United States Patent [19]

Ravitts

[11] **3,856,272**

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[54] **FLOATING MIXER**

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[73] Assignee: **Richards of Rockford, Inc.,** Rockford, Ill.

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[21] Appl. No.: **260,851**

[52] **U.S. Cl.** **259/95,** 277/135, 417/61

[51] **Int. Cl.** **B01f 5/12**

[58] **Field of Search** 415/7; 259/8, 95, 96, 97; 239/182; 261/120; 277/135; 308/36.3; 417/61

[56] **References Cited**

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Attorney, Agent, or Firm—Hume, Clement, Brinks, Willian, Olds & Cook, Inc.

[57] **ABSTRACT**

A floating mixer has a vertically oriented draft tube containing an impeller for directing liquid against a submerged baffle for deflecting the liquid radially in all directions. The submerged baffle may be the bottom wall of the float.

A passage is provided through the center of the float for accommodating the impeller drive shaft. A shield plate at the bottom end of the passage allows a small amount of liquid to enter the passage from which it is conducted by a conduit to the parent body of liquid at a remote point. The foregoing avoids the use of a water tight bearing for the impeller shaft.

12 Claims, 2 Drawing Figures

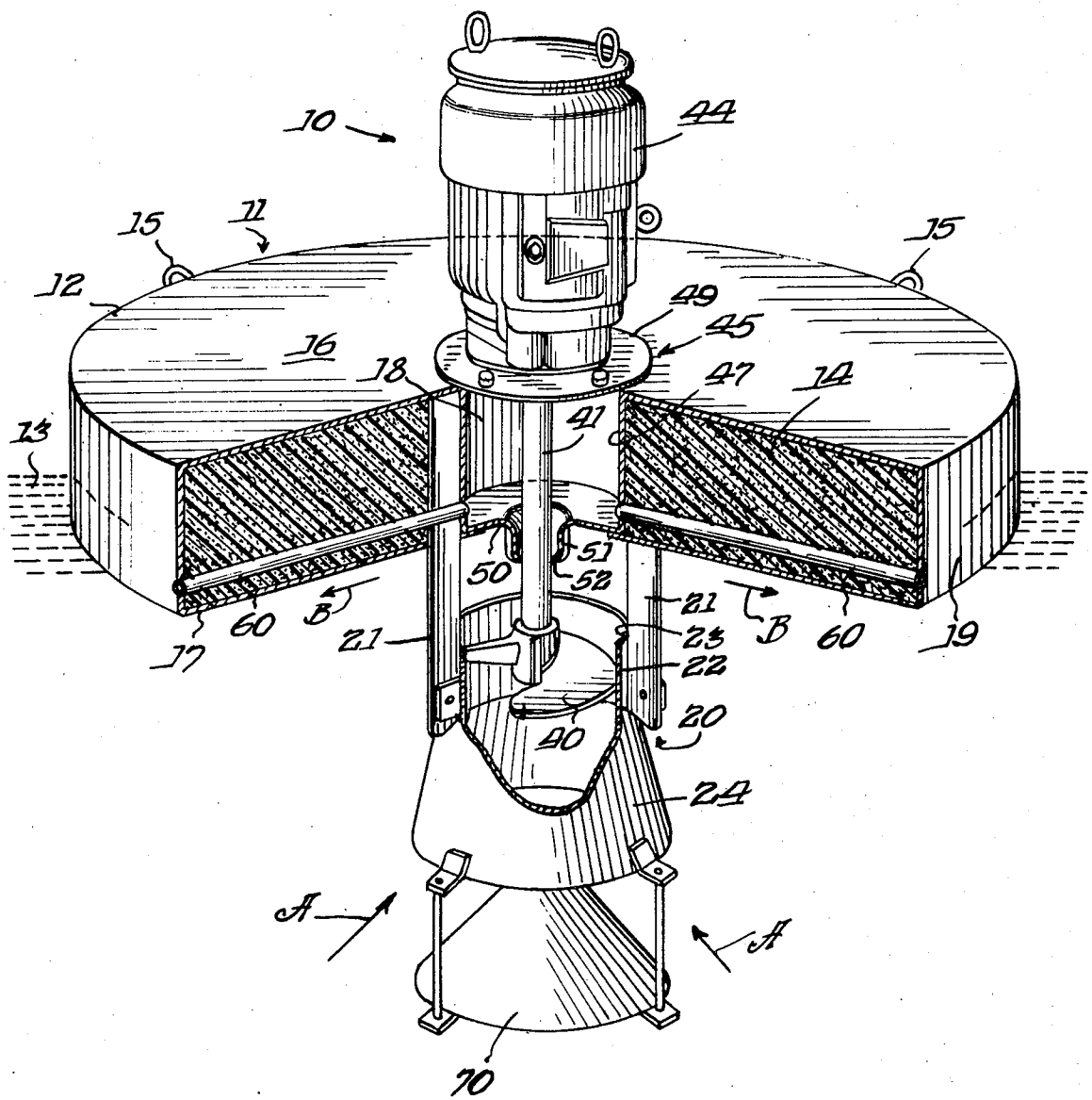
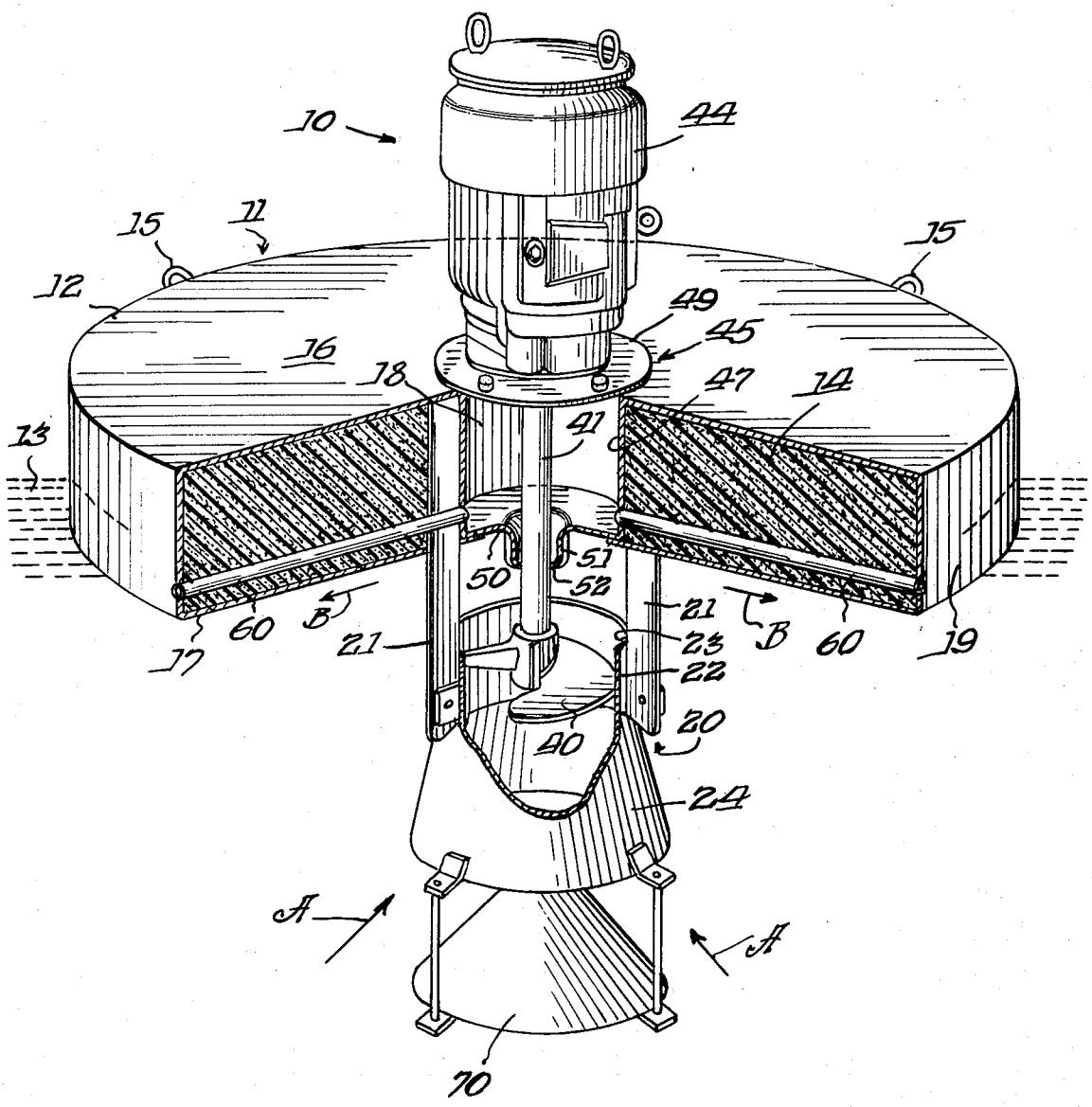


