Jan. 24, 1939. C. B. DALZELL ET AL 2,144,715

AGITATOR DRIVE MEANS FOR LIQUID CONTAINERS

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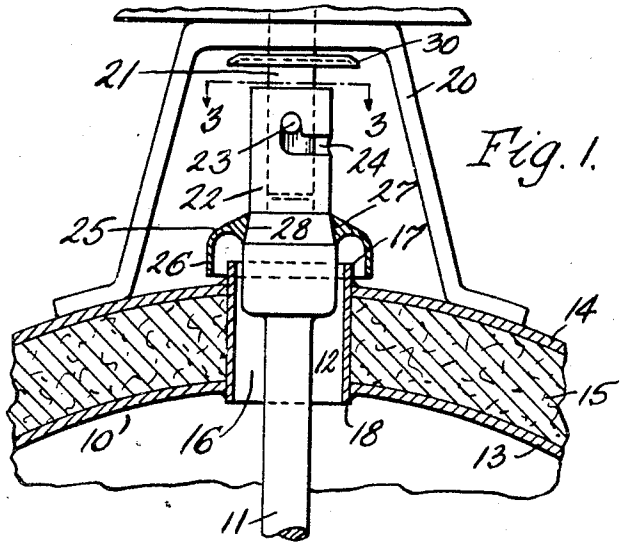


Fig. 1.

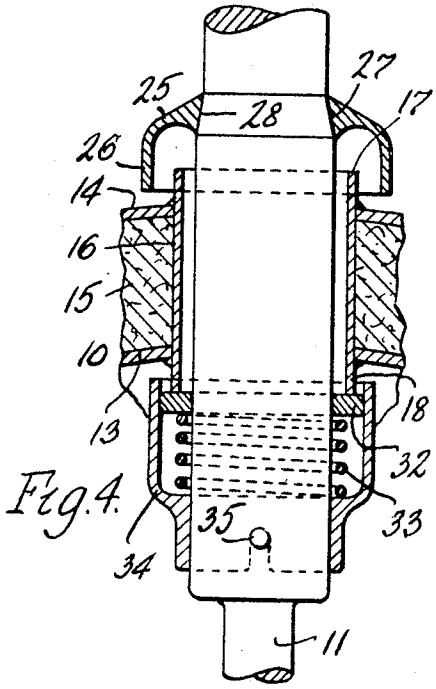


Fig. 4.

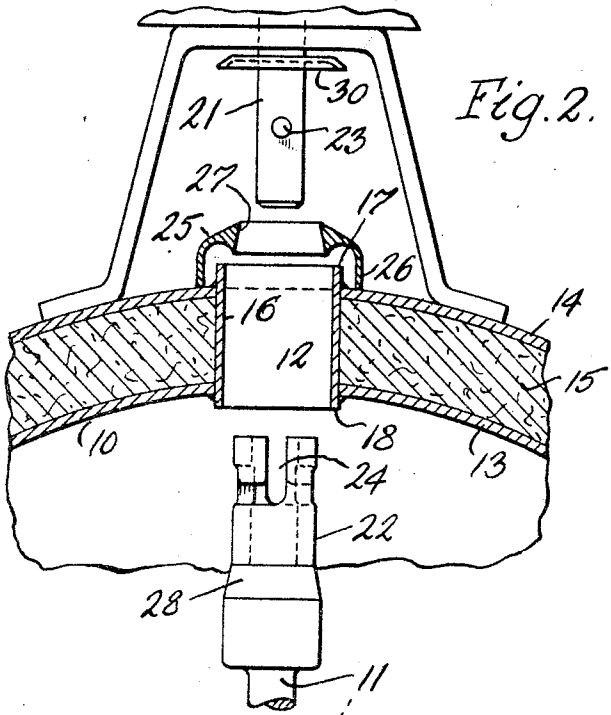
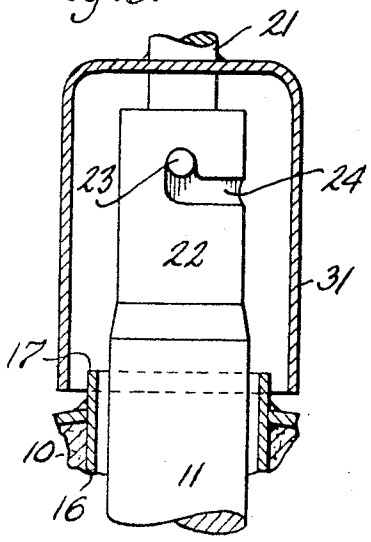
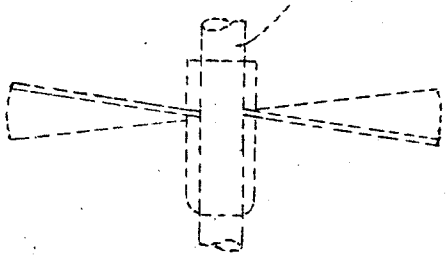


