RETRACTABLE MIXING DEVICE AND METHOD

FIELD OF THE INVENTION

[0001] The present invention generally relates to a mixing device and method. More particularly, the present invention pertains to a device and method for mixing a fluid disposed in a tank.

BACKGROUND OF THE INVENTION

[0002] It is generally known that fluids stored in tanks will often settle. Settling of some fluid may be of no consequence or even desirable. However, in other fluid, settling may be detrimental. For example, in petroleum product, settling may cause basic components to precipitate or concentrate at or near the bottom of the tank – damaging the tank and reducing the quality of the petroleum product stored therein. In general, this problem is referred to as basic sediment and water (BS&W).

[0003] Gasoline and crude oil storage tanks are generally agitated for product blending, uniformity and suspension of sediment and water. Since this type of storage vessel is typically very large diameter with relatively short height, top entry agitators are generally not practical and side entry agitators are used.

[0004] Side entry agitators penetrate through the side wall of the vessel and project several feet into the tank. There is currently no provision to extract the shaft and impeller from the tank without breaking the vessel seal which could result in a substantial spillage from the vessel.

[0005] Environmental requirements for gasoline tanks in particular have shifted the tank designs to use floating roofs. This allows for the minimization of the vapor space above the fluid and hence volatilization. Due to the presence of the current design side entry agitators, floating roofs cannot be dropped to the bottom of the vessel and a significant perpetual inventory must be maintained in each tank.

[0006] Accordingly, it is desirable to provide a system, device and method capable of overcoming the disadvantages described herein at least to some extent.

SUMMARY OF THE INVENTION

[0007] The foregoing needs are met, to a great extent, by the present invention, wherein various respects a system, device, and method of mixing fluid in a tank is provided.

[0008] An embodiment of the present invention pertains to a system for mixing a fluid in a tank having a floating roof. The system includes a mixer assembly, a housing, and an actuator. The mixer assembly has a motor, a shaft, and an impeller. The housing is disposed in a side wall of the tank. The housing has sufficient volume to contain the impeller. The actuator is configured to retract the mixer assembly and draw the impeller into the housing. The mixer assembly has a first conformation and a second conformation. In the first conformation the impeller is disposed in a main portion of the tank and configured to mix the fluid in response to rotation of the impeller via the motor and shaft. In the second conformation the impeller is disposed in the housing and out of the main portion of the tank. The system further comprises a sensor and a controller, said controller being configured to receive signals from the sensor and to send signals to the actuator to modulate the actuator in response to signals from the sensor in order to automatically draw said impeller into said second configuration in response to the roof falling below a predetermined minimum level.

[0009] ~~Another embodiment of the present invention relates to~~ There is also disclosed a mixer assembly. The mixer assembly includes an impeller, a motor to rotate the impeller, and a shaft affixed to the impeller and convey torque from the motor to the impeller. The mixer assembly additionally includes housing having sufficient volume to contain the impeller. A seal is disposed in the housing. The seal is configured to facilitate rotation of the shaft and being configured to facilitate longitudinal sliding the shaft while reducing leakage of a fluid across the seal. The actuator is configured to urge the shaft to move longitudinally. The impeller is drawn into the housing in response to the actuator moving the shaft.

[0010] Yet another embodiment of the present invention pertains to a method of drawing a fluid from a tank having a floating roof. In this method, if it is determined in a controller that the roof is below a predetermined minimum level in response to a signal received from a sensor, said controller sends a signal to an actuator prompting said actuator to retract an impeller ~~is retracted~~ from the tank and into a ~~chamber~~ housing affixed to a side of the tank. In this manner, additional fluid may be drawn from the tank and the roof is allowed to descend below

CLAIMS

What is claimed is:

1. A system for mixing a fluid in a tank having a floating roof, the system comprising:

a mixer assembly having a motor, a shaft, and an impeller;

a housing disposed in a side wall of the tank, the housing having sufficient volume to contain the impeller; ~~and~~

an actuator configured to retract the mixer assembly and draw the impeller into the housing, wherein the mixer assembly has a first conformation and a second conformation, in the first conformation the impeller is disposed in a main portion of the tank and configured to mix the fluid in response to rotation of the impeller via the motor and shaft, in the second conformation the impeller is disposed in the housing and out of the main portion of the tank~~.~~;

a sensor, and

a controller,

said controller being configured to receive signals from the sensor and to send signals to the actuator to modulate the actuator in response to signals from the sensor in order to automatically draw said impeller into said second configuration in response to the roof falling below a predetermined minimum level.

~~2. A mixer assembly comprising:~~

~~an impeller;~~

~~a motor to rotate the impeller;~~

~~a shaft affixed to the impeller and convey torque from the motor to the impeller;~~

~~a housing having sufficient volume to contain the impeller;~~

~~a seal disposed in the housing, the seal being configured to facilitate rotation of the shaft and being configured to facilitate longitudinal sliding the shaft while reducing leakage of a fluid across the seal; and~~

~~an actuator configured to urge the shaft to move longitudinally, wherein the impeller is drawn into the housing in response to the actuator moving the shaft.~~

~~3~~2. A method of drawing a fluid from a tank having a floating roof, the method comprising the steps of:

determining in a controller if the roof is below a predetermined minimum level in response to a signal received from a sensor;

said controller sending a signal to an actuator prompting said actuator to retract~~ing~~ an impeller from the tank and into a ~~chamber~~ housing affixed to a side of the tank ~~in response to the roof being below the predetermined minimum level~~;

drawing additional fluid from the tank, wherein the roof is allowed to descend below the impeller in response to the impeller being in the housing and out of a main portion of the tank.