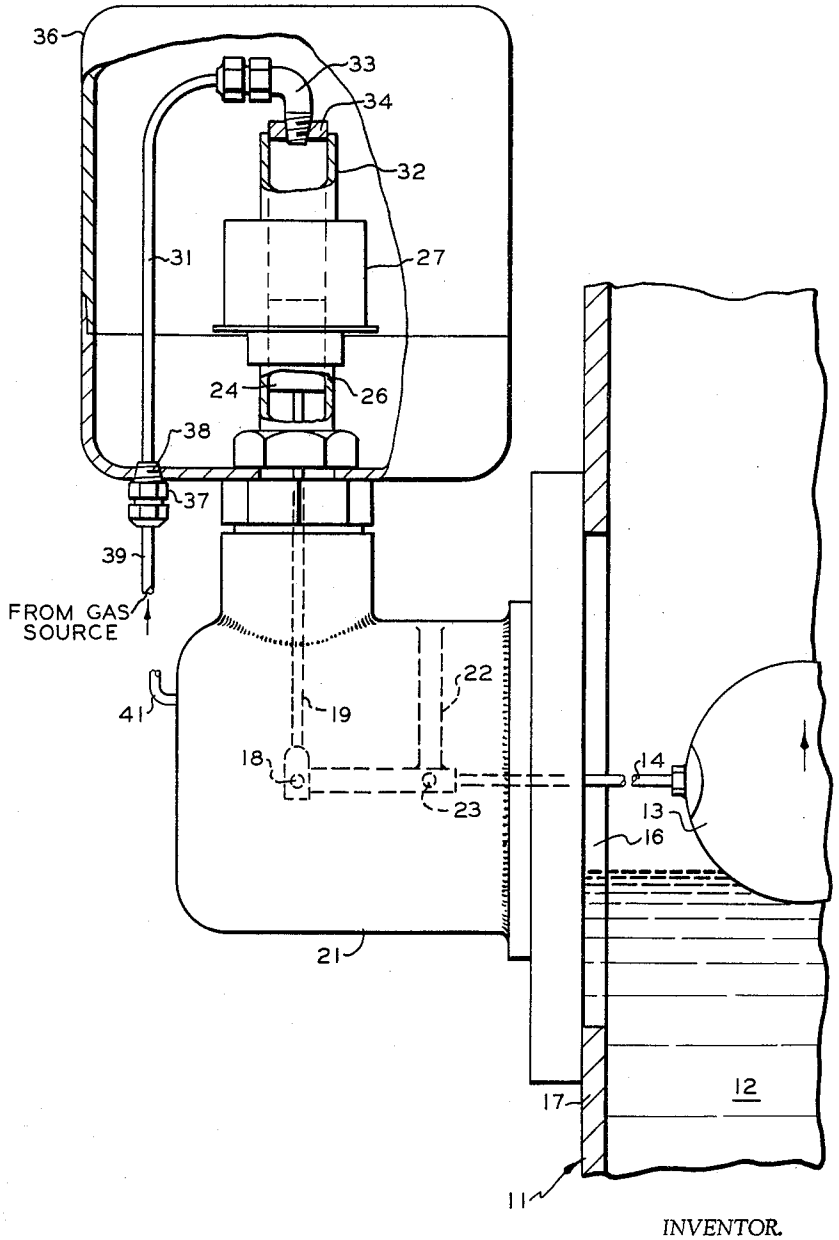
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LIQUID LEVEL CONTROL APPARATUS

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LIQUID LEVEL CONTROL APPARATUS

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This invention relates to liquid level control apparatus. In another aspect it relates to apparatus for liquid level control which is maintained free from fouling by the liquid being gauged. In still another aspect it relates to a purge system incorporated into a float-actuated liquid level control switch.

In measuring and controlling the level in a container of a heavy liquid, such as hydrocarbon oils, with a float-actuated control switch, fouling of the delicate components by plugging of the close tolerances is a chronic problem. Such apparatus will soon become inoperable in viscous liquid service.

It is an object of this invention to provide means for keeping the stored fluid from fouling the operating mechanism of a float-operated liquid level control switch.

It is another object of this invention to provide a purge system for a liquid level control system that precludes plugging of the close tolerances of the operating components.

Various modifications and alterations of this invention will become apparent to those skilled in the art without departing from the scope and spirit of this invention and it should be understood that the latter is not necessarily limited to the aforementioned discussion.

Referring now to the drawing, an elevational view, in partial section, is shown of the improved switch as it is positioned in actual service.

Tank 11 is partially filled with a liquid 12, on the top of which rides hollow float 13, which is composed of a metal resistant to attack by the liquid, and buildup of material thereon, such as 304 stainless steel. Arm 14, which is securably fastened to float 13, passes through an opening 16 provided in one wall 17 of tank 11, and pivotably connects at its other end 18 with a vertical shaft 19. A flanged housing 21 is mounted on tank 11, the chamber of which is coincident with opening 16 and thus surrounds arm 14. A support 22 extends inwardly from the inner wall of housing 21 and is adapted to pivotally connect with arm 14 at a point 23 intermediate the ends of the latter.

A magnetic piston 24 is secured to the free upper end of vertical shaft 19. A non-magnetic sleeve 26 is disposed about, and in close proximity with, piston 24. A switching means 27 is positioned adjacent sleeve 26, and is actuated by the position of said piston within said sleeve. A suitable type of "on-off" switch for this purpose is manufactured by The Mercoid Corporation, Chicago, Illinois, as described in Catalog 600–A, page 13, dated 1946.

Similarly, a rheostat type of switch can be employed in connection with the piston, to effect a graduated shutting down or opening up of a motor valve (not shown), operatively connected to switch 27. The motor valve itself may be positioned in either an inlet or outlet conduit (not shown) communicating with tank 11.

The afore-described side mounted float switch is a commercially available apparatus. A suitable float switch for this purpose is the Magnetrol Switch Model TF–62F, described in the Magnetrol Incorporated, Chicago 23, Illinois, Catalog Section V–53, page 4, dated 1953.

According to the present invention, the control apparatus is modified as further shown in the drawing. A tubing means 31 of typically ⅛" diameter is sealably fitted directly to the open, or upper, end of sleeve 26, or

a tube extension 32 thereof. A ⅛" NPT x ⅛" tubing male angle connector 33 may be employed to connect the tubing to a tapped hole in the closure member 34 of tube 32. A second housing 36 preferably encloses the electrical components to keep them protected from physical jamming as from foreign matter. Tubing means 31 passes from within housing 36 and connects to a source of inert fluid, via a straight tubing male connector 37 threadedly fitted into the drilled and tapped wall opening 38 of housing 36. Connector 37 is bored to act as a packing gland. The tubing passes through this fitting, and extension tube 39. Both are tightened to make a pressure tight joint.

The purge fluid passes from its source as a continuous stream into sleeve 26, flowing about the piston 24, and vents from the lower end of said sleeve into housing 21. The gas may escape from housing 21 via opening 16 in tank wall. Alternatively, a separate outlet, such as 41, may be provided in the wall of housing 21 for escape of the purge fluid.

Among the fluids suitable for use as the purge fluid would be any which are inert to the liquid being gauged. In the case of heavy hydrocarbon oil storage, any inert gases, such as argon, natural gas, and the like, are suitable. The criterion of acceptability being that they will not react with the stored liquid.

Various modifications and alterations of this invention will become apparent to those skilled in the art without departing from the scope and spirit of this invention and it should be understood that the latter is not necessarily limited to the aforementioned discussion.

I claim:

1. In a liquid level control apparatus comprising: a float disposed in a tank containing the liquid to be gauged; an arm connected to said float at one end and pivotally to a shaft at its other end; a housing adapted to be secured to said tank and surrounding said arm; a piston secured to the free end of said shaft; switching means adjacent said piston; and means affixed to said piston to trip said switching means in one direction and alternately the other; the improvement which comprises a purge system for maintaining the operating components of said control apparatus free from fouling by said liquid, said system comprising tubing means communicating with said housing and a source of fluid spaced from said tank for continuously passing a stream of fluid inert to said liquid through said housing and venting the same therefrom.

2. In a liquid level control apparatus comprising: a float disposed in a tank containing the liquid to be gauged; an arm passing through an opening in the tank wall and connected to said float at one end and pivotally to a shaft at its other end; a housing adapted to be mounted to the wall of said tank and surrounding said arm; a support extending inwardly from the inner wall of said housing and adapted to pivotally connect with said arm intermediate the ends of the latter; a magnetic piston secured to the free end of said shaft; a non-magnetic sleeve disposed about and in close proximity to said piston; switching means adjacent said sleeve adapted to be actuated by the position of said piston, the improvement which comprises a purge system for maintaining the operating components of said control apparatus free from fouling by said liquid, said system comprising tubing means communicating with the upper end of said sleeve and a source of fluid spaced from said tank for continuously passing a stream of fluid inert to said liquid through said sleeve and venting the same from the lower end of said sleeve.

3. An improved liquid level control apparatus comprising: a float disposed in a tank containing the liquid to be gauged; an arm passing through an opening in the tank wall and connected to said float at one end and pivotally to a shaft at its other end; a housing adapted to be mount-

ed to the wall of said tank and surrounding said arm; a support extending inwardly from the inner wall of said first housing and adapted to pivotally connect with said arm intermediate the ends of the latter; a magnetic piston secured to the free end of said shaft; a non-magnetic sleeve communicating with said first housing and surrounding said piston in a manner to allow vertical movement of said piston in said sleeve; switching means surrounding said sleeve adapted to be actuated by the position of said piston; a second housing adapted to be mounted to said first housing and surrounding said switching means; tubing means passing through said second housing and communicating with said non-magnetic sleeve and a source of gas spaced from said tank for continuously passing a stream of gas inert to said liquid about said piston; and means for venting said gas from said first housing.

4. The apparatus of claim 3 wherein the first and second housings are a single housing surrounding the switching means, piston, sleeve, and linkage means, and said tubing passes to said sleeve through a second opening in the wall of said housing.

5. In a system to control a liquid level within a tank, wherein a float extends into said tank and contacts the surface of said liquid, said float being connected by mechanical linkage to a magnetic piston to actuate switching means, and a housing surrounding said piston and linkage, the method of maintaining said housing and enclosed components free from fouling by said liquid comprising continuously passing a stream of gas inert to said liquid from a source spaced from said tank about said piston, and venting the same from said housing.

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