Fig. 2.

Fig. 5.





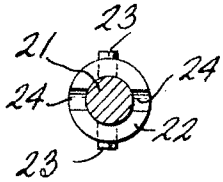


Fig. 3.

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Fig. 6.

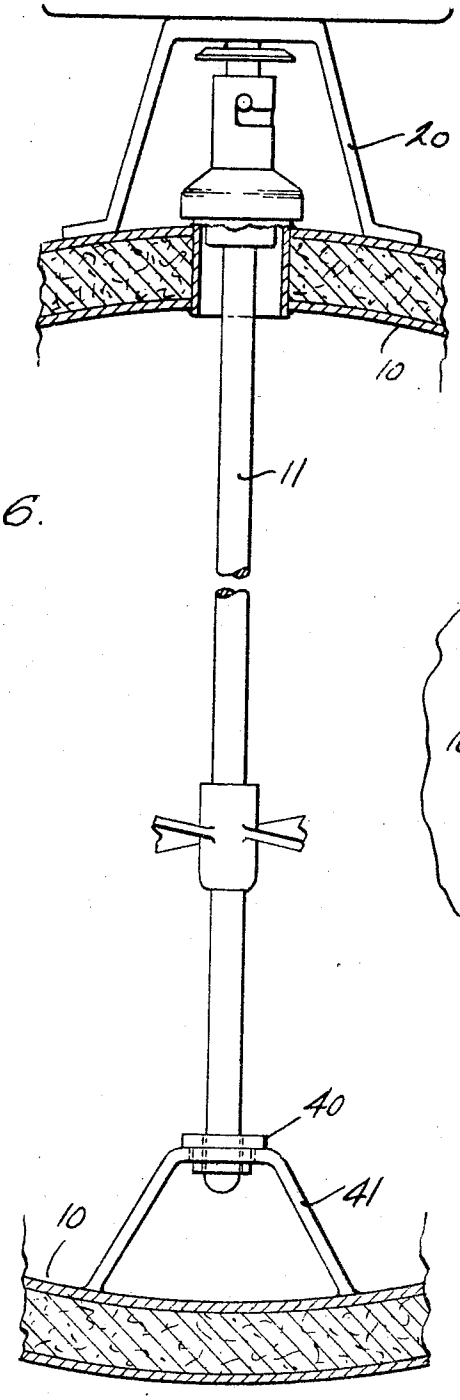


Fig. 7.

