United States Patent

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a part interest

Continuation of application Ser. No. 689,451, Jan. 17, 1968, now abandoned.

[54] **MIXING APPARATUS**
6 Claims, 3 Drawing Figs.

[52] **U.S. Cl.** **259/4,** 259/44, 259/64, 222/241

[51] **Int. Cl.** **B01f 5/00,** B01f 7/20, B01f 15/04

[50] **Field of Search** 259/4, 8, 23, 24, 43, 44, 64, 65; 222/333, 241; 210/193; 134/93

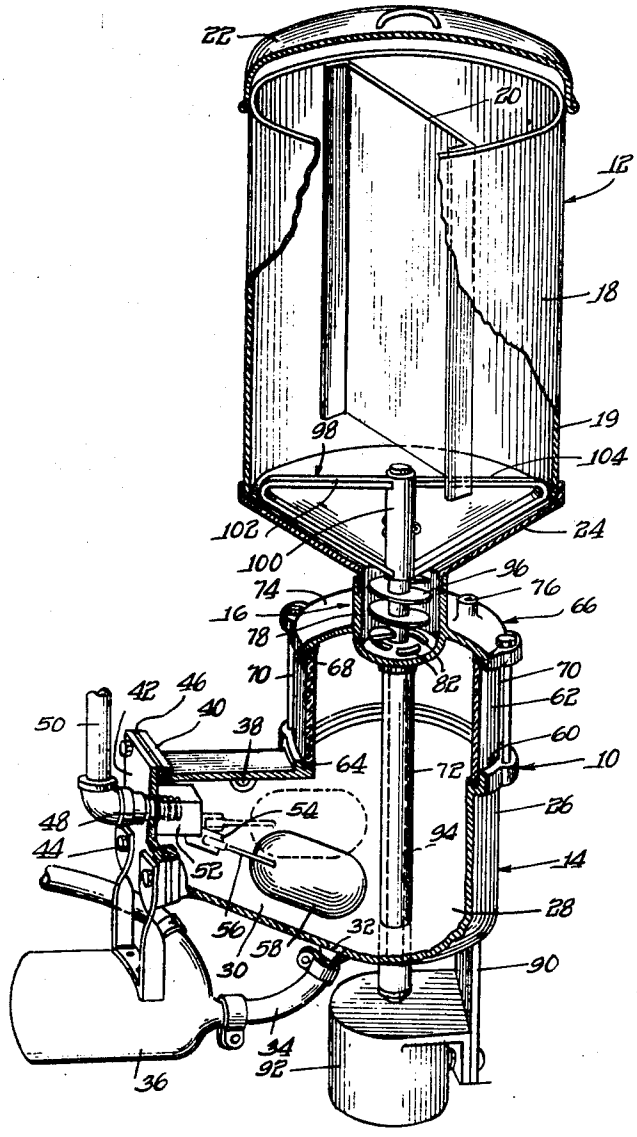
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ABSTRACT: The instant mixing apparatus includes a vessel for holding particles of a solid material, a beater positioned in the lower portion of the vessel and an apertured plate positioned below the beater. An auger connected to the beater and mounted above the plate positively displaces the particles from the vessel through the apertured plate into a basin positioned below the apertured plate. The basin holds a liquid and receives the powdered material. A drive is positioned below the basin and extends through the basin and is connected to the auger to drive the auger and beater simultaneously.



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Fig. 2.

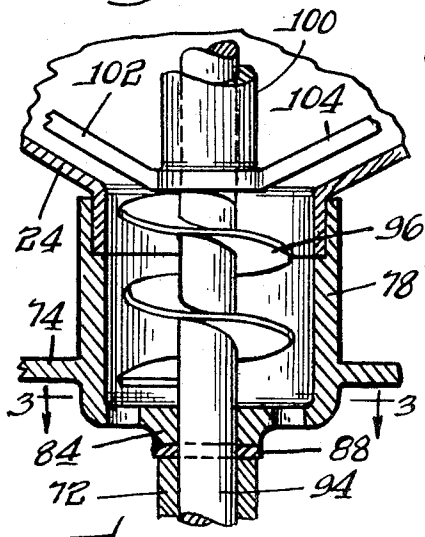


Fig. 3.

