing area for an observer. Moreover, the dial is placed in the viewing region, radially inwardly of the set point pointers and the pointer of the cam/pointer mechanism. In this manner, the set point pointers and the pointer of the cam/pointer mechanism move

relative to the dial, providing a complete visual representation of both set points associated with the switches and a current fluid level. The set point pointers and the pointer of the cam/pointer mechanism are movable within this viewing range, as described in detail above.

5 [0039] When the switches 46 and corresponding switch brackets 48, 50, upper hub 52, and set point pointers 58, 60 are provided, it is desirable to maintain accessibility to the lower hub, i.e., for facilitating calibration of the gauge in the manner described above. Accordingly, the upper hub 52 preferably has an aperture 53 formed axially
10 therethrough. In this manner, a tool, such as a flat head screwdriver, may be inserted through the cover of the gauge and through the upper hub to contact the slot formed on a top surface of the lower hub. As described above, the tool maybe used to facilitate relative rotation of the cam/pointer assembly with respect to the lower hub and second
15 magnet. Similarly, the cover 30 and any other structure arranged axially above the lower hub also has an aperture along the axis of the lower hub, to facilitate access to the slot formed in the lower hub.

[0040] The embodiments discussed above are representative of
embodiments of the present invention and are provided only for
20 illustration. The embodiments are not intended to limit the scope of the invention. Variations and modifications are apparent from a reading of the preceding description and are included within the scope of the

invention. The invention is intended to be limited only by the scope of the accompanying claims.

CLAIM OR CLAIMS

1. A vertical fluid level gauge for displaying a fluid level in an enclosed vessel, the gauge comprising:

a float portion disposed within the enclosed vessel and

5 including a float and a first rotating member, the float portion converting a vertical displacement of the float caused by a change in the fluid level into a rotational displacement of the first rotating member; and

a gauge portion disposed on an exterior of the enclosed

10 vessel and including a second rotating member, a pointer, and a clutch mechanism selectively engaging the pointer to the second rotating member, the gauge portion being arranged with respect to the float portion such that the second rotating member is rotatably coupled to the first rotating member,

15 wherein the clutch mechanism selectively (i) engages the pointer to the second rotating member such that the pointer rotates with the second rotating member to provide a visual indication of the fluid level, and (ii) disengages the pointer from the second rotating member to allow movement of the pointer with respect to the second
20 rotating member.

2. The gauge according to claim 1, wherein the gauge portion further comprises one or more set point switches activated when the fluid level reaches a predetermined level.

3. The gauge according to claim 2, wherein the pointer
5 includes a cam surface having a normal region and an alarm region, the switches are disposed to contact the cam surface, and the switches are activated when the alarm region of the cam surface contacts the switches.

4. The gauge according to claim 3, further comprising one or
10 more set point indicators, one corresponding to each of the switches, each of the indicators indicating a position of the pointer at which the alarm portion of the cam will activate the respective switch.

5. The gauge according to claim 2, wherein the gauge portion comprises two switches, a first of the two switches being activated when
15 the fluid level in the vessel reaches a maximum fluid level and a second of the two switches being activated when the fluid level in the vessel reaches a minimum fluid level.

6. The gauge according to claim 1, wherein the clutch
mechanism is a wave washer disposed between a fastener and the
20 pointer, the wave washer providing a biasing force in an axial direction to engage the pointer to the second rotating mechanism.

7. A gauge according to claim 6, wherein the second rotating member comprises a first hub having a slot formed in a top thereof.

8. A gauge according to claim 7, wherein the slot receives a tool facilitating overcoming the biasing force provided by the wave washer to disengage the first rotational member from the pointer.

9. The gauge according to claim 8, further comprising a second hub displaced axially from the first hub, the second hub having an aperture formed axially therethrough to facilitate access to the slot in the first hub.

10. A gauge according to claim 1, wherein the first rotating member comprises a first magnet and the second rotating member comprises a second magnet.

11. A vertical fluid level gauge for measuring a fluid level in an enclosed space, the gauge comprising:

a rotational member having a rotational position corresponding to a vertical height of a float disposed in the enclosed space;

a rotatable mechanism in communication with the rotational member, the mechanism including a pointer that indicates to an observer the rotational position of the rotatable mechanism;

a clutch member for biasing the rotatable mechanism against the rotational member with a biasing force sufficient to engage the rotatable mechanism with the rotational member, thereby causing the rotatable mechanism to rotate with the rotational member; and

5 a relative motion facilitator disposed on at least one of the rotational member and the rotatable mechanism for allowing the biasing force provided by the clutch member to be overcome, thereby disengaging the rotatable mechanism from the rotational member to rotate the rotatable mechanism with respect to the rotational member.

10 12. The gauge according to claim 11, wherein the rotatable mechanism further includes a cam surface having first and second regions with different radii.

