Oct. 22, 1957 I. V. ZOZULIN 2,810,556

AGITATORS FOR FLUID COOLING TANKS AND THE LIKE

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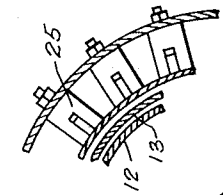


FIG. 1A

FIG. 1

FIG. 1B

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Fig. 2

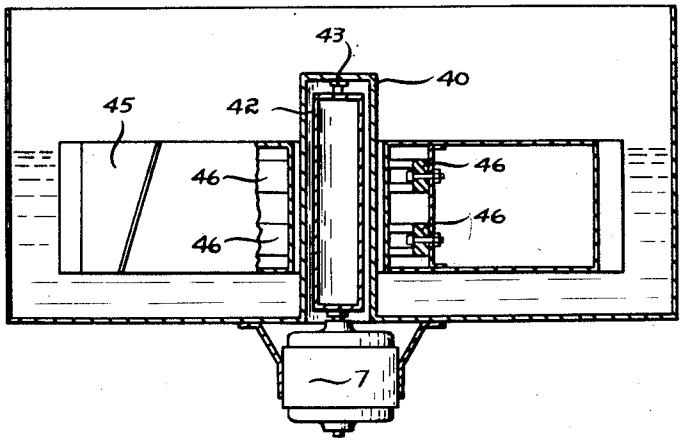
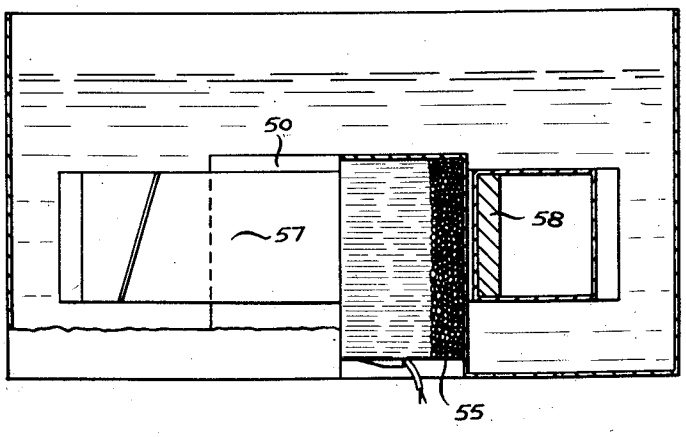


Fig. 3



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United States Patent Office 2,810,556
Patented Oct. 22, 1957

2,810,556

AGITATORS FOR FLUID COOLING TANKS AND THE LIKE

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Application March 14, 1955, Serial No. 493,996

2 Claims. (Cl. 259—108)

My invention relates to improvements in agitators for fluid cooling tanks and the like.

The object of the present invention is to provide an agitator for immersion in fluid in a tank, whereby the impeller element of the device is not in any way connected mechanically with any other part of the device when said device is in operation, and whereby it becomes possible for the impeller element to be a simple doughnut shaped structure having no internal projections or crevices capable of presenting any cleaning problem. A further object is to provide an agitator structure where the impeller element is disposed to rotate above the bottom wall of a tank and have its path of rotation about a perfectly smooth cylinder projecting upwardly above said bottom wall.

Referring to the accompanying drawings:

Figure 1 is a vertical sectional view of the invention having an impeller element adapted for rotation adjacent the bottom wall of the tank. Figure 1A is a sectional view taken on the line 1A—1A of Figure 1 and showing the radial disposition of the magnets. Figure 1B is an elevation of the inner end face of a magnet.

Figure 2 is a vertical sectional view of a modification having an impeller element to rotate at the level of the fluid in the tank.

Figure 3 is a vertical sectional view of a further modification having no moving part other than the impeller element.

In the drawings like characters of reference indicate corresponding parts in each figure.

The numeral **1** indicates the bottom wall of a tank having a central opening **2** which is lined with a sleeve **3**. The sleeve **3** supports a thin cylinder or diaphragm **4** which is substantially non-magnetic, being preferably of stainless steel, and extends upwardly into the tank and is provided with a top closure **5**.

Mounted within the central bottom opening **2** is a motor **7** having a drive shaft **8** which extends close to the top closure **5** of the cylinder **4** and is fitted with a fan **9** having a peripheral rim **11**. A cylindrical rotor **12**, which may be of any suitable electrically conductive material such as copper or aluminum, is mounted upon the rim **11** of the fan **9** and is spaced an appropriate distance within the cylinder or diaphragm **4** to provide a suitable air gap **13** therebetween. Surrounding the body of the motor **7** is a light stationary sleeve **14** which defines an upcast and a downcast air space **16** and **17**. The air space **16** connects concentrically with the air gap **13**, thus providing suitable air circulation from below the motor, upwardly around the upper part of said motor, through the fan **9** and down through the downcast air space **17** to the atmosphere below the tank. This air circulation also serves to cool the rotor **12** and the motor **7**.

