

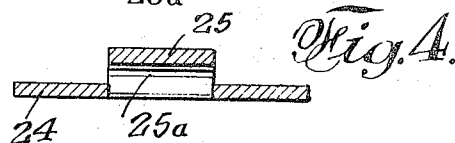
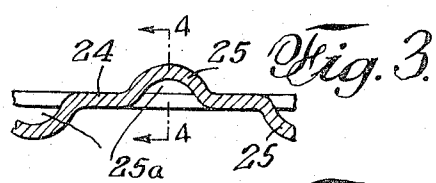
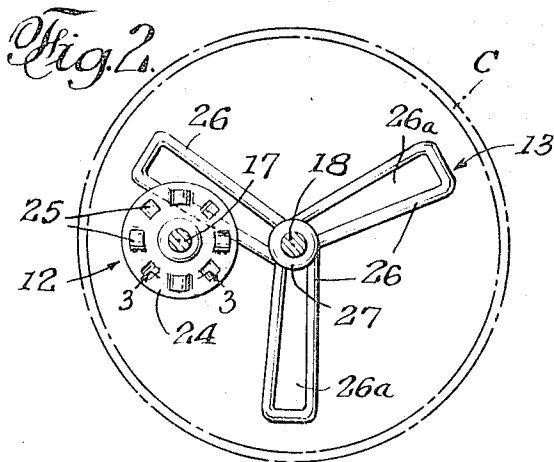
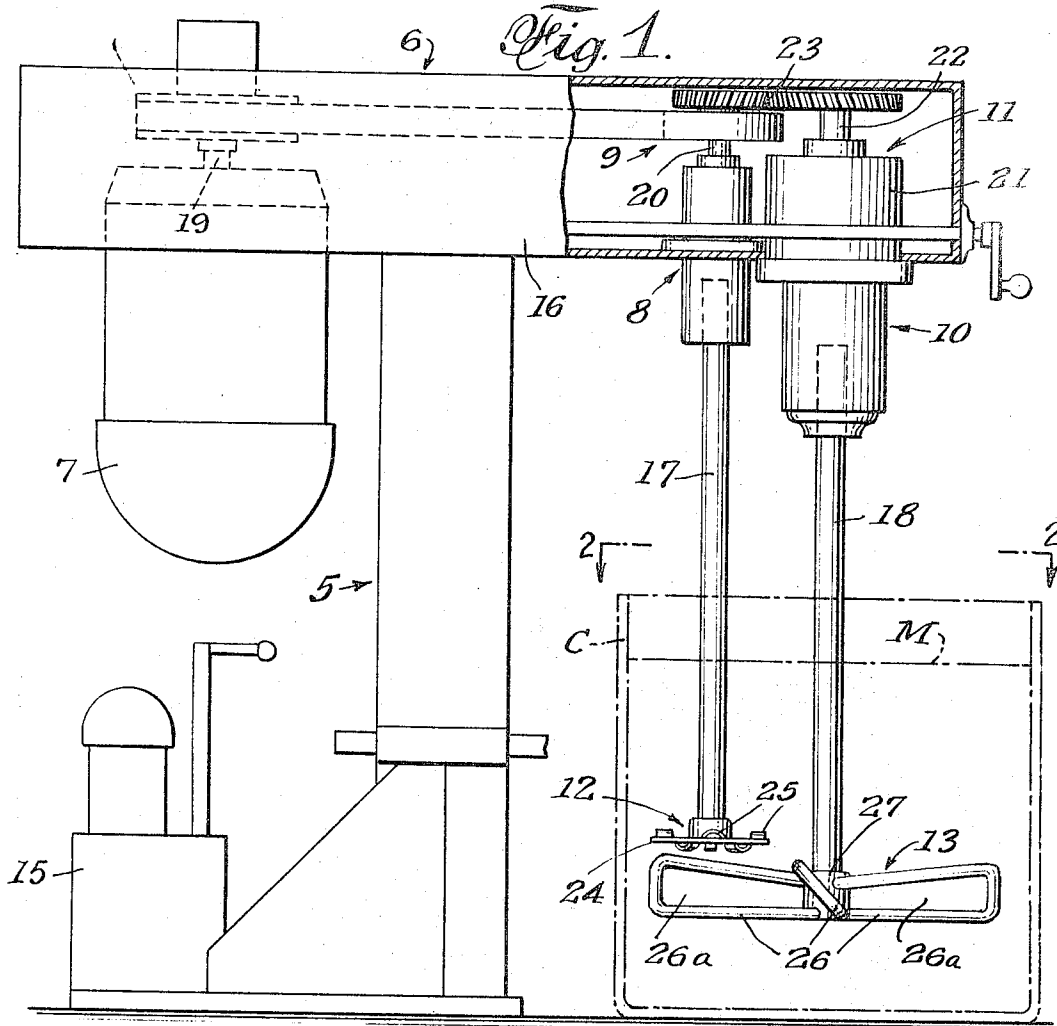
Sept. 19, 1967

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3,342,459

MIXER WITH DIFFERENT SPEED IMPELLERS

Filed June 27, 1966



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3,342,459

MIXER WITH DIFFERENT SPEED IMPELLERS
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Filed June 27, 1966, Ser. No. 560,643

5 Claims. (Cl. 259—104)

This application is a continuation-in-part of our pending application bearing the same title, Ser. No. 394,927, filed Sept. 8, 1964 and now abandoned.

