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MIXING PROCESS AND APPARATUS

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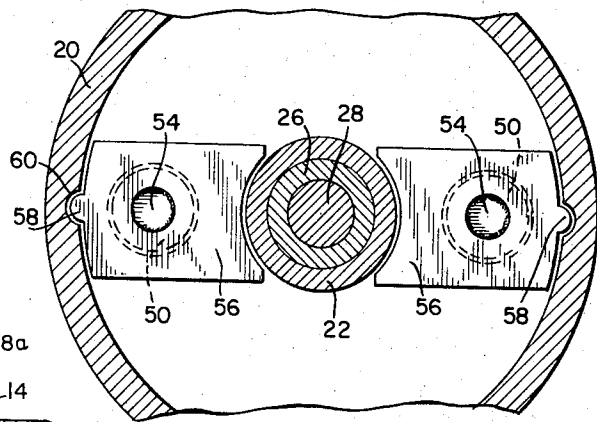
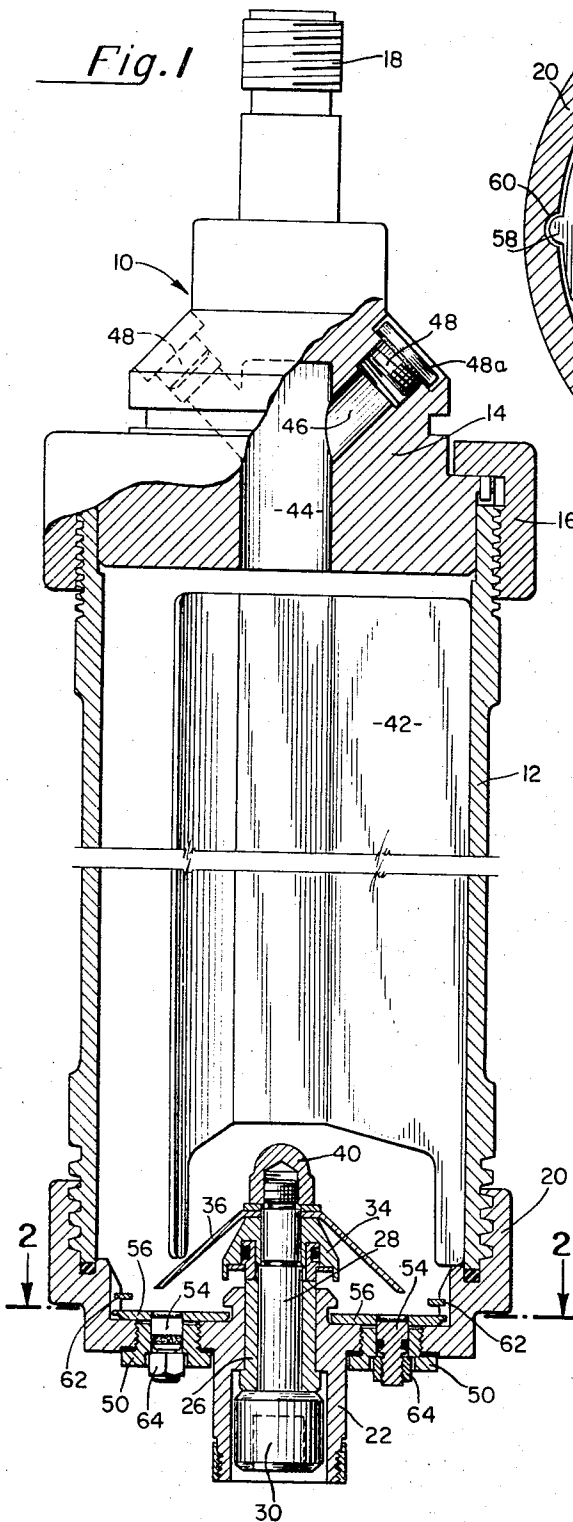


Fig. 2

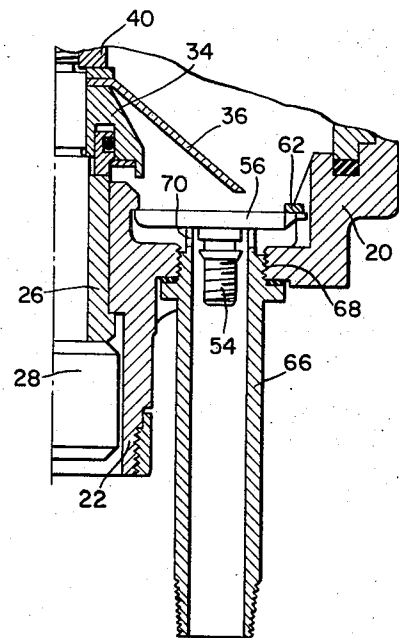


Fig. 3

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MIXING PROCESS AND APPARATUS

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ABSTRACT OF THE DISCLOSURE

Liquids and other components are mixed by placing them in a container, agitating the mixture while the container is in fixed position, and spinning the container to separate entrapped gas from the mixture by centrifugation. Apparatus for carrying out the process may include a mixing bowl having at its lower end an agitator coupled to drive means for operation when the container is fixed, also a discharge port and a baffle assembly associated with the port.

