Dec. 6, 1960 E. A. REIFFEN 2,963,281

STIRRER DEVICES FOR MIXING VESSELS

Filed April 8, 1954 2 Sheets-Sheet 1

Fig. 1

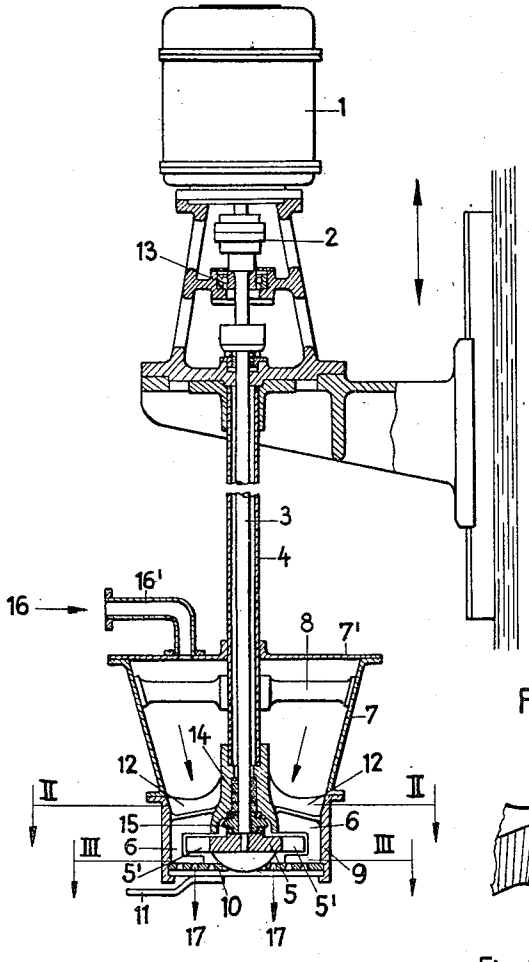


Fig. 4

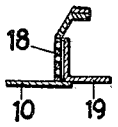


Fig. 4a

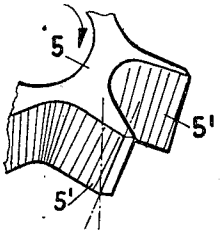


Fig. 2

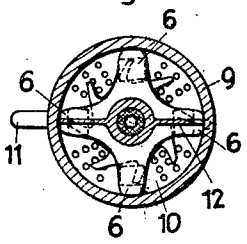
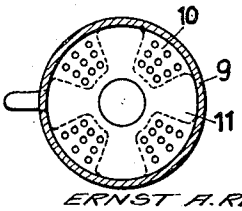


Fig. 3



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Dec. 6, 1960 E. A. REIFFEN 2,963,281