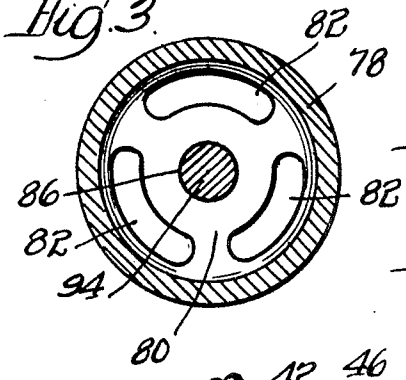


Fig. 1.

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MIXING APPARATUS

This is a continuation of application Ser. No. 698,451, filed Jan. 17, 1968, and now abandoned.

BACKGROUND OF THE INVENTION

In many applications, it is necessary to mix a quantity of dry powderlike material or granularlike material with a liquid. As an example, in the dry-cleaning industry, filter aids, such as diatomite or activated charcoal, are added to a dry-cleaning fluid, such as perchloroethylene. Obviously, the materials must be mixed into the liquid, but also the materials must be measured so that a prescribed amount of material is added.

In most operations wherein a powdered or granular material is added to a liquid, it is desirable to prescribe the amount of powdered or granular material which is added; that is, the quantity must be regulated. Many of the devices which are currently used are faulty for any number of reasons. Many devices depend upon a pure gravitational system and large particles may get into the system, or in some instances, moisture may get into the system, so that the powdered or granular material is formed into lumps, which inhibits the free flow of material, thereby preventing the successful operation of the system.

In recognition of the deficiencies of the gravity feed systems, a number of forced feed systems have been devised. These forced feed systems are accurate and they do accomplish their intended purpose. However, they have the deficiency of being very expensive and not suitable for many industrial applications wherein cost is a substantial factor, such as in a dry-cleaning plant.

SUMMARY OF THE INVENTION

The present invention relates to a mixing apparatus which utilizes the best features of both the gravity system and a complete forced feed system. The present apparatus utilizes gravity in portions of the apparatus, and then utilizes forced feed of the material particles in only the critical aspects of the system, so that the apparatus operates with a high degree of efficiency and has a high degree of reliability. It is therefore a principal object of the herein-disclosed invention to provide an improved mixing apparatus wherein gravity is utilized partially to deliver the material particles to a positive displacement device which delivers a prescribed amount of material to a mixing chamber.

A further object of the instant invention is to provide a mixing apparatus which is economical to manufacture and simple to maintain.

It is a still further object of the present invention to provide an improved mixing chamber construction which requires gaskets between stationary parts but does not require seals between moving parts to seal portions of the movable mechanical structure from the liquid.

Other objects and uses of the instant invention will become readily apparent to those skilled in the art upon a perusal of the following specification in light of the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view of a mixing apparatus embodying the herein-disclosed invention with portions broken away in order to show the interior construction thereof;

FIG. 2 is an enlarged cross-sectional view of a portion of a beater and an auger of the instant device; and

FIG. 3 is a cross-sectional view taken on line 3–3 of FIG. 2 showing the construction of a portion of a plate containing apertures.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, and especially to FIG. 1, a mixing apparatus generally indicated by the number 10 and embodying the herein-disclosed invention generally consists

of a container 12, a mixing chamber 14 and a dispensing assembly 16, connecting the container and the mixing chamber.

The container 12 generally consists of a vessel 18 having a cylindrical sidewall 19. A divider 20 is positioned in the vessel in order to separate two different materials. In the present apparatus, diatomite is held in one side of the container and activated charcoal is on the other side, though any other suitable material may be used. A conventional cover 22 is mounted on the upper portion of the vessel. The lower portion of the vessel includes a conical bottom 24 which is attached to the sidewall, and the apex of the cone is directed to the dispensing assembly 16.

The mixing chamber 14 is positioned below the container and includes a housing 26 which has a basin 28 and a penstock 30 opening into the basin. The lower portion of the basin contains an outlet 32 which is connected to a pipe 34 which is turn is connected to an outlet pump 36. The penstock 30 includes an overflow outlet 38 near the upper portion thereof.

