

Dec. 22, 1959

R. N. ACKLES

2,918,264

MIXER AGITATOR

Filed Feb. 13, 1957

FIG. 1.

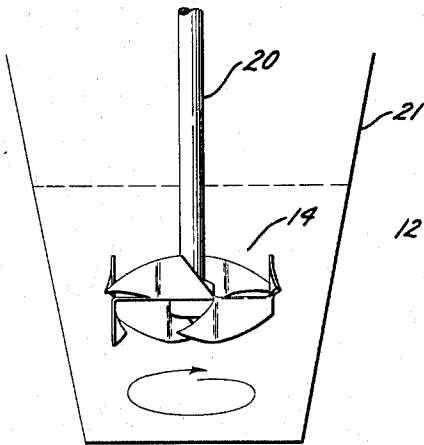


FIG. 2.

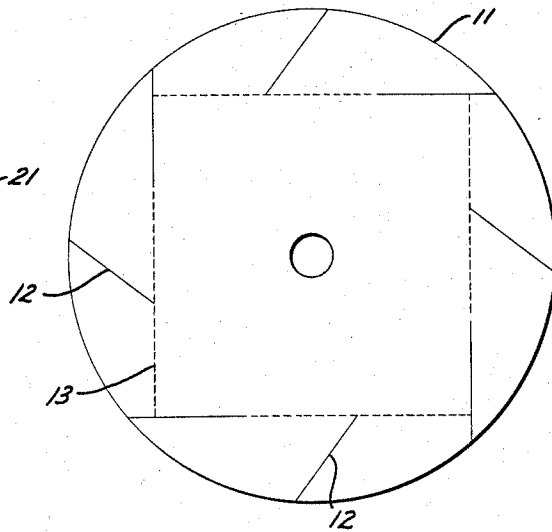


FIG. 3.

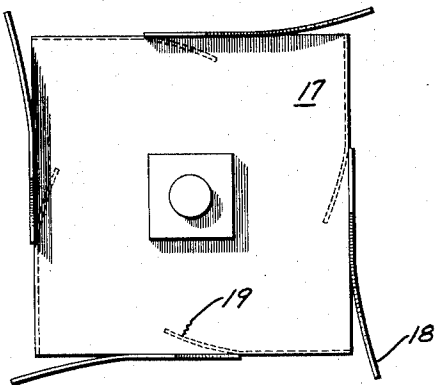
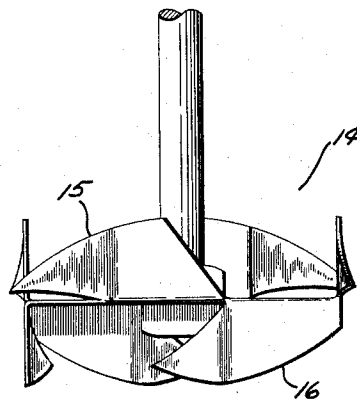


FIG. 4.



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1

2,918,264

## MIXER AGITATOR

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Application February 13, 1957, Serial No. 639,904

1 Claim. (Cl. 259—134)

The invention relates to a mixer agitator and more particularly to an improved agitator for mixing fluid plastic, resinous material, paint, and the like without introducing air bubbles into the material being mixed.

Mixers have heretofore been used in homes, industry, and eating places to mix various liquids, powders, and solids to produce desired homogeneous mixtures. This has been accomplished by increasing the speed of rotation of the mixing element and by providing a mixing element which will cause violent agitation of the liquid being mixed. In this manner, if solid particles are being mixed, they are disintegrated to form an homogeneous mixture. Liquids being mixed are also quickly reduced into a single resultant uniform mixture. It will be noted that liquids being mixed with each other or with solids are always forced against the side of a mixing container due to the centrifugal force exerted by the whirling liquids and solid particles. A vortex is created by this action which remains until the mixer has been stopped. This type of surface action introduces air into the material being mixed in the form of tiny bubbles entering through the vortex. Where the end product is a liquid or a food product in a solid or semi-solid state, this introduction of air is no problem and is in fact desired. In fact, an aerated food product has a fresher, more pleasing taste. In some material the introduction of air is undesirable since oxidation decomposition must be avoided. The introduction of air bubbles into a liquid plastic mixture similarly presents a serious problem. Upon solidification, after mixing, these air bubbles remain in the plastic. A rough and unsightly end product results, particularly when the plastic is molded into flat sheets.

A mixing element has been needed that will mix liquid plastic, quickly disintegrating the granules or additives therein, into an homogeneous mixture without undue introduction of air bubbles through a vortex created by the mixing action and which avoids violent surface agitation during mixing.

It is an object of this invention to provide complete mixing while maintaining a relatively flat and vortex-less surface on the material being mixed.

It is a further object of this invention to provide an agitator that will thoroughly mix any materials without excessive introduction of air bubbles into the resultant mixture.

Another object of this invention is to provide an agitator having knife-like blades that simultaneously slice and mix additives introduced into the mixture.

Another object of the present invention includes the accomplishment of the listed objectives while causing a minimum amount of disturbance of the material being mixed at the surface thereof where the materials are exposed to the atmosphere.

A still further object of this invention is to provide an agitator that is easily fabricated and capable of high production and economical maintenance and of particular

2

use in the intermixing of resins, hardeners, fillers, pigments and the like.

Other objects and advantages found in the construction of my invention will be apparent from a consideration of the following specification in connection with the appended claim and the accompanying drawings.

In the drawings:

Figure 1 is a front elevation view of the mixer element in its operative setting near the bottom of a container.