STIRRER DEVICES FOR MIXING VESSELS

Filed April 8, 1954 2 Sheets-Sheet 2

Fig. 5

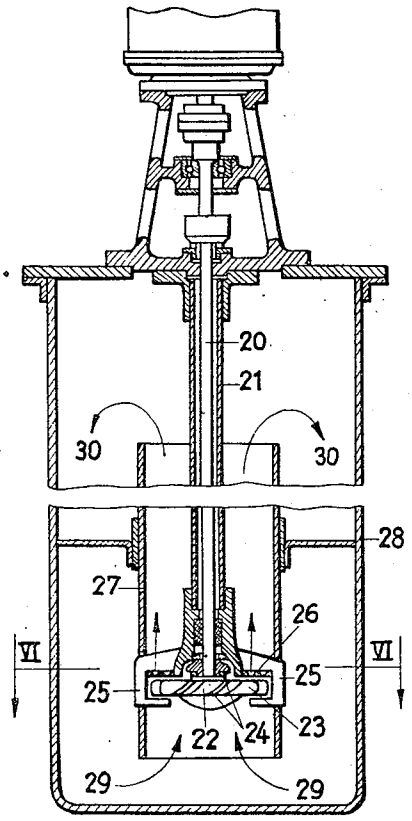


Fig. 7

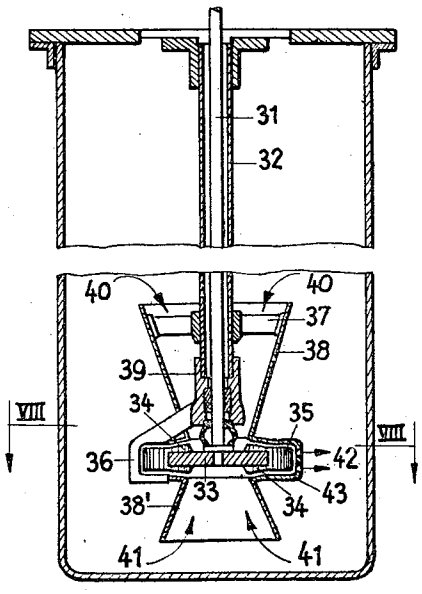


Fig. 6

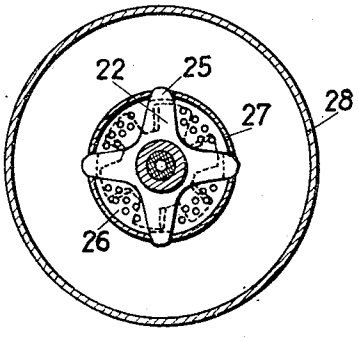
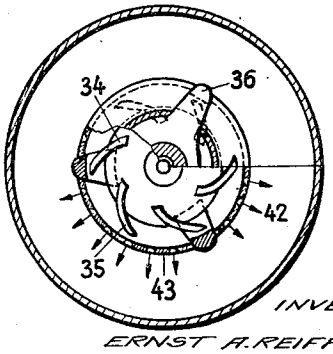


Fig. 8



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STIRRER DEVICES FOR MIXING VESSELS

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Claims priority, application Germany Dec. 19, 1952

6 Claims. (Cl. 259—95)

The present invention concerns stirrers which are used in stationary mixing vessels and employ as the means for mixing, toothed wheels whose teeth, when in rotation, pass through the slots of stationary comb-like bodies disposed free-standing at a distance from each other. One embodiment of such a mixing device is described, for instance, in the specification of British Patent No. 680,309 and U.S. Patent No. 2,592,334.

According to the present invention a stirrer of the type described is used in stationary mixing vessels in conjunction with means which effect a continuous flow of the material to be treated towards and through said teeth and slots.

These means may be modified and disposed in various manners. Such a means, according to one aspect of the invention, comprises a funnel-shaped container whose lower end is attached to a lower chamber into which the stirrer device comprising comb-like bodies and toothed milling wheel is inserted. Either in the bottom or in the upstanding side wall of the lower chamber, discharge apertures are provided whose cross-sectional area is adjustable by means of a shutter. With this controlling shutter the residence time of the material to be treated within the chamber can be adjusted as required for the process in hand. The material to be treated entering the funnel-shaped container on top must, in its feed motion directed from the top to the bottom, pass the stirrer device definitely and at the required rate.

According to a further embodiment of the present invention, another means serving the same purpose, that is the continuous feed of the material to be treated towards the stirrer device, provides a special form of the teeth of the toothed wheel, said teeth being shaped to act simultaneously as feeding members which, in conjunction with guide members, feed the material to be treated in a defined direction whereby the material is continuously conducted towards and through the stirrer device.

For this purpose, the teeth of the wheels can be shaped in one modification like the blades of a turbine wheel, disposed at an appropriate angle of incidence. In another modification, the teeth may comprise elongations of the blades of either an open or a closed impeller extending beyond the periphery of the impeller proper.

The invention will be described further, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a vertical section of a stirrer inserted in a funnel-shaped container with a chamber at the bottom.