This invention relates to a mixer having a larger slow speed impeller and a smaller high speed impeller, and has for an object to combine the slow heavy-duty material-stirring action of the larger impeller with the high energy and dispersion and agglomerate-breaking action of the fast speed impeller, thereby enabling high speed dispersion mixing on heavy, slow-flowing or even non-flowing pastes and liquid-paste mixtures, such as encountered in the mixing of paints, inks, plastics, rubber, pharmaceuticals, and many other analogous chemical products.

The present impeller form and arrangement provides an improved application of a high speed impeller, resulting in improved capability of said impeller to disperse mixtures that are rich in agglomerates and which are more viscous than those that can ordinarily be dispersed with conventional high speed dispersion impellers. Also, the present impeller form and arrangement results in agglomerate dispersion that lowers the viscosity of a mixture to that resulting for conventional high speed dispersion in initially less viscous material.

The present mixer structure improves on conventional dispersion in which agglomerates or like particles or masses of particles are added to liquids and stirred or mixed by high speed blades. The reduction or comminuting of the agglomerates to the size of the basic particle is best accomplished by effecting an inelastic collision of the agglomerates. Therefore, another object of the invention is to provide dispersion means that effects such collision by efficiently converting the kinetic energy introduced by the rotating impeller into the potential energy required to break the bond that forms the particles into agglomerates, producing efficient dispersion.

The efficiency of high speed dispersion increases as inelastic collision among the agglomerates becomes more probable. This greater probability is present in greater effectiveness in the more viscous materials. Accordingly, a further object of the invention is to provide an impeller blade arrangement by which slow stirring of the entire mass provides for a non-stagnant dispersion and agglomerate-breaking or comminuting action which is continuously fed by the circulation induced in the mass.

This invention also has for its objects to provide such means that are positive in operation, convenient in use, easily installed in a working position and easily disconnected therefrom, economical of manufacture, relatively simple, and of general superiority and serviceability.

The above objects are realized in a mixer structure that comprises a large, slow-turning impeller having elongated blades of rod material formed of flat loops and which moves through viscous material to produce a stirring action or movement of the agglomerates in the material, a high speed disc propeller having particle and agglomerate-striking portions offset oppositely from the disc and formed with radial passages that impose pressure on the agglomerates that move centrifugally along the opposite faces of the disc, thereby physically breaking them as well as bringing them into close and inelastic collision. The two impellers are driven to turn oppositely and the high speed impeller is located immediately above the slower impeller and within the perimeter of the arms of the latter im-

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pellor. Said arms of the slower propeller comprising elongated frames or loops formed of rod material and extending preferably radially from the mounting shaft thereof.

The invention also comprises novel details of construction and novel combinations and arrangements of parts, which will more fully appear in the course of the following description and which is based on the accompanying drawing. However, said drawing merely shows, and the following description merely describes, one embodiment of the present invention, which is given by way of illustration or example only.

In the drawing, like reference characters designate similar parts in the several views.

FIG. 1 is a side elevational view, partly in vertical section, of a mixing machine according to the present invention.

FIG. 2 is a cross-sectional view as taken on the line 2—2 of FIG. 1.

FIG. 3 is an enlarged and fragmentary sectional view as taken on the line 3—3 of FIG. 2.

FIG. 4 is a similarly enlarged sectional view as taken on the line 4—4 of FIG. 3.

The mixing machine that is illustrated comprises, generally, a support 5, a mixer head 6 mounted on said support, a motor 7 or other prime mover carried by the head, a combined bearing and chuck device 8, means 9 to drive said device directly from said motor, a second bearing and chuck device 10 disposed on an axis parallel to the axis of the device 8, means 11 to drive the device 10 at a slower rotational speed than the device 8, a high speed impeller 12 removably carried by the device 8, and a low speed impeller 13 removably carried by the device 10.

The standard 5, per se, forms no part of the invention. The same is shown as of the extensible type that is elongated or shortened, as desired, by means of an hydraulic jack 15. The head 6 is raised and lowered as the standard is extended or retracted.

The head 6 is shown as a housing 16 having an overhanging portion at one side of the standard to mount the motor 7 and an overhanging portion at the opposite side to mount the devices 8 and 10 as well as house the drive 9.

The chuck devices 8 and 10 extend downwardly from the head 6 and may comprise any conventional means for respectively holding the impellers 12 and 13 by separable engagement with the upper ends of the respective shafts 17 and 18 of said impellers.

The drive means 9 is shown as a belt and pulley drive from the shaft 19 of the motor to a shaft 20 on the axis of the bearing and chuck device 8.

The drive means 11 comprises a reducing gear unit 21 provided as an upper extension of the bearing and chuck device 10, an input shaft 22 to said unit, and a pair of drive gears 23 connecting the shafts 20 and 22. It will be clear that the unit 21 drives the shaft 18 at a slower speed than shaft 17. The direction of rotation of said shafts 17 and 18 is preferably opposite.

The impeller 12 is here shown as a disc 24 affixed to the lower end of the shaft 17 and provided with a set of alternately opposite agglomerate shearing portions 25 that, when the disc is rotating at high speed, have a high energy dispersing action in a mass of material M in a container or vessel C into which the impeller 12 extends. The portions 25 are shown as sheared, oppositely curved and integral parts of the disc 24, the same defining relatively small passages 25a that extend radially, as best seen from FIG. 2.

The impeller 13 is shown as having a set of elongated, generally radially extending arms 26 that radiate from a hub 27 on the lower end of shaft 18. Each said arm is

shown as being made of rod material defining an elongated horizontally disposed loop having a passage 26a therein. The overall diameter of the impeller 13 may be approximately two and one-half to three times greater than that of impeller 12, thereby enabling the latter to be disposed closely adjacent to the shaft 18 of the impeller 13, as shown, so that the smaller impeller is located substantially entirely within the perimeter circle swept by the arms 26 of the larger impeller.

It will be clear that the lengths of the impeller shafts 17 and 18 are proportioned so that the smaller impeller 17 is located above the larger impeller. To obviate inadvertent interchange of impellers, their shafts are simply made of different diametral size so that each of them will fit only into its own device 8 or 10.

The relatively slow movement of the arms 26 of the larger impeller 13, rather than having a paddle action that forces rapid upward displacement of the material M as well as a circulatory movement thereof, stirs the material to activate or agitate the same in a mixing movement caused by the rod members, of which the arms 26 are formed, cutting through the material which largely passes over and under said arms, and also through the loops, openings or passages 26a. Due to the frame-like form of the paddles, the mass of material M is in turbulent rather than directional movement.

The high speed dispersion action of the small impeller 12 takes effect on the agglomerates that are in the continuously turbulent portion of the material. The same, due to its high speed, centrifugally propels material into the mass of the material under the influence of the arms 26. When so propelled, agglomerates are struck by the oppositely offset parts 25, are forced through the passages 25a, are propelled into collision with each other, as they so move over the opposite faces of the disc 24, and into collision with the agglomerates in the mentioned turbulent portion of the mass and which are in slow movement toward the centrifugally propelled agglomerates. As a result, there is an inelastic rather than a resilient engagement between the agglomerates that promotes rapid size reduction thereof.

It will be noted that the impellers 12 and 13 are in close vertical spacing so the same cooperate efficiently, as above, and that the spacing of the impeller 13 from the vessel bottom is greater than the space between the impellers.

While the foregoing has illustrated and described what is now contemplated to be the best mode of carrying out the invention, the construction is, of course, subject to modification without departing from the spirit and scope of the invention. Therefore, it is not desired to restrict the invention to the particular form of construction illustrated and described, but to cover all modifications that may fall within the scope of the appended claims.

Having thus described this invention, what is claimed and desired to be secured by Letters Patent is:

1. A mixer for viscous materials dispersed with ag-

glomerates and contained in a vessel, said mixer comprising:

- (a) an impeller carried by a low speed vertical shaft and comprising a plurality of generally flat radial arms formed as flat loops of rod material framing a passage in each said arm, said impeller, when driven, creating turbulence in the contents of the vessel due to the rod material thereof cutting through said contents,
 - (b) and a smaller disc impeller carried by a high speed vertical shaft and spaced from the low speed shaft with the impeller thereon located within the perimeter of the larger impeller and spaced thereabove, and
 - (c) agglomerate-dispersing and comminuting portions that are offset on opposite sides of the disc and having radial passages therethrough to comminute agglomerates in the viscous material that is propelled over the faces of the disc by centrifugal force as the same is rotated, such centrifugally propelled agglomerates colliding with agglomerates in turbulent portions of said viscous material.
2. A mixer according to claim 1 in which the mentioned offset portions of the high speed disc are sheared from and are integral with the disc, said sheared portions comprising upset parts of the disc confining said passages.
3. A mixer according to claim 1 in which the larger, slower impeller is located in spaced relation to the bottom of the vessel and the smaller, high speed impeller is more closely spaced above the large impeller than the latter is spaced from the vessel bottom.
4. A mixer according to claim 1 in which is provided:
- (a) a support having a head with oppositely directed lateral portions, the two impellers being mounted to depend from one said portion,
 - (b) a motor to drive the impellers mounted to depend from the other head portion.
5. A mixer according to claim 4 in which the smaller impeller is located between the shaft of the larger impeller and the support for the head.

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