Fig. 1.


10
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17
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23
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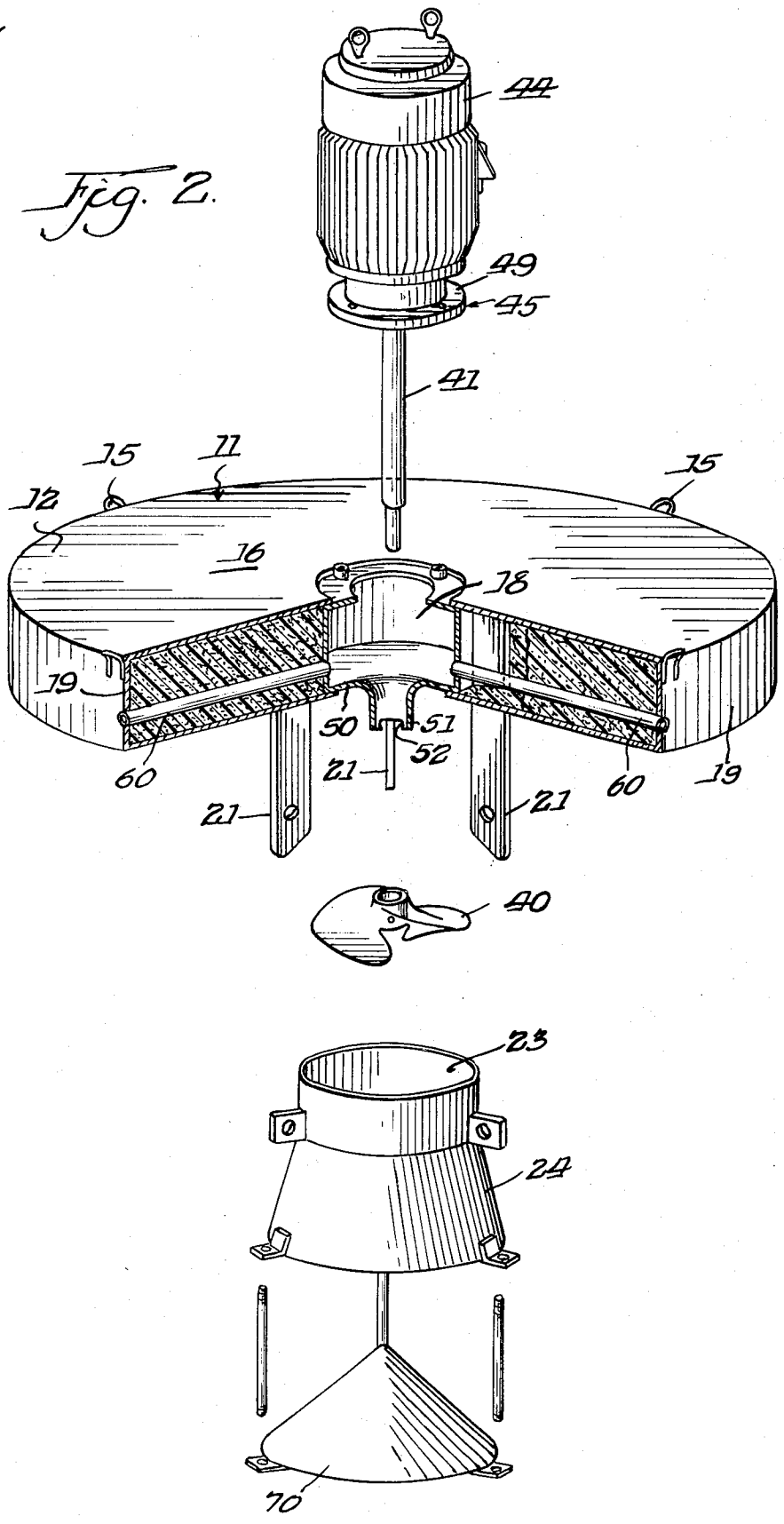
A
A
70

Fig. 2.