Fig. 2 is a horizontal section on the line II—II of Fig. 1,

Fig. 3 is a horizontal section on the line III—III of Fig. 1,

Fig. 4 is a vertical fragmentary section of a modified embodiment of the bottom chamber of the container,

Fig. 4*a* is a fragmentary perspective view of the milling wheel,

Fig. 5 is a vertical section showing the disposition of the stirrer with the object of feeding the material to be treated vertically within a draft tube,

Fig. 6 is a horizontal section on the line VI—VI of Fig. 5,

Fig. 7 is a vertical section of a modification of the disposition of the stirrer,

Fig. 8 is a horizontal section on the line VIII—VIII of Fig. 7.

Figs. 1, 2 and 3 show an arrangement wherein a stirrer is inserted in a funnel-shaped container with bottom chamber. A motor **1** drives a milling wheel shaft **3** through a coupling **2**. The milling wheel shaft **3** rotates within a tubular casing **4**, and at the lower end of this shaft there is mounted a milling wheel **5** with teeth **5'**. At the lower end of the tubular casing **4**, are arranged comb-like bodies **6**. A funnel-shaped container **7** is affixed to the tubular casing **4** by means of webs **8**, and the milling device comprising the toothed milling wheel **5** and the comb-like bodies **6** is seated in a chamber **9** attached to container **7**, closed with a lid **7'**. The chamber **9** ends in a perforated bottom plate **10** whose apertures **17** can be more or less closed by means of a rotary shutter **11**. Segment-shaped baffle plates **12** are disposed between the lower part of the tubular casing **4** and the lower part of funnel-shaped container **7**, and the shaft **3** is supended and guided in bearings at **13** and **14**, and is sealed with a sealing element **15**. Material to be treated is admitted to the stirrer in the direction of the arrow **16**, through an inlet tube **16'**.

In an alternative arrangement of the lower chamber **9**, shown in Fig. 4, the bottom plate **10** has no apertures, and lateral apertures **18** which can be closed as required by means of an annular shutter **19** are provided instead in the upstanding side wall of chamber **9**.

Fig. 4*a* shows a perspective, fragmentary view of the milling wheel **5** with teeth **5'**, whose faces are rearwardly inclined relative to the direction of rotation indicated by the arrow.

The further embodiment of stirrer shown in Figs. 5 and 6 enables the material to be treated to be fed vertically within a draught tube.

A milling wheel shaft **20** rotates within a tubular casing **21** and carries at its lower end, a toothed milling wheel **22** which includes turbine blade-like milling teeth **23** disposed at a certain angle of incidence to the horizontal. The upper and lower edges **24** of milling teeth **23** are turned flat to rotate through stationary comb-like bodies **25**. Between comb-like bodies **25**, and closely above milling teeth **23**, is disposed a slotted plate **26**. The milling device is mounted within a draught tube **27** which is suspended in mixing vessel **28**, and when toothed wheel **22** rotates, the material to be treated is circulated in direction of the arrows from **29** to **30** so as to pass through said teeth and apertures to grind and shear the material.

Fig. 7 shows a vertical section through yet another embodiment of the stirrer, with whereby a vertical suction of the material to be treated by the toothed milling wheel, with a horizontal discharge, is obtained.

A horizontal section on the line VIII—VIII of Fig. 7 is given in Fig. 8.

A milling wheel shaft **31** rotates within a tubular casing **32** and at its lower end carries a toothed milling wheel **33** constituting a double-sided impeller disc having pairs of blades **34** with the blades in each pair being positioned opposite each other on the upper and lower faces of the disc. Each pair of blades **34** is extended beyond the periphery of the disc into an elongation **35** which forms a milling tooth passing through the slots of stationary comb-like bodies **36** disposed around the periphery of the disc.