As may be seen in FIG. 1, the penstock includes a flange 40, and a head 42 is secured to the flange 40 by a plurality of screws 44. A gasket 46 is mounted between the head and the flange to provide a seal therebetween. The head includes an inlet 48 which is connected to a conventional source of dry-cleaning solvent, such as a dry-cleaning machine sump, through a pipe 50. Connected to the inlet 48 is a conventional inlet valve 52 which is controlled by a float 54, which float includes an arm 56 attached at one end to the valve and a bulb 58 connected to the other end of the arm.

The housing 26 includes an annulus 60 which has positioned therein a transparent cylindrical sleeve 62. A gasket 64 is held between the sleeve and the annulus. Mounted on top of the sleeve is a headplate 66 which receives the sleeve 62 and has a gasket 68 positioned between the sleeve and the headplate. A plurality of conventional tie rods 70 secures the headplate 66 to the housing 26 and thereby compressibly holds the sleeve 62 between the plate and the housing.

The dispensing assembly includes a tube 72 which is sealingly fixed to housing 26 and extends through basin 28. The aforementioned headplate 66 constitutes a portion of the dispensing assembly. The headplate 66 includes an annular cover 74 which has an air vent 76 formed therein. Formed integral with the cover 74 is a cylindrical auger chamber 78. The bottom of the auger chamber 78 is formed integral with a dispensing plate 80 which has three arcuate slots 82 contained therein. The dispensing plate 80 includes a seal boss 84 which is formed integral therewith and through which extends a shaft aperture 86. The tube 72 which is fixed to housing 26 has its upper end positioned adjacent to boss 84, and a gasket 88 is positioned between the end of the tube and the boss 84.

A motor bracket 90 is supported on the housing 26, and a drive motor 92 is mounted on the bracket. Connected to the drive motor is a drive shaft 94 which is rotatably positioned in the tube 72 and extends through the shaft aperture 86 and has mounted thereon an auger 96. The auger 96 is positioned in the auger chamber 78, which chamber opens onto the apex portion of the conical bottom 24. Fixed to the drive shaft 94 above the auger 96 is a beater 98. The beater 98 includes a sleeve 100 with a pair of open arms 102 and 104 fixed to the sleeve. The arms 102 and 104 conform in part to the slope of bottom 24, as may be seen in FIGS. 1 and 2.

It may be seen that the construction of the instant device is simple and is such that it is economical to manufacture. Specific attention is called to the construction of the integral headplate 66. It should be noted that by tightening the tie rods 70, the sleeve 62 is sealed to the housing 26 and the headplate, and simultaneously, the boss 84 is sealed relative to the tube 72 by gasket 88. It should be further noted that although the drive motor 92 is positioned below the basin 28, there is no need for a kinetic seal. All of the seals are static seals, which provides a construction wherein maintenance is minimized.

In the operation of the present device, two different powdered or granular materials are placed into the container on opposite sides of the divider. As mentioned above, on one side

of the divider, activated charcoal is placed in the container, and on the other side of the divider, diatomite is held therein. The pipe **50** is connected to the source of liquid; in this case, perchloroethylene, and when the bulb **58** is in a down or lowered position, the valve **52** is opened so that perchloroethylene fills the basin **28**. It may be appreciated that when the pump **36** operates, the liquid is drawn from the basin **28** and delivered to an appropriate location, such as the dry-cleaning machine. Should the pump fail to carry away liquid or should the inlet valve fail to operate properly, the excess liquid flows out through the overflow outlet.

In order to dispense a prescribed quantity of granular materials, the motor **92**, which provides a drive means, is energized for a prescribed period. As the motor turns shaft **94** a given number of revolutions in a prescribed period, and in turn the auger **96**, a prescribed amount of materials is displaced and delivered by the auger. The beater **98** rotates with the auger to mix the granular materials together and to break up any lumps of particles. The auger picks up the material particles and delivers them positively to the dispensing plate **80** and forces the material particles out through apertures **82**. The granular material then falls by gravity into the basin **28** where it mixes with the liquid, and the pump **36** carries away the mixed materials and liquid. It should be noted that the auger positively carries the materials to the dispensing plate and the dispensing aperture. The period of operation of the motor **92** determines the number of revolutions which the auger makes and thereby determines the amount of materials which are dispensed to the basin.

The present apparatus utilizes gravity to deliver the materials to the beater, where the beater breaks up any large masses of particles. Then, the auger makes a positive measurement and a positive dispersion of materials, and gravity then takes over again to drop the materials into the liquid. Thereby, the present apparatus utilizes gravity to provide an inexpensive apparatus, and utilizes a positive displacement of materials to insure reliability.

Although the preferred embodiment which has been described in detail herein discloses an apparatus for use in the dry-cleaning industry, it is readily apparent that those skilled in the art may make various modifications and changes and adapt the instant apparatus for use in many other applications where it is necessary to mix a powdered or granular material with a liquid. It is to be expressly understood that the disclosures contained herein are provided in order to conform to the applicable statutes. It is to be further understood that the instant invention is limited only by the appended claims.

I claim

1. Apparatus for mixing solid particles with a liquid comprising:

a vessel for storing solid particles;

auger means for conveying the particles from the vessel;

plate means positioned below the auger and having an aperture that allows particles conveyed by the auger to pass through the plate;

basin means positioned below the plate means for receiving solid particles passing from the vessel through through the aperture in the plate means and having an inlet for liquid and an outlet for liquid and solid particles;

drive means positioned below the basin means for driving the auger means and extending through the basin means and through the plate means to drivingly engage the auger means;

a hollow tube surrounding the drive means that extends through the basin means and terminates in an upper end adjacent to the plate means; and

static sealing means between the upper end of the tube and the plate means, said static sealing means being adapted to provide a static seal between the upper end of the tube and the plate means, thereby creating a static seal between the drive means and the interior of the basin means.

2. Apparatus as claimed in claim 1, wherein the static sealing means comprises a gasket positioned between the upper end of the hollow tube and a seal boss provided on the underside of the plate means.

3. Apparatus as claimed in claim 2, and further comprising:

a sleeve positioned above the basin means having a lower end adjacent to the basin means and an upper end adjacent to the plate means; and

tie rod means extending from the basin means to the plate means for holding the sleeve between the plate means and the basin means while at the same time holding the seal boss and gasket in sealing engagement with the upper end of the hollow tube.

4. Apparatus as claimed in claim 1, and further comprising:

divider means mounted within the vessel for separating the vessel into two separate chambers for two different types of solid particles, said divider having a lower end terminating above the auger means, thereby allowing the different types of particles to be combined prior to delivery to the auger means; and

beater means fixed to the auger means and positioned above the auger means and below the divider means for mixing the solid particles from the two chambers prior to delivery to the auger means.

5. Apparatus as claimed claim 1, and further comprising:

float valve means connected to the inlet of the basin means and being adapted to close the inlet of the basin means when the liquid in the basin means reaches a predetermined level.

6. An apparatus for mixing two different materials of solid particles with a dry-cleaning solvent comprising, a vessel for storing the solid particles, a divider positioned in the vessel to segregate the two materials contained in the vessel, said divider terminating adjacent to the bottom of the vessel, a conical bottom forming a portion of the vessel, a cylindrical auger chamber connected to the conical bottom, an auger rotatably mounted in the auger chamber for carrying solid particles, a beater positioned below the divider and above the auger to mix the materials which combine prior to delivery to the auger, a plate connected to the auger chamber, said plate containing an aperture to allow particles to pass through the plate, a sleeve connected to the plate, a basin positioned below the sleeve adapted to contain a liquid and adapted to receive the particles delivered through the apertured plate, an outlet in the basin for receiving the liquid and the particles, an inlet valve for controlling the amount of liquid delivered to the basin, a flat connected to the inlet valve for regulating the level of liquid in the basin, said plate having a seal boss, a tube extending through the basin, a gasket positioned between the tube and the seal boss, a plurality of tie rods securing the plate to the sleeve and holding the gasket in tight engagement between the seal boss and the tube, drive means positioned below the basin, and a drive shaft connected to the drive means and extending through the tube and connected to the auger and the beater to rotate the auger and the beater.