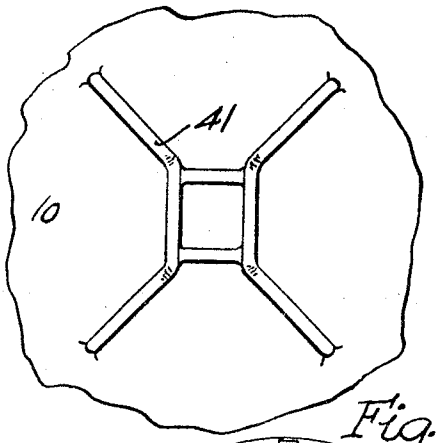
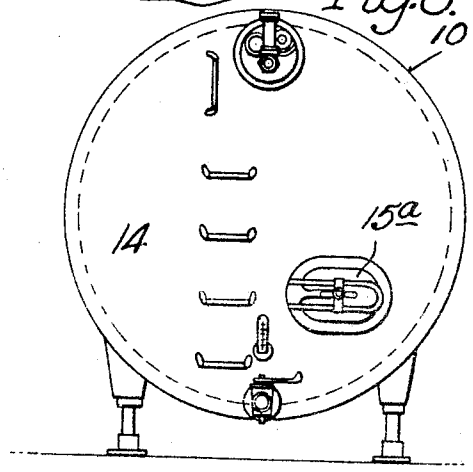


Fig. 8.



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AGITATOR DRIVE MEANS FOR LIQUID CONTAINERS

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Application January 29, 1938, Serial No. 187,724

9 Claims. (Cl. 259—108)

This invention relates to improvements in drive means for the agitators of liquid containers or tanks, such as are used for holding milk.

These tanks are commonly of horizontal, cylindrical form, of insulated construction and equipped with power-driven agitating devices or propellers for agitating the liquid in the tanks. Such tanks are of large dimensions, and it is ordinary practice for a person to enter the tank through a suitable covered manhole for cleaning the tank to keep it in the required clean or sanitary condition. The parts of the agitator as well as the inner surfaces of the walls of the tank have to be cleaned, and it is desirable to have the agitator and its shaft demountable or removable, both to facilitate thorough cleaning of these and other parts with which the liquid in the tank may contact, and also in order that they may be moved out of the way of the workman in the tank. Because of the curvature of the floor or bottom of the tank and consequent precarious footing afforded a person in the tank, the agitator should be mounted and connected to its drive so as to adapt it to be removed easily and with the minimum exertion by the workman in the tank.

The objects of our invention are to provide drive means of novel improved construction for the agitators of such tanks; to provide a novel construction in which the agitator shaft is detachably coupled externally of the interior of the tank or above the liquid level therein, to the drive shaft or element, and in a way which enables easy removal of the agitator and its shaft from within the tank; also to provide an overhead drive for the agitator in order to avoid any shaft bearing, opening for the passage of the agitator shaft out of the tank and seal or stuffing box therefor below the level of the liquid in the tank where the liquid can contact with such parts; also to provide a construction which enables a person within the tank to uncouple and remove the agitator shaft without getting out of the tank or having the assistance of any one outside of the tank; also to enable the agitator shaft to be uncoupled and removed from within the tank and provide means which will effectively guard or shield the opening through which the agitator shaft passes out of the tank against the entrance of foreign matter both when the shaft is in and when it is removed from the opening; and also to provide drive means for the agitators of tanks which have the other features of improvement and advantage hereinafter described and set forth in the claims.

In the acompanying drawings:

Fig. 1 is a transverse, sectional elevation of the top portion of a liquid storage tank and drive means for the liquid agitator, illustrating one embodiment of our invention.

Fig. 2 is a similar sectional elevation showing the agitator shaft uncoupled and removed inwardly through the shaft opening in the top of the tank.

Fig. 3 is a sectional plan view on line 3—3, Fig. 1, showing the detachable coupling between the agitator shaft and the drive shaft therefor.

Fig. 4 is a sectional elevation showing sealing means for the opening through which the agitator shaft passes out of the tank.

Fig. 5 is a similar view showing a modified construction embodying the invention.

Fig. 6 is a broken, sectional elevation of the tank and agitator, showing guide means for the lower end of the agitator shaft.

Fig. 7 is a plan view of the lower bearing support.

Fig. 8 shows in elevation, one end of the tank provided with a covered manhole.