This invention relates to the mixing with other ingredients of a liquid which tends to foam during the mixing and to the defoaming of the mixture. More specifically the invention relates to the mixing of a liquid, particularly a foamable viscous liquid, with other ingredients in a mixing container, then spinning the container to centrifuge entrained gases from the mixture, and discharging the defoamed mixture.

In a large number of processes it is desired to mix a foamable liquid with one or more liquid or solid components to form a thoroughly blended product. Problems have arisen in connection with the making of such a mixture in that the foaming of the liquid can cause non-uniformity in the mixture and impair its subsequent effectiveness. Foaming can also degrade the liquid. Some success has been achieved in avoiding these problems by removing the foamed mixture from the mixing container, placing it in a centrifuge bowl and centrifugally separating the entrapped gases from the liquid. The latter procedure, however, has been objectionable not only in that a separate centrifuge has been required and a transfer step has been necessitated, but also because in processing the mixture in two separate containers, i.e. the mixing container and the centrifuge bowl, some of the mixed product has unavoidably been lost in each container with a considerable loss of valuable product. An additional objection in instances in which the liquid is viscous is the difficulty in transferring the mixture from one receptacle to another.

It is an object of the invention to provide for the mixing and defoaming of ingredients without necessitating the transfer of the ingredients from one container to another.

A further object of the invention is to provide a mixing and defoaming container in which the components may be discharged under a gas pressure without danger of gas finding its way into the discharge mixture.

Further objects of the invention will be understood with reference to the attached specification and drawings in which:

FIGURE 1 is a broken elevational view of a combination mixing and centrifuge bowl embodying the invention, portions of the bowl being broken away to expose structure;

FIGURE 2 is a fragmentary sectional view taken on the line 2—2 of FIGURE 1; and

FIGURE 3 is an enlarged fragmentary sectional view showing the bowl in disposition for discharge of the blended ingredients.

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Briefly, the present invention involves the mixing of components in a mixing container and then spinning the same container to centrifuge out gases entrained in the mixture during the mixing.

Referring more particularly to the drawings, a centrifuge bowl embodying the invention is broadly designated 10 in FIGURE 1. It comprises a tubular shell 12 with a removable bowl top 14 held down against the shell 12 by a threaded coupling ring 16. The bowl top is equipped with a threaded upper end 18 by which it may be attached to a conventional centrifuge drive spindle.

The lower end of the bowl is equipped with a removable bowl bottom 20 which is threaded to engage corresponding threads of the peripheral shell 12. The bowl bottom has a central downwardly extending boss 22 having a central opening. The boss receives a threaded wear sleeve. The opening is provided with a bearing 26 which rotatably receives the blender drive shaft 28. The lower end of the drive shaft is equipped with part 30 of a conventional coupling element to which a blender drive is attached. Above the bushing 26 the drive shaft 28 is provided with bearing cap assembly 34. The assembly supports the blender impeller 36 which may be of various designs. Above the impeller the shaft is reduced and threaded and provided with a cap nut 40.

Within the shell 12 the bowl may be provided with a conventional three-wing 42 for the purpose of assuring that the liquid within the bowl rotates at the speed of the bowl during the centrifuge step.

The bowl top 14 is provided with a central bore 44. Adjacent the upper end of the bore diverging passages 46 are provided, the upper ends of which are threaded and receive plugs 48. The plugs have enlarged heads 48a which are received into a large recess about the opening on the outside of the bowl top.

Referring again to the lower end of the bowl there are provided two threaded openings which are fitted with plugs 50. The plugs 50 have central bores slidably receiving studs 54 which support baffle plates 56. As shown in FIGURE 2 the baffle plates 56 are provided with tangs 58 which fit into grooves 60, respectively, on the inside wall of the bowl bottom. Limiting the upper movement of the baffle plates is a spring retaining ring 62 which fits into an appropriate groove at the wall of the bowl bottom.

As shown the baffle studs 54 are provided with O-rings sealing the space between the studs and the plugs 50. The lower ends of the studs are reduced and threaded and receive the nuts 64 which hold the baffles down against the inside surface of the bowl bottom.

Referring now to FIGURE 3, discharge of liquid from the bowl can be effected by removing the plugs 50 from their respective holes in the bowl bottom. This is accomplished by first removing the nuts 64 and then unscrewing the plugs 50. Once this is accomplished a special nipple 66 may be provided having at its upper end threads 68 adapted to cooperate with the threads in openings for the plugs 50. When the nipple is screwed into the plug opening, the upper end of the nipple abuts the under surface of the baffle plate 56 and raises it so that liquid may move around the baffle and thereunder through the slots 70 on the side of the nipple. The lower end of the nipple may be attached if desired to a suitable discharge conduit.

Using the device the bowl top is removed and the liquid and/or solid components are introduced into the bowl. The 3-wing 42 may be removed. The lower end of the bowl rests on a blender drive, the coupling portion 30 attached to a co-operant coupling portion on the upper end of the blender drive. As the shaft 28 and the impeller rotate at a high rate of speed the components within the bowl are thoroughly mixed to provide a uniform and homogeneous mixture. This mixing however gives rise to

foaming. When from visual inspection it appears that the blending is sufficient, the bowl is taken off the blender drive and the bowl top is replaced. The threaded upper end 18 of the bowl is attached to a centrifuge drive spindle with the boss 22 at the lower end fitting into the customary drag bushing of the centrifuge. The entire bowl is then rotated about its axis at a high rate of speed which may be in the range from 4 to 20 thousand r.p.m. depending on the size of the bowl and the process requirement.

The bowl is then disengaged from the centrifuge drive and the nipples 66 are threadedly inserted into the openings as discussed to raise the baffle plates 56 permitting discharge of the blended liquid through the nipples. To facilitate and provide a vent for the discharge of this liquid, the plug 48 may be removed.

If the liquid mixture is considerably viscous, a pressure discharge may be required. In this instance a pressure hose is attached to the opening from which the plug 48 is removed. Pressure is then applied forming a pressure head pressing the liquid down through the openings in the nipples 66. Because of the baffle plates 56, there is no tendency for the gas to break through the viscous liquid in bubble form and move out the liquid discharge. The baffle plates 56 provide means to avoid this. The blended liquid flows smoothly under the baffle plates and through the nipples 66.

It will be clear that the present invention provides means for simplifying the thorough mixing and defoaming of process liquid. Not only does the present invention simplify the multi-step procedure by making unnecessary transfer of liquid from a mixing bowl to a centrifuge bowl, but also it avoids the spillage and wastage of liquid which invariably results as liquid is transferred from one container to another. In the instance of process liquids with which the present invention is employed, the value of small amounts of process liquid can be very high and hence this advantage is significant.

The present invention may be embodied in other specific forms without departing from the spirit or central attributes thereof and, accordingly, reference should be made to the appended claims rather than the foregoing specification as indicating the scope of the invention.

I claim:

1. A process for mixing a liquid and other components comprising placing the liquid and components in a container, and while holding the container in fixed position mixing the liquid and components with a rotating impeller, then spinning the container and mixed liquid at a speed sufficient to drive entrapped gas to the surface of the mixture and thereby remove therefrom gases entrapped in the mixing.

2. A process according to claim 1 including the additional steps of opening a port in the lower end of the container and pressurizing the upper end of the container to drive the mixture out the lower end of the container.

3. A mixing bowl comprising a peripheral shell and lower and upper end walls, the lower end wall having a downwardly extending boss with a central opening extending vertically through the boss and end wall, an agitator shaft extending snugly through the opening, the shaft mounting above the wall inside the bowl an impeller and terminating at its lower end in a portion of a coupling means adapted to be engaged and driven by agitator drive means, the upper wall having an opening, a removable fill plug in the opening, the lower wall having a discharge port spaced from the boss, a discharge plug received into the port and having a central bore, a baffle assembly comprising a plate disposed in the bowl and a stud secured perpendicularly to the plate, the stud extending through said bore and having a reduced and threaded end outside the bowl, and threaded means engaging the threaded end to hold the plate down against the lower end wall.

4. Mixing apparatus for liquid and other ingredients tending to foam when mixed, comprising a container having wall structure formed about a vertical axis and upper and lower end walls, an agitator disposed in the bottom of said container for rotation about said vertical axis, means including a shaft extending upwardly through said lower end wall adapted for driving said agitator when said container is fixed, said lower end wall being provided with a discharge opening and a removable plug for closing said opening, said container being mounted for rotation about said vertical axis, and means for rotating said container at high speed to centrifuge the contents thereof, the construction and arrangement being such that the rotation of said container following agitation of its contents separates entrapped gas therefrom and the mixed contents can be drained from said discharge opening in defoamed condition.

References Cited

UNITED STATES PATENTS

2,417,747	3/1947	Flowers	233—46 X
2,425,942	8/1947	Kooman	259—33
2,626,746	1/1953	Abbott	233—46 X
2,895,645	7/1959	Pelak	
3,096,282	7/1963	Trotter	233—7
3,250,518	5/1966	Van Rossem	259—43 X

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