FLOATING MIXER

This invention relates to apparatus for agitating liquids, and more particularly to a floating mixer which may be used for circulating liquids, for example, to prevent settling of solids in waste treatment plants, agitating sewage, stirring during chemical processing, and the like.

BACKGROUND OF THE INVENTION

Motor driven devices for mixing liquids are well known. One type of mixer construction is an assembly having a motor coupled to an impeller which is supported on a fixed structure.

Since the mixer is maintained in a fixed position during operation, if the liquid level changes, problems can result. Often the position of the impeller should be adjusted with any changes in the liquid level.

Moreover, mixing devices supported by fixed structures lack mobility. If it is desired to change the location of the mixer in the liquid, in some instances the entire support must be removed, and the support assembled at the new location. Further, a fixed support makes it difficult for the mixer to be inspected and/or repaired.

Although floating mixers of the type as depicted in Bood; Pat. No. 3,365,178 are known, they produce a unidirectional flow in a confined, submerged stream.

In any device in which the motor is located on a float, special precautions must be taken to prevent liquids from damaging the motor. In floating aerators and spray devices, for example, plates and seals of different configurations are ordinarily mounted between the impeller and the motor for shielding the motor. Assuming it is desirable to mount a shield between the impeller and the motor in order to protect the motor from corrosive effects of the liquids, there is the problem of accommodating the drive shaft through the plate or shield in such a way that liquid cannot reach the motor even after wear occurs.

OBJECTS OF THE INVENTION

Accordingly, it is a principal object of the invention to provide a floating mixer which readily adapts to changes in the surface level, and which circulates liquid radially in all directions from the mixing unit.

Another object of the invention is to provide such a floating mixer which may be readily moved along the surface of the liquid in order to change to any number of desired positions, and which can be readily removed from the liquid for inspection, and/or repair.

Still another object of the invention is to provide a mixer which protects the motor from corrosive effects of the liquid.

It is a further object of the present invention to provide a mixer that is readily and economically manufactured.

It is yet another object of the invention to provide a mixer which is readily installed in a lake, pond, basin, or channel which can be readily changed in its location, and which can be periodically removed and/or inspected and repaired without great deal of difficulty, and which is efficient in mixing and agitating.

These and further objects of the invention will become apparent from a study of the attached drawings, accompanying specification and the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view partly broken away of a floating mixer embodying the new and improved features of the invention.

FIG. **2** is an exploded perspective view partly broken away illustrating the device of FIG. **1.**

DESCRIPTION OF THE PREFERRED EMBODIMENTS OF THE INVENTION

Referring now to the drawing, FIG. **1** illustrates a floating mixer **10** in a body of liquid **13** such as a pond, canal, lake, pool, tank, and the like. A mixer is supported in the liquid by float **11** which comprises a sealed outer shell **12,** the interior of which is filled with polyurethane foam **13.** Hooks **15** are secured to the float **11** so that the mixer can be moored by cables (not shown) at a desired location. Although the float may assume many different shapes, a circular float provides many advantages.

The outer sealed shell **12** has a top plate **16** and a spaced bottom plate **17.** Inner and outer cylindrical walls **18** and **19** enclose the sides of the shell.