A doughnut shaped member **18** defining an annular chamber **19** is adapted to be placed within the tank and function coaxially with the cylinder **4**. This member **18** is provided with vanes **20**, the lower portions **21** of which

are inclined upwardly in the direction of the rotation of the motor shaft **8** in order to assist the member to ride in suspension in the fluid in the tank when rotating. One or more annular rows of magnets **25** are carried within the chamber with their pole pieces disposed in opposition to the rotor **12** and in such close proximity to the exterior of the cylinder **4** as to provide a suitable air gap between said cylinder and the pole pieces when the member **18** is rotating or afloat in the fluid in which it is intended to work, so that when the motor shaft is rotating at suitable speed eddy currents induced in the rotor **12** by the field of the magnets **25** will transmit the torque of the motor through the magnetic rotor **12** to the magnets and the member **18**. The lifting action of the vanes **20** will cause the member **18** to rise until the top row of magnets **25** will start to climb above the top edge of the rotor **12**. This action will obviously reduce the torque transmitted, resulting in a drop of speed of said member. This reduces the lifting action of the vanes and prevents the member from lifting further. When the motor is stopped, the upward lift of the impeller upon the member **18** will be lost and it will sink until a button **27** on a bridge piece **28** extending across the member **18** comes to rest on the top closure **5** of the cylinder **4**. The member is centered axially by radial repulsion which exists between the magnets **25** and eddy currents induced in the conductive cylindrical rotor **12** at the rate of slip envisaged.

In the modification shown in Figure 2, the upstanding closed topped cylinder carried on the tank bottom wall is indicated by the numeral **40** and extends to a substantial height within the tank, the conductive rotor **42** is journalled at the top of the cylinder as at **43**. The specific gravity of the impeller member **45** may be slightly less than that of the fluid to be stirred, so that it may rotate and float at the fluid level in the tank. The inner periphery of the impeller member is fitted with rows of permanent magnets **46** whose pole pieces are opposed when in operation to the conductive rotor **42** as in the previously described modification.

In the modification shown in Figure 3, the closed topped cylinder is indicated by the numeral **50** and is secured on the bottom wall of the tank as above described to form a cylindrical diaphragm. Within the cylinder **50** an annular stator **55** is mounted which is provided with appropriate pole pieces and windings, which latter are adapted for connection within a suitable electric circuit. The impeller element **57** is an annular member of slightly greater specific gravity than the fluid in which it is run, its impellers are relied upon to give the added lift to keep it suspended in the fluid in the tank when rotating and is provided internally with an electro conductive rotor **58** in opposition to the pole pieces of the stator.

It will be clearly seen that the three modifications herein described are fundamentally identical, each having a magnetic rotor and a conductive rotor relatively movable by means of eddy currents from a magnetic field, one of the moving parts enumerated being a buoyant structure or capable of being rendered buoyant by the impellers adapted for immersion in the fluid in the tank.

In the modifications shown in Figures 1 and 2, the magnets of the rotor lag behind the conductive rotor which is mechanically rotated, whereas in the modification of Figure 3 the electro conductive rotor lags the rotating magnetic field produced by electrical current in the stator **55**.

What I claim as my invention is:

1. A magnetically driven agitator comprising a substantially non-magnetic stationary cylinder mounted on the bottom wall of a liquid containing tank, a cylindrical rotor of non-magnetic material of high electrical con-

ductivity journalled vertically within the stationary cylinder, means for rotating the cylindrical rotor, a magnetic rotor in the form of an annulus adapted for rotation about the stationary cylinder, said magnetic rotor having an annulus of magnets with their poles extending radially inwards whereby when surrounding the stationary cylinder to define an air gap therebetween, said magnetic rotor having a spiral impeller, said stationary cylinder being substantially longer than the height of the magnetic rotor, and means as the magnetic rotor is rotated by eddy currents generated incidental to rotation of the cylindrical rotor in a given direction to propel the magnetic rotor upwardly of the stationary cylinder in fluid contained within the tank.

2. A magnetically driven agitator as claimed in claim 1,

wherein said air gap between the annulus of the magnetic rotor and the stationary cylinder will enable a repulsive component to develop in the magnetic field between the magnetic rotor and the cylindrical rotor and hold said magnetic rotor concentric with the stationary cylinder and out of contact therewith.

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