Suction funnels **38** and **38'** are mounted on the tubular casing **32** by means of a clamp **37**. The comb-like

bodies 36 are fixed to a hub 39 which is attached to the tubular casing 32. The impeller enables the material to be treated to be drawn in symmetrically on both sides in the direction of the arrows 40—41, and to be discharged horizontally in the direction of the arrow 42. Outside the circle of rotation described by the tips of teeth 35, cylindrically bent, either slotted or perforated metal sheets 43 of channel-like section are arranged between the comb-like bodies 36. The material to be treated must pass through the apertures of metal sheets 43 when discharged horizontally from the milling wheel.

In Figures 7 and 8 there is shown an arrangement having an open impeller. In place of such an open impeller, a closed impeller can, of course, be employed, whose blades likewise extend beyond the periphery of the impeller disc to form the milling teeth.

I claim:

1. A stirrer device for a mixing vessel, including an open-ended draught tube suspended within said vessel, a stirrer shaft terminating within said draught tube, a mixing tool comprising a toothed wheel carried at the termination of said shaft, a plurality of stationary comb-like bodies mounted in spaced relationship within said draught tube, and a perforated metal sheet arranged substantially horizontally within said draught tube above said wheel, the teeth of said wheel being formed in the manner of turbine blades and being adapted on rotation of said shaft to pass through the slots in said comb-like bodies, and to promote a continuous flow of the material to be treated towards and through said teeth, slots and perforated sheet.

2. A stirrer device for a mixing vessel, including a stirrer shaft terminating within said mixing vessel, a double-sided impeller carried at the termination of said shaft, said impeller comprising an impeller disc having pairs of blades, the blades of each pair being positioned opposite each other on the upper and lower surfaces of said disc, elongations on said blades extending beyond the periphery of said disc, and a plurality of peripherally spaced comb-like bodies disposed within said mixing vessel, through the slots in which bodies said blades and elongations are adapted to pass on rotation of said shaft, to promote a continuous flow towards and through said blades and slots of the material to be treated.

3. A stirrer device for a mixing vessel, including an elongated tubular casing extending within said vessel, a stirrer shaft carried within said casing to terminate within said vessel, a mixing tool comprising a double-sided impeller carried at the termination of said shaft, said impeller comprising an impeller disc having pairs of blades, the blades of each pair being positioned opposite each other on the upper and lower surfaces of said disc, elongations on said blades extending beyond the periphery of said disc, a plurality of peripherally spaced, stationary comb-like bodies secured to said tubular casing, said blades and elongations being adapted on rotation of said shaft to pass through the slots in said bodies, a suction funnel disposed above said impeller and supported on webs secured to and extending from said tubular casing, and a similar suction funnel arranged below said disc, whereby a continuous flow of material to be treated towards and through said blades and slots is promoted.

4. A stirrer device for a mixing vessel, including a stirrer shaft terminating within said mixing vessel, a double-sided impeller carried at the termination of said shaft, said impeller comprising an impeller disc having pairs of blades, the blades of each pair being positioned opposite each other on the upper and lower surfaces of said disc, elongations on said blades extending beyond the periphery of said disc, a plurality of peripherally spaced comb-like bodies disposed within said mixing vessel, through the slots in which bodies said blades and elongations are adapted to pass on rotation of said shaft, to promote a continuous flow towards and through said blades and slots of the material to be treated, and apertured annular segments of channel shape disposed between said comb-like bodies outside the periphery of said impeller.

5. A stirrer device for a mixing vessel, including an open-ended draught tube suspended within said vessel, a stirrer shaft terminating within said draught tube, a mixing tool comprising a toothed wheel carried at the termination of said shaft, a plurality of stationary comb-like bodies mounted in spaced relationship within said draught tube, and apertured plate means mounted closely adjacent said toothed wheel for the flow of material coming from said wheel through the apertures in said plate, the teeth of said wheel being formed in the manner of blades and being adapted on rotation of said shaft to pass through the slots in said comb-like bodies, to promote a continuous flow of the material to be treated towards and through said teeth and apertures to grind and shear the material.

6. A stirrer device as in claim 5, said teeth of said wheel further comprising blade-like milling teeth.

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