Referring first to the construction shown in Figs. 1–3, 10 represents the top portion of the cylindrical wall of the storage tank, 11 the shaft of a liquid agitator or propeller within the tank, and 12 the opening in the top of the tank through which the agitator shaft passes for connection with the drive shaft or element for the agitator shaft 11. The tank may be of usual insulated construction, comprising a lining 13 of suitable material, an outer metal jacket 14 and suitable insulating material 15 between the lining and outer jacket and, as usual, the tank is provided with a manhole closed by a door 15a. The opening 12 for the passage of the shaft through the tank wall is preferably lined by a sleeve or tube 16 which is welded or otherwise attached to the lining and outer jacket so as to provide hermetic joints between the tube, lining and jacket, and preferably this tube 16 provides a flange or curb 17 projecting outwardly from the outer surface of the jacket around the shaft opening and a flange 18 projecting inwardly beyond the inner surface of the tank lining.

In the construction illustrated the agitator is driven by an electric or other suitable motor mounted on a stand or base 20 stationarily secured on top of the tank and having a vertical drive shaft or element 21 in substantial axial alinement with the agitator shaft 11, and to which the latter is coupled so as to permit disconnection of the agitaor shaft from the drive element 21 and the removal of the agitator shaft inwardly

through the shaft opening 12 of the tank. Preferably the agitator and drive shafts are coupled together by a bayonet joint formed by a sleeve 22 fixed on and projecting upwardly from the agitator shaft forming a cylindrical socket adapted to receive the lower end of the drive shaft, which is provided with one or more, preferably two, fixed radial studs 23 adapted to engage in angular slots 24 in the sides of the sleeve. Each slot 24 shown has an upwardly extending, inner end portion in which the studs seat to support the agitator shaft when the shafts are coupled together. In order to disconnect the agitator shaft from the drive shaft, it is only necessary to lift the agitator shaft slightly to disengage the inner ends of the slots from the studs, turn the shaft a part revolution to bring the studs ino registration with the vertical outer ends of the slots, and then pull the agitator shaft downwardly off of the drive shaft 21. The shafts are coupled together by a reversal of this operation.

Thus, a person within the tank can readily uncouple the agitator shaft from the drive shaft and pull the agitator shaft downwardly into the tank through the shaft opening 12, the coupling sleeve being of small enough diameter to pass freely through the shaft opening, and this can be done entirely by the person within the tank, unaided by another person outside of the tank.

The shaft opening 12 of the tank is preferably of enough larger diameter than the coupling sleeve on the agitator shaft to leave sufficient space between the sleeve and walls of the shaft opening to permit easy removal of the agitator shaft through the shaft opening 12. For the purpose of preventing water, oil or other foreign matter from passing into the tank through this space whether the agitator shaft is in operative position in the opening 12, or has been removed, the following means are preferably employed.

25 indicates a guard or shield, preferably in the form of a ring, which surrounds the coupling sleeve 22 or enlarged upper portion of the agitator shaft, and is provided with a peripheral flange or skirt 26 which depends outside of and preferably overlaps the outwardly projecting curb 17 at the outer end of the shaft opening 12. This guard is carried by but removable from the agitator shaft in such a way that in removing the shaft it will be drawn out of the guard, leaving the latter resting on the tank, as shown in Fig. 2. As shown, the guard is made with a tapered central hole 27 adapted to fit on a correspondingly tapered shoulder 28 on the coupling sleeve on the agitator shaft. When the agitator shaft is in operative position coupled to the drive shaft, the tapered hole of the guard 25 forms a snug fit on the tapered shoulder 28 so as to prevent oil or other foreign matter passing through the joint between the guard and shaft, and the guard, which is held by the shaft over the outwardly projecting curb 17 around the shaft opening, will shed the foreign matter outside of the curb and prevent it from entering the shaft opening. In removing the agitator shaft, it is pulled out of the tapered hole of the guard, and when the shaft is removed inwardly through the shaft opening, the guard is left resting on the tank surrounding the outwardly projecting curb 17.

As a further safeguard to prevent oil from the drive shaft bearing or any other foreign matter from falling into the tank through the hole in the guard 25, the drive shaft is provided with an annular disk or collar 30 which projects outwardly from the drive shaft above the hole in the guard 25. This collar or disk 30 is of sufficient diameter to shed any oil or other substance outwardly away from the central hole of the guard 25 and prevent its passing through said opening into the tank.