A mixing unit **20** in the form of a vertically oriented cylindrical throat **22** is supported below, and spaced from the float **11** by a plurality of legs **21.**

The throat acts as a propeller duct and is in the form of a cylindrical chamber **23** having upper and lower open ends. The lower portion of the chamber **20** is flared at **24** in a frusto-conical shaped draft tube. The upper open end of chamber **23** is spaced below bottom wall **17** of the float **11.**

An impeller in the form of an axial flow type pump **40** is mounted for rotation within the chamber **23.** Impeller **40** is in the form of a helical blade that is rotated by drive shaft **41.** Drive shaft **41** is driven by motor **44.** The motor **44** is supported on motor mount **45** on bosses (not shown) secured to the top surface of the outer shell **12.**

The motor **44,** drive shaft **41,** chamber **23,** and impeller **40** are preferably mounted concentric to the circular float **11** in order to provide balance to the floating assembly. Moreover by positioning the throat **22,** draft tube **20** and impeller concentrically to the float, as well as the other mentioned units, stability of the device is improved.

The inner cylindrical wall **18** forms a central passage **47** through the float **11.** Motor mount **45** has a stationery plate **49** that covers the upper end of the passage **47.** A diffusing plate **50** partially encloses the lower end of the passage **47.**

It will be noted that the upward flow of liquid through the chamber **23** is directed against the bottom wall **17** of the shell **12.** The bottom wall serves as a large baffle or deflective plate to distribute the liquid radially in all directions. If the motor is reversed, and there is downward flow of liquid, the bottom wall **17** serves to prevent cavitation of the impeller **40.** During downward flow, the liquid emerging from the chamber **23** flows laterally in all directions.

The aforedescribed mixing unit presents the problem of protecting the motor, since liquid is under pressure along the drive shaft **41** by the action of impeller **40.** The usual solution would be a water tight seal or bearing surrounding shaft **41.** In the present invention a novel solution is provided.

As shown, diffusing plate **50** is flared downwardly into a bell **51.** The bell **51** is provided with a central opening **52** through which passes the drive shaft **41.**

A small clearance is provided, for example, clearance of **0.005** inches, between the sides of bell **51** and the drive shaft **41.** Therefore, as liquid is forced by the impeller **40** toward or away from the float **11,** a small amount of controlled bleeding of the liquid between the drive shaft **41** and the sides of opening **52** in bell **51** occurs.

Conduits **60,** which can be mounted in the shell **12,** conduit liquid to or from the passage **47** to a point remotely located from the mixing unit **20,** so that the positive or negative pressure applied to the liquid within passage **47** by the impeller **40** is relieved to the surrounding body of liquid **13.** In the device illustrated in FIG. **1,** the conduits **60** are mounted at the lower portion of the passage **47** between the inner wall **18** and the outer wall **19** of the float **11.**

A cone **70** may be removably mounted below the flared end portion of draft tube **20** in order to prevent erosion of the bottom of the pond and the like. The cone **70** is removable, and may be removed in the event the body of liquid is of sufficient depth. Also the cone **70** is removed if the impeller is rotated for updraft of the liquid through the chamber **23.**

From the foregoing, it is believed that the operation of the device is apparent. The floating mixer **10** is placed in a pool or pond **13** and secured by hooks **15** to cables (not shown). The electrically powered motor **44** rotates shaft **41** to drive impeller **40.** The motor is usually driven to produce an upward flow of liquid through chamber **23,** but may be reversed to create a downdraft through the chamber **23.**

The draft tube **20** determines the flow of the liquid being mixed. As is apparent from the foregoing, liquid is drawn vertically from one horizontal level and discharged at another horizontal level in a submerged path. This facilitates mixing of materials having different densities, for example, preventing the settling of solids.

Moreover, the liquid driven upwardly as shown by arrows A in FIG. **1** is deflected by the bottom wall **17** of the float **11** for lateral distribution of the liquid in all directions indicated by arrows B. This provides efficient mixing of the liquid in the parent body **13.** If the liquid is driven downwardly the flared end **24** distributes the liquid radially in all directions and the bottom wall prevents cavitation of the impeller. In any case, the bottom wall of the float serves as a baffle to the chamber **23.**

A central passage **47** in the float **11** normally contains a small amount of liquid which serves as a seal and the level of which is maintained against positive and negative static heads by the conduits **60** to the parent body of liquid. If an updraft is produced by impeller **40,** the head of liquid within the passage **47** tends to increase but is relieved by conduits **60** which communicate between the passage **47** and the external body of liquid. If a downdraft is produced by impeller **40,** the head of liquid within passage **47** tends to be less than the level in the external body of liquid but such negative head is relieved also by the conduits **60** to the parent body of liquid, thus preventing ingestion of air to the impeller and consequent cavitation.