13. The gauge according to claim 12, wherein the pointer and the cam surface are formed as an integral structure.

15 14. The gauge according to claim 12, further comprising one or more set point switches disposed to contact the cam surface of the rotatable mechanism such that the switches are activated when in contact with one of the first and second portions of the cam surface, and the switches are not activated when in contact with the other of the
20 first and second portions.

15. The gauge according to claim 14, further comprising one or more set point indicators, one associated with each of the one or more switches and providing a visual indication of the position of the cam surface at which the respective switch will be activated.

5 16. The gauge according to claim 14, wherein two set point switches are provided and the cam surface activates each of the switches independently.

17. The gauge according to claim 16, wherein a first of the two set point switches is activated when the fluid level reaches a
10 predetermined minimum level, and the second of the two set point switches is activated when the fluid level reaches a predetermined maximum level.

18. The gauge according to claim 16, wherein the switches are movable with respect to each other and with respect to an axis of
15 rotation of the rotatable mechanism.

19. The gauge according to claim 11, wherein the rotational member comprises a first hub and the relative motion facilitator comprises a slot formed in the first hub, the slot being sized to receive a tool for facilitating relative rotation of the rotatable mechanism with
20 respect to the rotational member.

20. The gauge according to claim 19, further comprising a second hub spaced axially from the first hub, the second hub having an aperture formed axially therethrough, through which the tool may be passed to engage the slot formed in the first hub.

5 21. A vertical fluid-level gauge for displaying a fluid level in an enclosed vessel, the gauge comprising:

a float portion disposed inside the vessel and having a first magnet arranged proximate to a top of the vessel, the first magnet rotating correspondingly to a change in the level of the fluid in the
10 vessel;

a second magnet disposed outside the vessel and magnetically coupled to the first magnet such that the second magnet rotates correspondingly with the first magnet;

a pointer mechanism providing a visual representation of
15 the rotational position of the second magnet; and

a clutch mechanism selectively engaging and disengaging the pointer mechanism with the second magnet such that the pointer mechanism rotates with and with respect to the second magnet, respectively.

22. The gauge according to claim 21, further comprising one or more switches disposed proximate the pointer mechanism, and activatable by the pointer mechanism.

23. The gauge according to claim 22, wherein the pointer
5 mechanism further comprises a cam surface and the switches are disposed to contact the cam surface, the cam surface being configured to selectively activate the one or more switches.

24. The gauge according to claim 22, further comprising one or more switch pointers, one associated with each of the one or more
10 switches, and providing a visual indication of the position at which the at least one switch will be activated.

25. The gauge according to claim 22, wherein the one or more switches are adjustable with respect to the pointer mechanism.

26. The gauge according to claim 21, wherein the clutch
15 mechanism comprises a wave washer disposed between a fastener and the pointer mechanism, the wave washer providing an axial force to engage the pointer mechanism to the second magnet, the pointer mechanism being disengaged from the second magnet by overcoming the axial force.

27. The gauge according to claim 26, further comprising a first hub fixed to the second magnet, the first hub including a slot formed therein for receiving a tool that holds the second magnet stationary while the pointer mechanism may be manually rotated to overcome the axial force to disengage the pointer mechanism from the second magnet.

28. The gauge according to claim 27, further comprising a second hub displaced axially from the first hub opposite the first and second magnets the second hub having an aperture formed axially therethrough providing access to the slot formed in the first hub.

29. An electric power transformer having an external indication of the fluid level within the transformer comprising:

an enclosed vessel;

a transformer disposed within the vessel;

dielectric fluid within the vessel at least partially covering the transformer;

a float within the vessel contacting the dielectric fluid and translating substantially vertically within the vessel with a change in the level of the dielectric fluid;

a first rotating member disposed proximate a top of the vessel;

a linear motion to rotational motion coupler connected between the float and the first rotating member that rotates the first rotating member in response to a vertical translation of the float;

a second rotating member outside the vessel and coupled to
5 the first rotating member;

an indicator gauge outside the vessel; and

a clutch connected between the second rotating member and the indicator gauge.

30. An electrical power transformer according to claim 29, the
10 indicator gauge comprising a pointer mechanism indicating the rotational position of the second rotating member.

31. An electrical power transformer according to claim 30,
further comprising one or more switches, the pointer mechanism having
a cam surface formed thereon for communicating with the switches to
15 selectively activate the switches.

32. An electrical power transformer according to claim 29,
wherein the clutch comprises a wave washer and a fastener biasing the
wave washer and indicator gauge to the second rotating member.

33. An electrical power transformer according to claim 29, the
20 second rotating member comprising a groove formed in a top thereof to

receive a tool that facilitates, in conjunction with the clutch, engagement and disengagement of the indicator gauge and the second rotating member.