A modified embodiment of the means for preventing entrance of foreign matter into the tank is shown in Fig. 5. In this embodiment a relatively deep bell-like guard 31 is shown, which is fixed at its closed upper end on the drive shaft above the coupling between the latter and the agitator shaft, and the open, lower end of this guard extends down around and preferably overlaps the projecting curb 17 around the shaft opening 12. This guard or shield does not interfere with the uncoupling of the agitator shaft and its removal through the shaft opening of the tank but effectually covers the shaft opening both when the agitator shaft is in place and when it is removed. While this guard forms a very effective guarantee against the entrance of foreign matter through the shaft opening, this construction does not permit as ready cleaning of the shaft opening as the construction first described, in which the detachable guard 25 is employed, and which can be removed from over the outer end of the shaft opening to permit the cleaning of the latter.

In the embodiment of the invention shown in Fig. 4, a sealing device is provided for closing the shaft opening 12 so that the liquid in the tank may be pushed out by air pressure as is some times done, rather than by gravity or by means of a liquid pump. When such means are used, the tank or liquid container would be provided with an air escape means to permit the tank to be filled. Such tanks, too, are some times filled by exhausting the air from the tank rather than by gravity or by a liquid pump, in which case a separate air escape would not be necessary. This sealing device, which also makes this procedure possible, as illustrated in Fig. 4, comprises an annular sealing ring or washer 32, which loosely surrounds the enlarged upper portion or sleeve of the agitator shaft and is yieldingly pressed against the end of the flange 18 surrounding the lower end of the shaft opening 12, the end of this flange and the sealing ring being preferably finished to provide a ground joint between the contacting faces of these parts. The sealing ring can be pressed against or held in yielding contact with the end of the flange 18 by any suitable means, such for instance, as a coil spring 33 surrounding the shaft between the bottom face of the sealing ring and a collar 34 on the agitator shaft. This collar, as shown is chambered at its upper portion to receive the spring and sealing ring and forms a guide for the ring in its movements to and from contact with the end of the flange 18. The collar 34 may be removably retained on the agitator shaft, as by a stud 35 on the shaft projecting into a slot in the lower end of the collar, to facilitate its removal for cleaning the same and the other parts of the sealing means. A sealing device of any other suitable construction could be employed. This sealing device does not interfere in any way with the manipulation of the agitator shaft for uncoupling it from its drive shaft and removing it from the shaft opening of the tank, since in lifting the agitator shaft to uncouple it, the sealing ring 32 can move on the shaft sufficiently to allow the necessary upward uncoupling movement of the shaft.

There is the danger when a person gets into the tank to clean it that he may slip and fall or lean against and bend or deflect the shaft out of alinement so as to throw undue radial load

on the shaft bearing at the top of the tank. To provide against such contingency, and also limit lateral play or vibration of the lower end of the shaft, guide or bearing means for the lower end of the agitator shaft are shown in Figs. 6 and 7, which means, as illustrated, comprise a bushing 40 into which the lower end of the shaft projects and which is removably seated in the upper end of a skeleton stand or support 41 stationarily secured, by welding or otherwise in the bottom of the tank. The fits of the shaft in the bushing and of the bushing in the support are purposely loose, as the object is to minimize the danger of the shaft being bent and the lateral play of its lower end, while enabling ready removal of the shaft, rather than to provide a close fitting, normally operating bearing. Guide means of other construction suitable for the purpose could be employed.

We claim as our invention:

1. In combination with a tank having a fixed upper portion with a shaft opening therethrough and also having in addition to said shaft opening a covered manhole giving access to the tank, a drive element located outside of the tank for an agitator in the tank, and an agitator shaft passing through said opening and detachably coupled externally of the inside of the tank to said drive element, the agitator shaft and the coupling connecting said shaft and drive element being operable by manipulation of said agitator shaft from within the tank to disconnect the shaft from the drive element and the shaft when uncoupled being movable into the tank through said shaft opening.

2. In combination with a tank having a fixed upper portion with a shaft opening therethrough and also having in addition to said shaft opening a covered manhole giving access to the tank, a drive element located outside of the tank for an agitator in the tank, an agitator shaft passing through said opening, and a coupling external to the inside of the tank comprising separable parts which detachably connects said shaft and drive element by manipulation of said shaft and is operable from within the tank to disconnect said shaft from the drive element, said shaft with its coupling part when detached being movable into the tank through said shaft opening.

3. In combination with a tank having a fixed upper wall part with a shaft opening therethrough and also having in addition to said shaft opening a covered manhole giving access to the tank, a drive element located outside of the tank for an agitator in the tank, and an agitator shaft passing through said opening and detachably coupled externally of the inside of the tank to said drive element, the coupling connecting said shaft and drive element being operable by manipulation of said agitator shaft from within the tank to uncouple the shaft from the drive element, and the shaft when uncoupled being removable from said shaft opening, and means forming a guard to prevent entrance of matter into the tank through the shaft opening both when the shaft is in and is removed from said opening.

4. In combination with a tank having a shaft opening through its upper portion, a drive element located outside of the tank for an agitator in the tank, and an agitator shaft passing through said opening and detachably coupled externally of the inside of the tank to said drive element, the coupling connecting said shaft and drive element being constructed and arranged to enable said agitator shaft to be disconnected and removed from said shaft opening, and a guard for the shaft opening carried by said shaft above said opening, said guard being detached from the shaft and remaining in position to guard said opening when said shaft is removed through said opening.

5. In combination with a tank having a shaft opening through its upper portion, a drive element located outside of the tank for an agitator in the tank, and an agitator shaft passing through said opening and detachably coupled externally of the inside of the tank to said drive element, said shaft being adapted to be uncoupled and moved into the tank through said shaft opening, and a guard for said opening which is detachably supported by said shaft above said opening and is detached from the shaft by removing the shaft through said opening and remains in guarding position relative to the opening when the shaft is removed.

6. In combination with a tank having a shaft opening through its upper portion, a drive element located outside of the tank for an agitator in the tank, and an agitator shaft passing through said opening and detachably coupled externally of the inside of the tank to said drive element, said shaft being adapted to be uncoupled and moved into the tank through said shaft opening, and a guard ring for said opening which is detachably seated on said shaft above said opening and is unseated from the shaft and left supported on the tank at the outer end of the opening by removing the shaft through the opening.

7. In combination with a tank having a shaft opening through its upper portion, a drive element located outside of the tank for an agitator in the tank, and an agitator shaft passing through said opening and detachably coupled externally of the inside of the tank to said drive element, said shaft being adapted to be uncoupled and moved into the tank through said shaft opening, a guard ring for said opening which is detachably seated on said shaft above said opening and is unseated from the shaft and left supported on the tank at the outer end of the opening by removing the shaft through the opening, and a guard on said drive element above said guard ring.

8. In combination with a tank having a shaft opening through its upper portion, a drive element located outside of the tank for an agitator in the tank, and an agitator shaft passing through said opening and detachably coupled externally of the inside of the tank to said drive element, said shaft being detachable from the drive element by manipulation of the shaft from within the tank and movable into the tank through said shaft opening, and a sealing device comprising a ring surrounding said shaft and pressed yieldingly against the inner end wall of said shaft opening to seal said opening against the passage of air therethrough, said sealing device being movable relatively to said shaft to allow endwise movement of the shaft for the uncoupling thereof.

9. In combination with a tank having a shaft opening through its upper portion, a drive element located outside of the tank for an agitator in the tank, and an agitator shaft passing through said opening and detachably coupled externally of the inside of the tank to said drive element, said shaft being adapted to be uncoupled

and moved into the tank through said shaft opening, and a sealing device carried by said shaft and comprising a sealing ring surrounding the shaft and spring-pressed against the inner end wall of said opening for closing said opening against the loss of air pressure from the tank through said opening, said sealing device being movable axially on the shaft to allow axial movement of the shaft for uncoupling it.

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