In the drawing and specification there has been set forth preferred embodiments of the invention, and although specific terms are employed, these are used in a generic and descriptive sense only and not for purpose of limitation. Changes in form and proportion of parts, as well as substitution of equivalents are contemplated, as circumstances may suggest or render expedient, without departing from the spirit and scope of this invention, as further defined in the following claims.

I claim:

1. In a floating liquid mixer adapted to be mounted in a parent body of liquid, the combination comprising:

a float adapted to be supported bouyantly in the parent body of liquid,

said float having a vertically extending passage therethrough,

mixing means positioned below said float adapted to be submerged in the parent body of liquid for agitating the liquid,

drive shaft means connected to said mixing means,

motor means mounted on said float for powering said drive shaft,

a shield member at the lower end of said passage containing an opening through which said drive shaft means extends,

said opening providing a clearance between said drive shaft means and said shield member whereby liquid agitated by the mixing is introduced into said passage, and

conduit means between said passage and a location remote from said mixing means for controllong the level of liquid in said passage.

2. The mixer of claim **1** in which said float is circular.

3. The mixer of claim **2** in which said mixing means, motor means, and conduit means are mounted concentric to said float.

4. A mixing device comprising:

floatable supporting means adapted to be buoyantly suspended in a parent body of liquid,

motor means supported on said floatable supporting means,

a shaft for rotation by said motor,

conduit means suspended vertically below said floatable supporting means and adapted to be submerged in the body of liquid,

said conduit means having vertically spaced upper and lower openings so that liquid is withdrawn from one level and discharged at another level below the liquid surface,

said upper opening of the conduit means being spaced below said floatable supporting means,

axial flow impeller means positioned in said conduit means below said upper opening and driven by said shaft for forcing liquid under pressure through said conduit means,

chamber means surrounding said shaft for receiving the liquid projected upwardly along said shaft in order to provide a seal between said motor means and said axial flow impeller means,

baffle means adapted to be submerged below the surface of the parent body of liquid and spaced above the upper opening of said conduit means for radially deflecting the liquid discharged from said conduit means in substantially radial directions, and

said conduit means oriented so that the liquid is discharged substantially vertically from the upper opening thereof against said baffle means.

5. The mixing device of claim 4 in which said upper end of the conduit means is vertically oriented in a position spaced below said baffle means by leg members depending from said floatable supporting means.

6. The mixing device of claim 4 in which said baffle means is circular.

7. The mixing device of claim 4 in which said conduit means has a cylindrical portion, and said axial flow impeller means is positioned in said cylindrical portion.

8. The mixing device of claim 4 in which said baffle means comprises the bottom wall of said floatable supporting means.

9. In a mixing device, the combination comprising:

float means adapted to be suspended in a parent body of liquid,

said float means having a bottom wall adapted to be submerged in the parent body of liquid,

draft tube means suspended below said float means for directing liquid upwardly toward the bottom wall of said float means,

said draft tube having an upper open end and lower opening,

axial flow impeller means within said draft tube means below said upper open end for discharging liquid under pressure from said upper open end against the bottom wall of said float means,

motor means supported on said float means for driving said impeller means with a shaft,

chamber means surrounding said shaft for receiving the liquid moving upwardly along said shaft so as to provide a seal between said motor means and said impeller means, and

said upper end of the draft tube means oriented toward and spaced from said bottom wall of the float means so that as the liquid is discharged therefrom it is deflected radially.

10. The mixing device of claim 9 in which said shaft tube, impeller means, and motor means are mounted centrally of said float means.

11. The mixing device of claim 9 in which said bottom wall of the float means is circular in configuration.

12. The mixing device of claim 9 in which said draft tube is suspended below said float means by a plurality of depending leg members.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,856,272 Dated December 24, 1974

Inventor(s) Richard B. Ravitts

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the Specification

Column 3, line 12, "conduit" should be -- conduct --.

Signed and Sealed this

seventh Day of October 1975

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks