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C. E. BENDER

2,766,022

MIXING EQUIPMENT

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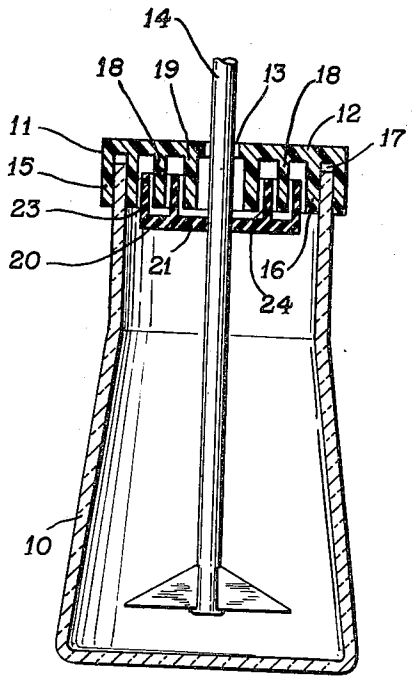


Fig. 1.

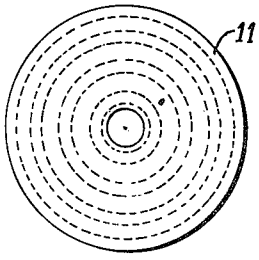


Fig. 2.

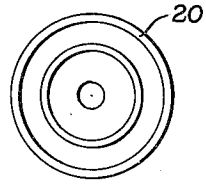


Fig. 3.

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MIXING EQUIPMENT

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3 Claims. (Cl. 259—122)

This invention relates to mixing equipment, particularly high speed mixers. It is directed at the problem of controlling atomization, and aims to provide an apparatus for high speed mixing in which aerosols from the fluid are prevented from leaving the mixing vessel.

Any mixing of any fluid disturbs the surface, and some mist is formed by this disturbance. As speed goes up, disturbance and consequent atomization or misting increases. For example, even the relatively slow speeds used in whipping cream on a household mixer can throw cream far out of the bowl. When speeds of 20,000 or more R. P. M. are used, as in the case of homogenization of biologicals, misting becomes a serious problem. If the liquid is at all dangerous, the homogenization must be done in a completely closed system, which may be expensive, or difficult to clean and/or sterilize, or have some other disadvantage. A simple high speed stirring device in a container cannot be used, because the mist escapes through the hole in the container lid through which the stirrer passes.

I have discovered that escape of mist can be prevented in high speed stirring of the contents of a covered container in which the stirring shaft passes through a hole in the container lid by mounting on the stirrer shaft, close to the lid, a disc of preferably flexible material which is keyed to the shaft, and is large enough to cover the hole in the lid. The centrifugal action of the whirling disc drives mist outward and downward, and prevents mist from passing inward and upward to the hole in the lid.

Most preferably, for handling dangerous biologicals, the lid has downwardly projecting baffles which mesh with upwardly projecting baffles on the disc, to add a safety element to the assemblage. The baffled devices can be used for high speed homogenization, even at speeds of the order of 40,000 R. P. M., with no trace of atmospheric contamination.

The drawings disclose a preferred embodiment of the invention; in the drawings,

Fig. 1 is a section to a high speed mixer, with my invention mounted thereon,

Fig. 2 is a plan view of the lid used in Fig. 1,

Fig. 3 is a plan view of the sealing disc used in Fig. 1.

Referring to the drawings, the container **10**, preferably of glass, has mounted thereon a lid **11**. It consists of a flat disc **12** of "Teflon" or other material; a hole **13** is provided to permit a mixer shaft **14** to pass through. Downwardly projecting rings **15** and **16** are located at the edge of the disc; they form a channel **17** which tightly fits the upper rim of the container **10**. Similar downwardly projecting baffle rings **18** and **19** are located between the hole **13** and the edge rings **15** and **16**.

The bottom piece **20** consists of a flat disc **21** of "Teflon" or similar flexible material; hole **22** is provided which just fits the rod **14**, so that the piece **20** will be held in yieldable contact with the rod **14**, at any vertical point on the rod. An upwardly extending edge baffle ring **23** fits between rings **17** and **18** on the lid piece; a central baffle ring **24** fits between the rings **18** and **19**. In practice, the

ring **20** is mounted on the stirrer just below the lid, so that the baffles overlap as shown.

Teflon (poly tetrachlorodifluoroethylene) is one of the preferred materials for my invention because it is flexible, resistant to practically all known solvents, acids and alkalis, and in addition can be sterilized at the high temperatures used for biological work. Other materials can be substituted, depending on the use to which the mixing equipment is put—thus, polyethylene is useful for household mixers, thin springy metal for paint work etc.

For household, and other relatively low speed mixing, where spattering rather than contamination of the air is the problem simple flat discs can be used to advantage—the bottom disc catches substantially all of the mist, and by centrifugal action sends it back, out and down. But where contamination is a problem, at least single baffling is necessary to ensure against stray misting. I prefer to use the double baffles shown in the preferred embodiment of my invention, since the double baffled disc and lid are no more expensive than single baffled pieces; but single baffled piece have proved effective even at such high speeds as 40,000 R. P. M.

It will be noted that my entire assemblage consists of four pieces—a container, a stirrer, a baffled lid, and a baffled disc meshing with the lid—sealing is obtained by design and resilience. Cleaning and sterilization are very simple matters.

The simple design shown can be changed without departing from my invention, which is defined in the claims.

I claim:

1. An apparatus for mixing liquids at speeds capable of causing the formation of aerosol mists comprising a container with an open top; a lid for the open top of the container effectively sealing the container except for a central hole therein; a stirrer shaft passing through the hole with sufficient clearance so that free rotation of the shaft is possible without lubrication between the shaft and the lid; a disc of flexible material tightly attached to and rotable with the shaft at a point close to the lid and substantially filling the space below the lid; at least one upwardly projecting baffle carried by the lid adjacent its circumference; and at least one downwardly projecting baffle carried by the lid encircled and overlapped by the upwardly projecting baffle, whereby mist rising from the liquid being mixed, as it hits the disc, is directed outwardly and downwardly by the disc against the sides of the container to retard passage of mist above the disc and through the hole in the center of the lid.

2. The apparatus of claim 1, in which the lid carries a pair of downwardly extending projections about its rim which clamp the rim of the container top tightly between them.

3. The apparatus of claim 2, in which the disc contains two upwardly projecting cylindrical baffles, and the lid contains two downwardly projecting cylindrical baffles, one of which is disposed between the two upwardly projecting baffles and one of which is inside the inner upwardly projecting baffle.

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