Figure 2 is a top view of the disk indicating in dotted lines the cuts made into the disk from the outer periphery thereof.

Figure 3 is a top view of the mixer element showing the blades and the curvature of the forward tips thereof.

Figure 4 is a side view of the mixer element showing the blades.

### General description

In general, a mixer element is provided which can mix plastic or similar material without undue introduction of air bubbles into the resultant mixture. The mixer element is transversely attached to the bottom end of a shaft in the usual manner and is positioned in the lower portion of a mixing chamber which is to contain the ingredients that are to be mixed. The body of the mixer element is comprised of a horizontal plate and has a plurality of alternate upwardly and downwardly disposed blades provided on its outer periphery. In the preferred embodiment, the tips of the upwardly disposed blades are bent so as to point outwardly and the tips of the downwardly disposed blades are bent so as to point inwardly. The material of the mix is directed in currents that counteract the effect of centrifugal force on the material being mixed and a vortex is thus avoided. The interface of contact between the two oppositely moving currents occurs at a plane passing through the base portions of the blade. Mixer elements hitherto used have not been able to cope with the problem of air bubbles in the material being mixed. No successful structure thus far has been made to avoid the creation of an undesirable vortex or agitated surface while the mixing action is occurring. While other mixing elements set up vertically oriented currents in the material, or seek violent radial turbulence, the present invention sets up a combination of vertical and horizontal currents with emphasis placed on the horizontal oppositely oriented type of currents suppressing vortex formation and substantially eliminating surface disturbance while accomplishing unusual mixing within the mass.

### Specific description

In the preferred embodiment, a disc 11 is provided with a series of equally-spaced slanting cuts 12 made into the outer periphery thereof as shown in Figure 2. The disc 11 may be of tin, sheet steel, or any sheet metal that can be easily cut and bent. The cuts 12 are made a depth equal to approximately  $\frac{1}{3}$  the radius of disc 11. The outer portions of the disc 11 formed by the cuts 12 are bent alternately up and down along an imaginary line 13 that is an extension of each cut 11. In this manner an agitator 14 is formed having four vertical upwardly extending blades 15 and four vertical downwardly extending blades 16, as shown in Figures 3 and 4, positioned on the horizontal plate-like portion 17 of the agitator or mixer element 14. The edges of the blades may be sharpened to provide cutting edges for easier shearing of granules of material being mixed. The pointed tips 18 of the vertical upwardly extending blades 15 are bent outwardly as indicated in Figure 3. The pointed tips 19 of the downwardly extending blades are bent inwardly as indicated by hidden edge lines in Figure 3. Each side of

## 3

the mixer element has a pair of upwardly and downwardly disposed blades. The upwardly disposed blade 15 is positioned ahead of the downwardly disposed blade 16. The forward tips 18 and 19 of each blade come to a point similar to blades of a scissors. The tip portion 19 of the lower blade 16 overlaps and is positioned below the rear portion of the upper blade 15. The agitator or mixer element 14 is mounted on a rotatable shaft 20 and is secured to the shaft 20 by conventional means. The direction of rotation as shown in Figure 1, is always in the direction of the tips 18 and 19 of the mixer element.

From the foregoing description and as shown in Figures 3 and 4, each of the upwardly extending blades has an outwardly curved cutting tip portion and each of the downwardly extending blades has an inwardly curved cutting tip portion. Each edge of the square base member is provided with two blades, one extending upwardly and the other extending downwardly so as to be alternately up and down along the periphery of the base member. Upon rotation, the outwardly curved cutting tip portions throw the material outwardly and the inwardly curved cutting tip portions throw the material inwardly. Thus, horizontal counter-rotating currents or eddies are created. The use of a square base member provides ease of manufacture which enables the provision of two blades on each edge, one extending upwardly and the other extending downwardly.

Although the resultant agitator 14 has been formed from a disc 11 and has four blades extending upwardly and four blades extending downwardly from a square horizontal portion 17, an agitator may be cast, stamped, or otherwise formed to have a plurality of blades provided about a square or circular horizontal flat portion. The resulting horizontal counter-rotating eddies or currents in the material being mixed by such a mixer element creates mixing action having no vortex and a relatively flat surface would be maintained on the material being mixed. The baffling effect of the horizontal flat portion of the mixer element in conjunction with the counter-rotating effect of the blades cooperate to create non-vortexial mixing.

## 4

## Operation

The mixer element or agitator 14 is mounted on the rotatable shaft 20. A container 21 containing material to be mixed is positioned below the mixer element in such a manner that the mixer element extends into and is positioned near the bottom of the container and is submerged in the material to be mixed. The mixer element is then rotated until the desired mixing action has been accomplished. Tests have shown that, when the mixer element is rotated at 1200-1400 r.p.m., five gallons of polyester and epoxy plastic can be mixed, thoroughly and without the creation of air bubbles therein, in approximately two minutes. Naturally, the time for mixing will vary with the type of material being mixed and the speed of rotation.

Various modifications of the invention may be made without departing from the principle thereof. Each of these modifications is to be considered as included in the hereinafter appended claim unless the claim by its language expressly provides otherwise.

Having thus set forth the nature of my invention, I claim the following:

In a mixing device, the combination including: a square base member; each edge of said square base member having two blades; one of said blades extending upwardly and the other of said blades extending downwardly so as to be alternately up and down along the periphery of said base member; each of the upwardly extending blades having a cutting tip portion curved outwardly and each of the downwardly extending blades having a cutting tip portion curved inwardly.

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